Food and Agriculture Organization
of the United Nations

Sustainable Management of the Fall Armyworm in Africa

FAO Programme for Action

6 October 2017

Executive Summary

The invasive insect pest, Fall Armyworm, FAW (*Spodoptera frugiperda*) continues to spread across Africa, affecting millions of smallholder maize producers across the continent. In addition to its preferred maize, FAW can feed on more than 80 plant species, including rice, sorghum, millet, sugarcane, vegetable crops and cotton. FAW can cause significant yield losses if not well managed or in the absence of natural biological control.

Unlike quarantine pests under official control or insects with gregarious behaviour (e.g. some locust species), FAW does not lend itself to official, centralized control. FAW moths oviposit directly on maize plants, where the larvae feed and live. They are one more risk that farmers face in growing maize. The direct actions that can be taken to manage FAW are largely up to farmers in their fields. Thus the main focus and majority of resources should be aimed at helping farmers do their job better. Farmers need understanding, advice, tools, resources, risk management, and a conducive environment to sustainably manage FAW.

Farmers need to first understand what FAW is – how to identify it and understand its biology & ecology. They need to be able to determine the risk level in the context of their production systems, and take appropriate actions, both preventive and responsive, based on their assessments. The information and resources that they have at hand largely depend on the context in which they function. That context is influenced by many actors and interests, with public institutions and organizations – purveyors of public goods – playing a very important, but not exclusive role.

FAO and its partners will help at all levels: to help determine and disseminate best recommended practices to smallholder farmers, help in the assessment and use of risk analysis, facilitating and supporting the refinement and application of near-term solutions, and helping to shape the policy and technical environment that farmers face.

Some advice and recommendations are directly available from the Americas, where both maize and FAW are native. Maize farmers in the Americas have been managing FAW for centuries. However, the ecological and economic contexts are quite different between the typical maize farmer in the Americas and those of Africa. A sustainable integrated FAW management programme appropriate for the African context needs to be rapidly communicated and practiced by tens of millions of smallholder maize farmers across the continent. The context is shaped by public policies and programmes, thus it is also urgent that governments fully appreciate the threat that FAW possess and adopt policies and programmes that help promote sustainable responses to the new threat.

To this end, FAO has prepared this Programme for Action to help support Sustainable Management of FAW in Africa.

FAO proposes a five-year programme of action to help farmers, their organizations, their public institutions, national governments and development partners quickly respond the challenges of FAW infestation in smallholder farmers' fields across Africa. This Programme has a total cost of USD 87.550 million. FAO will train National Plant Protection Organizations, extension services, and farmers via Farmer Field Schools, to quickly get the appropriate action in the field, avoiding the pitfalls of possible miss-steps, while simultaneously filling knowledge gaps, innovating for future solutions, developing local capacities, promoting local empowerment and rural youth employment and coordinating among partners to maximize results and minimize inefficiencies.

FAO works closely with its development and resource partners to maximize coordinated results and minimize duplications. To this end, FAO has worked with partners in developing a coordinated FAW Framework that takes into account all FAW response interventions regardless of funding sources. FAO will take an active role in coordinating among all partners' activities, plans, and approaches to provide sustainable solutions to the FAW challenge.

FAO has prepared this Programme for Action in the context of that Framework. This Programme presents to development and resource partners that part of the Framework actions that FAO is prepared to directly coordinate and administer. Many of the activities described here include the active participation of partners and service providers. FAO will develop the appropriate Letters of Agreement or Contracts under which the obligations and responsibilities of all parties will be defined. FAO specifically leaves certain work to partners' comparative advantages and organizational missions better dedicated to those areas of work (e.g. longer-term research). FAO focusses on its comparative strengths to propose this Programme divided into six components:

1. **Management of FAW: Immediate Recommendations & Actions**
2. **Short-term Research Priorities**
3. **Communications & Training**
4. **Monitoring & Early Warning**
5. **Policy & Regulatory Support**
6. **Coordination**

Acronyms

AGRA	Alliance for a Green Revolution in Africa
AU	African Union
CABI	Centre for Agriculture and Bioscience International
CARE	Cooperative for Assistance and Relief Everywhere
CBO	Community-based Organization
CGIAR	Consultative Group on International Agricultural Research
CILSS	Permanent Interstate Committee for drought control in the Sahel
CYMMIT	International Maize and Wheat Improvement Center
EAC	East African Community
ECCAS	Economic Community of Central African States
ECOWAS	Economic Community of West African States
EU	European Union
FAO	Food and Agriculture Organization
FAO-HQ	FAO Headquarter
FAW	Fall Armyworm
FEWSNET	Famine Early Warning Systems Network
FFS	Farmer Field
GEF	Global Environment Facility
GIS	Geographic Information System
GPS	Geographic Positioning System
HHP	Highly Hazardous Pesticides
IAPSC	Inter African Phytosanitary Council
ICIPE	International Centre of Insect Physiology and Ecology
ICT	Information and Communication Technologies
IFAD	International Fund for Agricultural Development
IGAD	Intergovernmental Authority on Development
IITA	International Institute of Tropical Agriculture
INSA	Institut du Sahel
IPC	Integrated Phase Classification
IPM	Integrated Pest Management
NAR	National Agricultural Research
NGO	Non-governmental organization
NPPO	National Plant Protection Organization
NPV	Nuclear Polyhedrosis Virus
OXFAM	Oxford Committee for Famine Relief
PC	Personal Computer
PSU	Penn State University
REC	Regional Economic Communities
SADC	Southern African Development Community
SAPReF	Southern African Pesticides Regulators Forum
SMS	Short Message Service
SSC	South-South Cooperation

Contents

1. Fall Armyworm

Fall Armyworm (*Spodoptera frugiperda*), FAW, is an insect native to tropical and subtropical regions of the Americas. Its larval stage feeds on more than 80 plant species, including maize, rice, sorghum, millet, sugarcane, vegetable crops and cotton. FAW can cause significant yield losses if not well managed. It can have a number of generations per year and the adult moth can fly up to 100 km per night.

FAW was first detected in Central and Western Africa in early 2016 (Benin, Nigeria, Sao Tome and Principe, and Togo) and in whole of mainland Southern Africa (except Lesotho and the Island States), in Burkina Faso, Cabo Verde, Cameroon, Central African Republic, Gambia, Ghana, Guinea Bissau, Niger, Senegal, and Ethiopia, Burundi, Kenya, Rwanda, South Sudan, Uganda, and it is expected to spread further, probably beyond the African continent. Its modality of introduction, along with its ecological adaptation across Africa are still speculative.

FAW has quickly dispersed through much of Sub-Saharan Africa, where it now feeds on maize and other crops across millions of hectares in millions of plots, mostly managed by smallholder family farmers. Farmers urgently need support and guidance to sustainably manage FAW in their cropping systems. Although there are some management practices that can be quickly adopted to the conditions in Africa, some work needs to be done to test and validate them. Some short-term research needs to be conducted to rapidly validate additional potential, but un-proven management practices. Massive communication and training campaigns must be conducted to help farmers and their organizations learn about FAW biology and ecology and how to manage it. Finally, decision-makers must be aware of the potential threat and have access to information and advice regarding positive policies and programmes. While tempting to give away or import large quantities of pesticides, this is probably not a sustainable response.

1.1. Scope of the threat

Left unmanaged or in the absence of natural biological control, FAW can cause significant yield loss in maize and other crops. A quantification of that potential yield loss is still speculative, as many variables come into play between FAW infestation and yield reduction.
The response of maize to FAW infestation is highly dependent on the level and timing of infestation, natural enemy and pathogen levels that can help regulate the populations, and the health and vigor of the maize plant (nutritional and moisture status).
The effects of FAW infestation go far beyond reducing crop yields in a season. The vast majority of farmers in Sub-Saharan Africa are smallholder family farmers, who often depend on production to maintain household food and nutrition security, as well as household livelihoods. There are tens of millions of smallholder family maize farmers across Sub-Saharan Africa, farming the majority of the 35 million hectares of maize produced annually in the region. For the most part the farmers face very significant risks with little risk transfer mechanisms and

marginal economic viability of their production systems, putting them at great risk to the added shock of FAW infestation.

Finally, the introduction of significant use of pesticides, especially in maize-based cropping systems risks both the economic viability of these systems and poses a significant threat of putting smallholder family farmers on an unsustainable "pesticide treadmill".

A number of countries in the region have already begun significant programmes of providing pesticides to farmers, often as the main response to FAW infestation.

The Government of Zambia, for instance, allocated $3m to smallholder maize farmers in 2017 for pesticides, including provision for replanting 90,000 hectares affected. Government of Ghana provided $4m as an emergency measure to procure plant protection products. The Government of Rwanda mobilized the armed forces to engage in mechanical control, crushing egg masses, and treating attacked fields.

Most smallholders in Africa do not use pesticides in their maize production. The introduction of sustained use of pesticides in these systems may make the systems not only economically unviable, through increasing the costs of production, but also introduce significant risks to human health. Women are responsible for performing most farming tasks in these systems, including application of pesticides, and their direct exposure can be transferred to children and the entire households. The pesticides (often older chemicals no longer approved in Europe or North America) also represent risks to the environment and can have a significant impact on both local human health and trade due to pesticide residues in food.

1.2. FAW and Maize

FAW attacks many crops, but shows a strong preference for maize. Although it has already been found feeding on other crops in Africa, the vast majority of the reports and requests from farmers have come from infestations in maize.

Both maize and FAW are native to the Americas, where farmers have been managing the insect in their fields for many years. Over the last one hundred years much research has been conducted on maize and FAW across the Americas. Some key lessons can be learned from this research and experience:

- FAW has a cohort of natural enemies (predators, parasitoids and pathogens) that provide a high level of natural control of FAW populations. Even in landscapes with high pesticide use, when fields are left unsprayed, natural parasitism levels of 44% have been measured. This high level of natural control has several important implications for recommending management options in the Sub-Saharan context.
- Smallholder farmers in Mesoamerica often enter their fields when maize plants are in the whorl stage, checking for FAW egg masses or young larvae, and killing them via mechanical crushing.
- Some famers believe that mixed planting systems (either poly-cultures of two or more crops, or the use of certain non-crop plants) both lower FAW oviposition on maize and/or create environments that attract and maintain higher levels of natural enemy populations.

- Another important lesson learned from the Americas is that maize has the ability to compensate for lower levels of foliar damage, as the FAW larvae typically cause. Studies have shown that maize response to FAW damage is growth-stage specific and dependent on the nutritional and water-balance status of plant. This work also has important implications for training farmers about FAW damage and management, as well as the development of action thresholds.
- Smallholder maize farmers in Mesoamerica have also observed that tropical rains apparently cause high levels of FAW larval mortality in maize whorls. In addition, many of these farmers apply ash, sand, or soil into the whorls and report significant control of FAW larvae with these applications. Other farmers report using soap solutions or local botanical mixtures (including, but not exclusively using extracts from neem trees) with good control success.

Smallholder family farmers in Mesoamerica manage FAW in their maize as part of their cropping systems. They understand the important role of natural enemies in controlling FAW populations, understand that not all FAW damage will lead to significant yield loss and not to over-react to low-level damage, enter their fields to observe their crops and directly control FAW, take advantage of cropping patterns to reduce FAW populations, and try local solutions when they feel they have to take a direct action to control larval populations.

2. The six components of the Programme for Action

2.1. Management of FAW: Immediate Recommendations & Actions

Smallholder family maize farmers, especially in Mesoamerica have been managing FAW in their maize fields for centuries. So immediate recommendations for smallholders in Sub-Saharan Africa should start there. While there are ecological differences, the context of smallholders producing in small plots, mostly for family consumption and with limited access to resources is surprisingly similar.

Based on how smallholders manage FAW in Mesoamerica, training and awareness raising material should be prepared, highlighting the following immediate recommendations to be made to farmers:

- Visit the field and look at the status of the crop: its health and signs of presence of FAW – egg masses, young larvae, and typical FAW damage to the ears. Look also for presence of natural enemies. To do this, farmers must be able to recognize the different stages of FAW and understanding about natural enemies. They can take direct action by crushing egg masses and young larvae.
- Farmers should also have an understanding about oviposition – what attracts female moths to lay their eggs on a particular plant – and what makes them move on without laying eggs. Certain plants are known to repel or confuse female moths from laying her eggs on maize plants. Plant diversity also supports higher populations and diversity of natural enemies. Pest management begins with prevention.
- They should also not panic when faced with FAW damage. Not all damage leads to significant yield reduction. Maize plants are able to compensate for certain level of leaf damage, especially at certain stages of growth.
- They could also try “local remedies”, including application of ash, sand, or soil directly into infested whorls. Or the use of locally-produced botanical insecticides (e.g. neem) or the use of soap solutions.
- They should also recognize that insecticide applications are costly, may not work, and probably kill off the natural enemies of FAW. Although they may receive insecticides free this year, and maybe next, it is doubtful if they’ll still be receiving them many years in the future. Unfortunately, FAW is in Africa to stay. So, it’s important to look for longer-term solutions.
- These lessons from Mesoamerican farmers should form the basis of immediate information and experimentation by farmers. This agro-ecological approach is precisely the method used by the FAO-led Farmer Field Schools, which have successfully worked with millions of smallholder farmers. These messages can also be used by national extension programmes, farmers’ associations, and mass communication campaigns.

- Unfortunately, the action taken to date in most countries has been limited to the use of synthetic pesticides (especially organophosphates, synthetic pyrethroids, a few neonicotinoids, and in some cases cocktails of pesticides). In some countries, the pesticide applications were mainly emergency responses, not based on a cost-benefit evaluation.
- Older pesticide molecules, recognized as hazardous and banned in industrialized countries, are readily available and widely used in African countries. These products pose unacceptable risks to human health and the environment under the local conditions of use. Furthermore, their use may result in pesticide residue levels that become a constraint to marketability of crops both on domestic and export markets.
- The use of botanical and biological insecticides (certain strains of *Bacillus thuringiensis (Bt)*, fungi and virus to manage FAW in an IPM context has been reported to be effective in several sources, but bio-pesticides are not always locally available in the affected countries.
- At a national policy level information and recommendations regarding the pesticides being deployed are urgently needed. Not only is the strategy of focusing on the use of synthetic pesticides not sustainable, but the use of older, well-known dangerous pesticides is putting farmers, their families and communities directly at risk.

The recommended practices and actions are synthesized into key concepts and messages. The messages are useful in creating and maintaining a harmonized, consistent set of key messages to be used in all media and mass communication campaigns. The concepts form the basis of extension and learning-by-doing activities with extensionists and farmers. These concepts are used in Farmer Field School training and are described in detail in the section on Communications & Training. The key concepts will be reviewed, further developed and modified as more learning and prioritization evolves over time.

2.2. Short-term Research Priorities

In addition to immediate recommendations and actions, a number of areas should be short-term research priorities. They could be tested both on research stations, and through action-research with farmers, for instance through Farmer Field Schools and other related farmer-led extension approaches. In addition, FAO proposes to enter into Letters of Agreements with at least ten national agricultural universities or national agricultural research institutes to carry out a series of coordinated research topics.

- Determination of yield loss from FAW under different conditions representative of the range of contexts in Africa (soil types and nutrition, crop nutrition, moisture availability, variety, stage of infestation, etc.). Based on these studies and the costs and effectivity of control and the prices received by farmers for their harvest, action thresholds can be developed and recommended.

- Standardization of protocols for determining levels of infestation in fields, digital methods (application) for reporting, platform for receiving and analyzing information, and retuning advice and products to farmers for action.
- Inventory of natural enemies (predators, parasitoids, pathogens) of FAW in its new range in Sub-Saharan Africa. Quantification of their importance in FAW population management. Identification of gaps and candidates for classical biological control introductions from the Americas.
- Effectiveness, availability, costs and recommendations for the use of biological pesticides. Among the botanical pesticides, neem has been widely tried. Among the biological pesticides, virus (Nuclear Polyhedrosis Virus - NPV), bacteria (*Bacillus thuringiensis* - *Bt*), and fungi (*Metarhizium* and *Beauveria* spp.) have all shown promise.
- Explore local production and application of biological control agents, especially the egg parasitoid *Trichogramma*, NPV virus and *Bt* bacterium.
- Determining the efficacy of natural enemies (predators, parasitoids and pathogens) on FAW to evaluate the potential for conservation / classical biocontrol strategies.
- Testing a classical biological control approach through exploration, introduction, evaluation and release of natural enemies from outside Africa.
- Analysis of the efficacy of available control options, especially low-risk pesticides, bio-pesticides, botanicals and pheromone-based management, to guide implementation of IPM strategies.
- Low-risk and effective insecticides (botanical, biological, and low-risk synthetic) are most effective when they are delivered directly into the whorl because that's where the FAW larvae feed.
- Determination of movement patterns and use of pheromone traps for local scouting and actionable information. Standardization of lures and traps.
- Review of cropping patterns and landscape information to determine area-wide management and recommendations based on FAW ecology. Effect of planting dates and staggered plantings on FAW infestation and damage.
- Studies of the influence of plant diversity (multi-cropping systems and the use of border plantings) to reduce FAW oviposition and increase populations of natural enemies.
- Trials of cultural practices (application of ash to whorls, use of soaps, sprays of sugar water to attract and feed natural enemies) to test their validity and effectiveness.
- Benefit-cost analysis of the different FAW control options, comparing benefits (estimated value of abated loss) to costs (including labor, control products, health and environmental costs).

This work will be done in the context of developing a network of active, motivated FAW researchers across Africa. The emphasis will be on national agricultural universities and research institutes. Work at national universities has the added benefit of training students while conducting the research. Much of the work can be done in the context of thesis research, most typically at the Masters' degree level. Pairing will be sought for the national universities with the international research centers and universities.

South-south cooperation, especially among researchers and practitioners from the Americas and counterparts in Africa will be promoted, both through study tours, short-term exchanges, joint research projects and participation in international symposia.

The results of the short-term studies will be published and shared at annual regional symposia organized to bring together the researchers to share and discuss their work.
In addition, a reference compendium, the *Fall Armyworm in Africa Handbook* will be produced and published, serving as a reference guide to collect in one publication in an organized manner the information necessary upon which to base management decisions. The handbook will be available in print and as a living document publically available on the internet.

The potential for local production of biological control methods, especially the egg parasitoid *Trichogramma*, the bacteria *Bacillus thuringiensis*, and the Nuclear Polyhedrosis Virus will be carefully studied to determine the feasibility of setting up local production facilities and businesses. Local businesses that produce products and provide advisory services may offer interesting opportunities for rural youth employment and entrepreneurs.

Impact Assessment

Once the relationship between FAW infestation at different levels and different phenological stages of maize is determined under the different ecological conditions of maize production in Africa, estimates of local, state, national and sub-regional yields and their impacts on food security and trade can be made. These estimates will take advantage of the on-going crop yield estimates made by the Global Information and Early Warning System (GIEWS) of FAO. The data will also be used to determine a baseline estimate of yields without infestation of FAW, and the impacts on yields over time. The data will also be linked to and inform the broader analytical processes and products, including the Integrated Phase Classification (IPC) and the annual inter-agency Global Report on Food Crises[1].

In addition, these estimates can be used at local and national-level by decision makers to reduce the risks of impact on household livelihoods and food and nutritional security.

The range of potential impacts of the FAW is broad and not confined to yield loss reductions in maize. The pest is polyphagous, potentially feeding on a range of food and cash crops. Therefore impact assessment protocols will need to look at other crops. For all affected crops, impact assessment will need to look at issues including the financial, time and environmental costs of control methods, including pesticide use. The potential increased use of pesticides is especially problematic, in that the impacts will be both direct (increased economic costs to farmers) as well as indirect (potential for impacts on human health and environmental contamination). An impact assessment protocol will have to be implemented that examines and quantifies both the direct and indirect impacts of FAW.

[1] "Global Report on Food Crises 2017" Food Security Information Network (comprised of CILLS, European Commission, FAO, FEWSNet, IGAD, IPC, UNICEF and WFP).

2.3. Communications & Training

A large-scale, immediate action campaign

A mass farmer information and training campaign will be deployed to offer a first management response to FAW. The campaign will promote management measures that have been used and reported to be effective in reducing FAW infestation as detailed under section 1.

Going to scale in disseminating the management options to wider numbers of smallholder farmers, will require working through existing structures and leveraging opportunities that exist to reach large numbers of smallholder farmers. The Programme will work closely with all of these options, including local government, the national agricultural extension services, Farmer Field Schools, the Plantwise Plant Health Clinics and local media.

Local government

Local government entities have the closest regular contact with the farmers. Mobilizing through both locally elected officials and administrators is a cost effective and powerful means of disseminating simple messages in the immediate term. Village authorities and traditional leaders will help mobilize communities to develop community management plans for Fall Armyworm.

National Extension Services and farmer organizations

The capacity of the national extension services differs substantially in the countries; with some of them characterized by inadequate capacities in skills as well as resources to cover the farmers' extension needs adequately. The Programme will hence need to work very closely with the national extension services to provide the capacity development to equip them for providing adequate and appropriate technical support to farmers to sustainably manage the FAW.

Extension workers and agricultural advisers will conduct village rallies and short field training courses in villages. They will be equipped with picture boxes and posters, and as much as possible they will conduct short practical trainings in nearby infested fields.

Interventions required to achieve this will include conducting training of trainers (ToT) on FAW management for extension workers. Inclusion of other key development institutions (NGOs, private sector, farmer association and commodity groups) that are active in supporting smallholder farmers' development will be a key strategy to ensure that as many farmers as possible can be trained besides those who are members of the FFS.

Where the capacity of extension services is relatively satisfactory, the extension workers are expected to provide support for the training of Farmer Field Schools Master Trainers and other private extension services providers as a way of bringing the number of smallholders equipped with the knowledge and skills in the management of FAW to scale.

Other participatory extension services include concepts of “Lead Farmers” or Farmer to Farmer extension. Thousands of farmer organizations across the continent have been organized to supply extension services to their farmer members. Farmer to farmer extension approaches are also used extensively inter alia to support Conservation Agriculture scaling up in most countries in Southern Africa. The Study Circles approach is also implemented with farmer organizations in a number of countries. Such approaches are also amenable to providing an avenue for the training of farmers in the management of the FAW.

CABI Plant Health Clinics

Another mechanism for facilitating dissemination of the FAW management options to a wider number of smallholder farmers is through the CABI Plant Health Clinics that are implemented under the Plantwise program. These clinics provide another opportunity for developing smallholder capacity for managing the FAW in a sustainable manner.

CABI has already received substantial reports from farmers of presence of FAW in a number of their clinics in Africa and hence the system can also be used to disseminate information to the farmers on the potential management options. An integrated approach to the implementation of the Plant Health Clinics and FFS provides significant opportunities for creating synergistic effects for more sustainable management of the pests and improvement of the use of IPM options by smallholder farmers. The Plant Health Clinics are managed by “plant doctors” who are basically extension officers that have been trained to provide extension services for largely crop protection aspects to farmers.

Other existing approaches in reaching farmers working with the national extension approaches in the countries will also be explored. Such training will be led by the extension staff and lead farmers supported by the Crop Protection Units/NPPOs as well as other organizations such as CABI and CIMMYT and other key CGIARs, farmer organizations, NGOs and civil society organizations.

Mass Communication Campaigns

Several other communication mechanisms for awareness creation are also key in ensuring that as many farmers as possible are aware of the available management options. Among them are; mass media, ICT, communication materials in local languages; e.g. visual objects such as posters, programs, leaflets etc. can be effective tools for communication with and to train farmers.

Awareness creation of the policy makers through the production of policy briefs as well as involving them in field exposure visits are some of the activities that can lead to government buy in into support for promoting the sustainable management options among the smallholder farmers.

The National FAW Task Forces will coordinate the development of action plans for the immediate awareness campaign and crash courses and provide the coordination services.

Season long management of FAW: capacity building and research

This component is aimed at strengthening the country capacity to sustainably manage FAW and prevent further outbreaks over time. Two elements are central to this outcomes: farmer education and innovative research.

It will focus on developing and fine-tuning FAW management strategies building on the new knowledge generated by the research-actions. As these options becomes available, training curricula for farmer education will be updated.

Farmer Field Schools (FFS)

Farmer education and community action are important elements in the strategy to best manage FAW populations. Sound understanding of biology and ecology of the pest, monitoring at community and field level and fine-tuning management strategies underpin community action. FAO has promoted FFSs as platforms for farmers to learn and exchange for nearly three decades. The FFS approach is being used in over 90 countries, for a vast range of topics, with support from multiple partners including national and local governments, farmer organizations, IFAD, World Bank, GEF, the EU, many bilateral donors, Oxfam, CARE, and many other international and national NGOs. A number of African governments in affected countries have integrated FFS in their extension systems and conduct FFS every year through government budgets, or have developed FFS national strategies (Rwanda, Burkina Faso, Burundi, Mali, Mozambique and others).

In 2017, FAO released the Global Farmers' Field School Platform http://www.fao.org/farmer-field-schools/it/, the global knowledge center on Farmers' Field Schools with over 90 countries involved and 15 international partner organizations including IFAD, GEF, Bioversity International, bilateral donors, international NGOs and others. FAO has also promoted the establishment of sub-regional networks of FFS practitioners and projects to facilitate exchange of experiences and document lessons learnt within the different sub regions and to promote quality FFS programmes. Three sub-regional FFS networks have been established in Africa. Through the sub-regional FFS networks for Southern Africa, Eastern Africa and Western & Central Africa. FAO will be able to reach out and mobilize most of the FFS projects in the FAW effected countries.

A rapid investigation of the different FFS projects in the FAW affected countries in Africa conducted through the Global FFS Platform shows that more than 4,000 FFSs are scheduled to be implemented in 2017, reaching out to more than 100,000 farming households.

Based on this first stocktaking of ongoing FFS projects and activities, FAO and its partners are able to be operational in a short time in the following countries: Angola, Central African Republic, Malawi, Mozambique, D.R. Congo, Burundi, Kenya, Nigeria, Uganda, Rwanda, Burkina Faso, Gambia, Niger, Senegal and Mali.

In addition, in coming years, 5000 facilitators will the trained and over 40,000 FFS will be implemented in affected countries in Africa.

Based on the outputs of the expert technical meetings at FAO-HQ and the forthcoming in West Africa (Accra), curricula development workshops will be organized as follows: one in West Africa (Nigeria), one in Central Africa (Kinshasa), one in Eastern Africa (Nairobi) and one in Southern Africa (Blantyre) with representatives of the respective sub-regional FFS networks, regional FFS master trainers, sub-regional FAO offices, regional pest management specialists/scientists and SSC FAW expert(s) from Latin America. During the curricula development workshops, the participants will discuss the different characteristics of FAW and its impact on maize, proposed actions to educate farmers through FFS and initiate community actions on FAW, develop the curricula for the FFS, refresher courses and short crash courses, Plan of action to roll out the project activities in the respective sub-regions.

Mapping and coordination of FFS initiatives. This will be implemented through the Global FFS Platform in close coordination with the Sub Regional FFS Networks. This will include finalization and monitoring of the mapping of FFS initiatives and projects by multiple partners (FAO, IFAD, World Bank, bilateral cooperation, governments), coordination of FFS activities through the Platform in coordination with the FFS networks; and identification of gaps and further needs for FFS implementation. The networks, largely informal, play an important role, in better coordinating FFS activities among countries and between regions. They aim to exchange information, innovations and FFS resource materials; to facilitate the integration of research outcomes on IPM FAW into the FFS curriculum; to develop a common understanding in maintaining the quality of FFS processes; to provide technical support among countries including exchanges of Master Trainers; and to identify opportunities for joint trainings.

The mapping exercise will highlight the need for additional FFS initiatives, specific on maize/FAW management, in countries/hotspot areas not currently covered by ongoing projects or government-led FFS programmes.

Training courses for Master Trainers and Facilitators on FAW management. In close collaboration with the different national FFS projects, refresher courses for their FFS Master Trainers and facilitators will be organized to incorporate FAW related topics in their FFS curricula; with involvement of FAW experts from Latin America when relevant. Training and information material will be developed to incorporate FAW related topics in FFS curricula.

Awareness raising activities. At the end of the season, the FFS group holds a field day to show local authorities and government agriculture workers, and other farmers what they are doing. The project will also support farmers to host exchange visits for members of other field schools, and visit the other field schools themselves, and larger meetings of farmers to exchange experiences and information and defined possible collaborations, called “farmer congresses”. This allows them to share ideas and see how others are dealing with similar problems.

Monitoring, evaluation and learning. Through the Global FFS Platform and its vibrant member community, a FAW specific interactive web page and a library will be put in place with a reporting system to monitor, evaluate and learn from the sustainable management options tested in the field through action-research processes by farmers and researchers. This will help improve the understanding of the biology and ecology of FAW and adapted options in African contexts. Webinars will also be organized to share experiences.

The awareness raising strategy will include activities through rural radios, Community Listener Clubs and other communitarian media. The use of low-cost, participatory training videos in local languages produced by communities themselves will be supported, through systems such as Digital Green.

2.4. Monitoring and Early Warning

Overview

The capacity of many African countries to detect and react promptly to new pest invasions, through regular monitoring, is often limited. A Fall Armyworm Monitoring and Early Warning System will be established in African countries where Fall Armyworm is currently present as well as those countries that are potentially threatened by the pest. The system will have two objectives and consist of two primary components: in-country monitoring and monitoring at the community (farmer) level and early warning that encompasses the community (farmer), district, national, sub-regional and regional levels. The development and delivery of the system will be done in concert with structures put in place at these different levels for the coherent and coordinated management of FAW across the continent (e.g. village level pest management groups/communities as well as task forces or steering committees at district, national, sub-regional and regional levels).
The monitoring component of the system should be established within the context of existing structures and community Integrated Pest Management (IPM) programmes such as national extension services, Farmer Field Schools (FFS), farmer groups, organizations and associations, and other community-based systems. This will reduce the need to create new structures that may be difficult to sustain in the future. However, new community IPM programmes would need to be established in FAW-affected areas that previously did not have these programmes. It should focus on organized communities of farmers and be of benefit to them as well as to national institutions and regional organizations.

The system will consist of field data collected at the community (farmer) level that is centrally collated so that it can be shared and analysed at different levels in order to produce useful information in the form of relevant advice and early warning for all stakeholders. The collection and transmission of field data is the foundation of the system and the basis for early warning. The usefulness and accuracy of the early warning system is a direct function of the quality and timeliness of the monitoring component. It will be critical to involve stakeholders from the various levels at the beginning to identify what information, advice and early warning products (e.g. alerts, maps, bulletins) should be derived from the field as well as any other data they

may need in order to meet their individual or specific requirements. These outputs should be clear and delivered on time. The system should include information and feedback mechanisms that encourage and promote users to collect high-quality field data regularly for ensuring a timely and constant flow of data for early warning. Stakeholders at each level should be involved in the design of the early warning system and receive basic, refresher and updated training in all aspects of this system.

The system will allow action to be taken at different levels:

- Community (farmers): immediate control
- District: threat potential, pesticide needs
- National: planning, food security assessment, task force
- Sub-regional: food security assessment, planning
- Regional: food security assessment, planning
- Global: assessment of migration and expansion

Given its demonstrated expertise, experience and comparative advantage in continental-wide and global early warning systems for agricultural transboundary pests, FAO should lead the establishment and operation of the FAW monitoring and early warning system in partnership with other institutes to ensure the integration of all existing expertise (see Annex). Prior to full implementation and operationality, various elements of the system will need to be tested in two pilot countries per region (West, Central, Eastern and Southern Africa). Additional research will be required to further strengthen some aspects of the system. For instance, there may be scope to eventually expand the system to include other important transboundary plant pests and diseases.

Within the programme, it will be necessary to pay strict attention to detail, care, simplicity, focus on the user and the user experience, and concentrate on building the best early warning system for all stakeholders.

Monitoring

The monitoring component involves the collection, recording and transmission of field data primarily by farmers either as individuals or organized as communities such as FFS and other community-based programmes. This may include other relevant stakeholders such as extension agents, CABI plant-wise health clinic personnel, NGOs, and CBOs. National and district officials should encourage large-scale public and private sector farms to participate in the system.

Field data

Field data will be collected in order to (a) determine FAW presence and damage at different crop stages at the local, district, national and regional levels, (b) take immediate action, (c) monitor FAW movements and spread, (d) identify gaps in monitoring, (e) identify potentially threatened areas or areas at risk, and (f) provide forecasts and early warning. There are two

primary types of field data - that which can be obtained from field scouting, and that from pheromone traps.

Field scouting

There is a need to standardize the data that is collected in the field for FAW monitoring and early warning. This is critical in order to allow comparative data analysis across countries and regions for situation assessments and early warning at the district, national and regional levels. Standardization also facilitates the sharing and exchange of data.

The amount of data to be collected should not be too large because this will affect the ability to easily record and transmit the data. Consequently, it is imperative that only the basic and most important data relevant to FAW and associated agronomic practices and control are collected; in other words, the data required to assess the situation and provide early warning on an operational basis rather than as a research exercise[2]. If more detailed data are required, they can be provided through specific research projects. Therefore, it will be important to work with all stakeholders in order to establish and agree on the basic data to be collected. It is important to initiate this process as quickly as possible because it is required before the system development can proceed further. If all stakeholders are part of this process and reach consensus, then they will be more likely to collect and contribute data to the system on a regular basis. This will help to avoid spending time and effort in collecting data that is not important or useful. This process is also important to solidify support at the national level so that it becomes integrated as an official activity within the context of a country's plant protection programme.

Pheromone traps

Data from pheromone traps can complement but not substitute field scouting. Pheromone traps can be appropriate for (a) local FAW monitoring, (b) local FAW control, (c) early alerts and (d) research on the pattern of FAW migration. For example, trap data can be used to relate adult catches to the potential scale of breeding and for monitoring the spread of FAW. Attract and kill traps that consist of both a pheromone bait and a control agent could be considered as part of the control strategy for FAW. Initially, pheromone traps should be used judiciously and on a limited scale in those areas in which their impact can be of the most benefit. This will involve the procurement of the traps and pheromone, delivery and assembly, proper placement in the field, and training in the use and maintenance of the traps. Later, the use of pheromone traps can be scaled-up to cover broader and larger areas.

Data collection and transmission tools

It is critical that data collected in the field – both from scouting and traps – are recorded and transmitted in a timely manner. Without transmission to a centralized database, it will not be

[2] Basic data could include profile (farmer, location, date, farm size), agronomic (crop, variety, stage, planting date, inputs), and FAW (presence, numbers, stage, damage level, control)

possible to use the data to assess the current situation and provide early warning and advice to stakeholders.

There is a need to develop a robust tool to allow the collection, recording and transmission of field data. This tool must be simple, straightforward and intuitive to use as well as easy to maintain and update. Given that nearly all farmers or communities have a mobile phone and the potentially large number of users involved in FAW monitoring, it is preferred to take advantage of what already exists rather than procuring new devices that are difficult and expensive to distribute, manage and repair. Using existing mobile phones avoids any personal or institutional ownership issues of devices. Another advantage is the geographic positioning system (GPS) function integrated into most phones that can be used for automatic geo-referencing of field data. Therefore, an app should be developed for Internet-enabled ("smart") mobile phones as well as for non-Internet-enabled ("dumb") phones that rely on SMS.

While smart mobile phones are the ideal platform for data collection, recording and transmission because of their Internet connectivity and extended capacity and functionality, it cannot be assumed that all farmers or community focal points will have a smart mobile phone. For example, three out of four people have mobile phones in Kenya but only a third of Kenyans had access to the Internet in 2013. Although Internet access is expected to increase as the technology becomes more available and prices come down, there is still a requirement to develop an app for non-Internet-enabled mobile phones that rely on SMS for data transmission. The app would be used by individual farmers who own a mobile phone. If farmers do not own mobile phones, then a community focal point with a phone could collect the standard data from the farmers, record and transmit it from his/her mobile phone.

Existing mobile apps for pest management, the expertise of partners, the experience of systems (e.g. livestock marketing in Kenya[3]) and the expectations of users should be utilized and incorporated when developing a FAW mobile app. The app should not only allow data input and transmission but also should store historical data that can be displayed as graphs and other functionality on the user's smart phone. It will be important to invest in developing a very complete first version that meets farmer and analysts' needs within a few months, rather than relying on subsequent updates to enhance functionality. Prior to release, the app should be thoroughly tested and properly validated with actual users under field conditions.

Training

Standardized training and teaching material, including a comprehensive training manual and online YouTube videos, will need to be developed on FAW that covers data collection methodologies for field scouting and pheromone traps, the use and maintenance of pheromone traps, and the use of the mobile app. Training should be provided to all individuals involved in data collection, recording and transmission not only initially but updated refresher training should be conducted on a regular basis. Training should be provided through existing

[3] http://www.fao.org/news/story/en/item/170807/icode/

mechanisms such as FFS and community-based programmes. Master Trainers should also be designated and trained.

Early Warning

The early warning component consists of a centralized cloud-based platform that contains a global database connected to a geographic information system (GIS). Stakeholders who have Internet connectivity will be able to query and display field data on a map as a means of a simplistic visual analysis of the current or past FAW situations. Within the GIS, more complex analysis of the field data combined with satellite-based rainfall estimates, crop maps and calendars, and a trajectory model will be possible. The platform will be able to automatically disseminate alerts to stakeholders at all levels via SMS and the Internet and will assist in producing FAW advice and early warning products that meet the needs of stakeholders.

Platform

The platform will reside on a centralized server utilizing cloud-based Internet technology to ensure uninterrupted access at all times by all stakeholders. This concept relies on the general understanding that FAW and other associated data are a common public good free from ownership issues.

Given its mandate, neutrality and substantial and robust IT infrastructure, FAO is well-placed to host the server and necessary software and assume responsibilities for the necessary hardware and software maintenance, including automatic updates and backups. As a United Nations agency, it is also able to guarantee free public access to all member countries. Furthermore, Google Earth Engine technology can be incorporated into the platform within the partnership agreement between FAO and Google.

The design of the system should be based on other systems that FAO has designed and operated for early warning systems. This inherent expertise will facilitate a more rapid development of the FAW early warning system and ensure compatibility with the mobile app for the collection, recording and transmission of field data.

FAO in collaboration with relevant partners should develop the necessary database and GIS applications based on cloud and Internet (web) technologies. A cloud-based Internet solution offers numerous benefits:

- a single database that is easier to maintain, update and expand than numerous databases hosted in various regions, organizations and countries by a variety of institutes;
- analysis of data at a sub-regional, regional and global level is only possible by using a single centralized database;
- access by all stakeholders (who have Internet access) in all member countries;
- eliminates the need for a stand-alone application that must be installed on individual computers or applications that require annual license fees;
- not PC specific – it will work on Windows, Mac and Linux computers as well as Android and iOS tablets.

The cloud-based database will manage all data collected from field scouting and pheromone traps. Open-source software such as PostgreSQL should be used because it is platform-independent and does not require license fees.
The Geographic Information System (GIS) should include basic and advanced functionality based on user requirements. For example, it should allow:

- data query and display on background maps for basic visual analysis of current and past FAW infestations
- analysis of field data, combined with satellite imagery and geo-referenced crop maps and calendars
- trajectory estimates of adult FAW migrations
- utilize Google Earth Engine technology where feasible for display, analysis and map dissemination

More complex analysis may be limited by current understanding and knowledge of FAW biology, behaviour, population dynamics and migration. These gaps will require further research in which their eventual results should be utilized within the early warning system.
Additional functionality could be developed that would link to impact assessments and contribute to impact mapping and relevant outputs.

Alerts, Advice and Early Warning Products

The platform should be able to disseminate alerts via Internet (web) and SMS to stakeholders based on specific criteria. These criteria will need defining and validation as well as ensuring it meets the requirements of recipients.
The results of analysis conducted on the platform should contribute to advice and early warning that is made available to stakeholders. It is critical that this advice and early warning meets the needs and requirements of all stakeholders. Such needs will vary, depending on the level – community (farmer), district, national, sub-regional, regional, global. For example, a farmer will require different advice and early warning than a national plant protection director. Therefore, the precise nature and format of these products should be identified and defined with the stakeholders from the outset in order to understand and meet their needs. Care should be taken to ensure that the products are appropriate, useful, clearly presented and can be accessed by all platforms (PC, tablet, smart phone, dumb phone). The most appropriate means such as Internet, website, social media and SMS should be used for dissemination. These products could be developed and distributed by FAO, affected countries and relevant organizations and institutes. A collaborative approach in the development of advice and early warning products should help to ensure that the outputs from the system are meaningful and used by all stakeholders.
Lessons learned and examples should be utilized from currently existing early warning system such as FAO's Desert Locust and Coffee Rust systems, CIMMYT's Rust Mapper Tool, FEWSNET and others.

2.5. Policy & Regulatory Support

Policy and regulations

Highly Hazardous Pesticides have been reported to be used in large quantities in response to FAW infestations. Among all pesticide products on the market, a relatively small number have an extremely high potential to severely impair human health and the environment. The cost effectiveness of these products is always negative when the externalities on public health and environmental degradation are considered. This is true especially in developing countries and economies in transition, where proper risk mitigation measures, such as protective clothing or properly maintained application equipment, may not be in place. Low-risk alternatives exist, which might however not be readily available to farmers in Africa.

Regulatory actions to ensure that products authorized and used do not pose unacceptable adverse effects and that facilitate the registration of low-risk products are key to the long term sustainability of FAW management. Activities include:

- Create adequate awareness among policymakers and regulatory organizations on the need for fast-tracked testing, registration and quality management of FAW management options (e.g., biopesticides / botanicals / natural enemies / low-risk synthetics);
- Organise regional workshops for national pesticide regulatory authorities and their regional networks (e.g. SAPReF, EAC Technical Working Groups, INSAH for CILSS…) to:
    - Review the list of registered pesticides and identify sources for low-risk, IPM compatible products already registered or legally available in respective countries, in the region or globally. Exchange experiences on their use and efficacy.
    - Identify priorities the testing/development of new products with the highest potential to be effective.
    - Complete and publish a study on the costs and returns of maize among smallholders. Examine the true costs of pesticides (including effectiveness, human and environmental risks, and impacts on trade).
    - Demonstrate the effectiveness of public investments in extension and agricultural research & training.
    - Conduct policy analysis on support for smallholders: Prices received, price transmission, aggregation & infrastructure, farmer organizations, & insurance & other risk-transfer mechanisms.

2.6. Coordination of FAW Management in Africa

Institutional Coordination

Coordination of FAW response in Africa is needed at multiple levels: local, national, regional or Africa-wide.

National coordination

Several countries have already adopted the approach of creating a National FAW Task Force or committee. Typically chaired by the Ministry of Agriculture, this would include research, extension, National Plant Protection Organisations, private sector, farmers' organisations and others. The purpose of this group would be to:

- Coordinate national efforts to manage FAW among different organizations, to ensure coherent, consistent response and including monitoring, awareness campaigns, mobilizing resources for training programmes, etc.;
- Engage with the relevant regulatory authorities to fast-track testing, validating and registering of FAW control options that are not available in the local market;
- Monitor status of FAW in the country, and produce progress reports regarding field efforts to improve farmers capacity to manage the pest (through Farmer Field Schools and other means), maps (in association with the early warning component, building national capacity to use mapping tools) and guidance documents (may include a "data analysis" sub group);
- Mobilize resources from within government and/or from development partners for national programme activities (promotion of management approaches, including Farmer Field Schools, early warning and monitoring activities & information, etc.).

Regional coordination

Regional Economic Communities steering group (ECOWAS, SADC, IGAD, ECCAS) – will share information and analysis based on programmes at regional level, and will be made up of the agriculture department of the REC, with a representative members drawn from each of the countries.

The RECs will support both face to face and video conference meetings between representatives of the national task forces on the evolving situation. This should include sharing of status reports from countries, identification of what has worked and what has not, identification of best options for managing the pest, identification of themes for research, dissemination of information and communication, recommending policies and strategies to facilitate FAW management, etc.

Each REC would need resources and capacity to play a role in FAW coordination, with staff to be hired within the REC, typically in the Agriculture and Environment Department or similar.

Africa-wide coordination

The third level of coordination involves Africa-wide activities under the auspices of the African Union (AU).

This framework to guide the development of programmes to improve the management of FAW in Africa can only succeed with the strong political support at the highest possible level. The AU Department on Rural Economy and Agriculture will also host the main framework "steering

group", to coordinate donor efforts at national, regional and continental level. This group will be made up of the main stakeholders in FAW management (see diagram), and will be the main forum for discussion of the impact assessment exercises as well as programme progress reporting.

AU specialist entities such as the InterAfrican Phytosanitary Council (IAPSC), as the Regional Plant Protection Organisation, will have a specific role in continent-wide information sharing, and to handle occasional meetings of the various Africa-wide technical advisory groups on FAW. IAPSC may also convene international technical meetings on technical aspects of FAW control, in association with the main International Agricultural Research Institutions active in this area (CIMMYT, IITA, ICIPE, etc.).

Effective and quick communications through modern ICT tools are central to coordinated management of FAW. An Africa-wide "Community of Practice" needs to be established quickly (using social and mass media) for quick sharing of learning and information across institutions and borders, inventory of the experiences with other migratory pests, and stimulating necessary actions. This will complement the communications activities at national level.

Programme Monitoring

The Programme will be monitored via FAO's standard monitoring and evaluation procedures.

In addition, a Programme Advisory Committee will be established with members representing the key stakeholders. This Committee will receive quarterly reports on the progress of the Programme and will meet annually to review progress and make recommendations for future work.

3. Action plan and resource allocation

1. Management of FAW: Immediate Recommendations & Actions			
Objective	**Activities**	**Partners**	**USD ('000)**
Provide farmers with knowledge and recommendations for sustainable management of FAW	✓ Compile and publish technical guideline for immediate use. ✓ Translate & Edit into at least ten languages. ✓ Print & distribute copies	NPPOs NARS CABI NGOs	1.500
Learn & share experiences and knowledge from Americas	✓ Five missions of South-South Cooperation	Countries Universities	500
Determine use of pheromone traps in FAW management system.	✓ Conduct international seminar to present and determine role for pheromone traps in FAW management. ✓ Hire consultant	Universities NARS	250
Make pesticide use more effective and less hazardous.	✓ Review insecticides currently being used by countries to determine if they are known to be: effective & not highly hazardous. ✓ Review registrations for botanical and bio-pesticide alternatives.	NPPOs NARS	500
Provide up-dated information on use of chemical insecticides	✓ Develop sub-regional lists of permitted active ingredients for FAW. ✓ Determine priorities for emergency registrations. ✓ Determine priorities of high risk pesticides (banned by other countries, etc.)	NPPOs Sub-regional Pesticide Organizations Inter-African Phytosanitary Council	500
Promote region-wide registration reviews and harmonization to ensure that Highly Hazardous Pesticides are not included and bio-pesticides are included in registration systems.	✓ Conduct sub-regional reviews of current pesticide registrations to review for potential HHP. ✓ Review status of bio-pesticide registrations and identify knowledge gaps.	NPPOS Sub-regional pesticide organizations	1.000
TOTAL COMPONENT			**4.250**

2. Short-term Research & Development Priorities			
Objective	**Activities**	**Partners**	**USD ('000)**
Create and coordinate an African Network of National Research & Development for FAW.	✓ Identify National Agricultural Universities, National Research Institutes and existing sub-regional and regional networks to participate in the Network. ✓ Hold initial meeting to determine short-term (less than 3 years) research priorities and develop annual work plan. ✓ Hold monthly virtual meetings to share advances and prioritize. ✓ Hold annual meetings to present results, determine priorities, and develop new annual work plan.	National Agricultural Universities NARS Existing sub-regional and regional networks	3.000
Determine yield loss due to FAW and develop action thresholds.	✓ Identify and form a committee (of the Network) of researchers and professors to develop protocols and carry out trials. ✓ Develop standardized protocols for field trials. ✓ Regional workshop to discuss and train to protocols ✓ Field trials measuring yield response to FAW infestation levels.	NARS NPPOs Universities	3.000
Promote the use of bio-pesticides and botanical pesticides.	✓ Identify and develop South-South Cooperation of use of bio-pesticides and botanicals (Brazil, Colombia, Cuba, Mexico) ✓ Conduct trials to determine effectiveness, appropriate formulations, dosage levels, and application strategies for bio-pesticides and botanicals. ✓ Identify and support at least five local businesses to produce and market bio-pesticides and botanicals. ✓ Host four sub-regional symposia/fairs of botanical and bio-pesticides	IITA ICIPE Lancaster U. CABI NARS NPPOs	5.000
Determining the efficacy of natural enemies (predators, parasitoids and pathogens) on FAW	✓ Determine priorities. ✓ Design protocols.	IITA ICIPE Universities	2.500

to evaluate the potential for conservation / classical biocontrol strategies.			
Testing a classical biological control approach through exploration, introduction, evaluation and release of natural enemies from outside Africa.	✓ Determine top candidates for classical biological control ✓ Carry out field exploration ✓ Complete biosafety evaluations ✓ Make releases ✓ Monitor effectiveness	IITA ICIPE CABI Universities	3.000
Determining the efficacy of cultural control options against FAW, including early versus late planting, scouting protocols, handpicking, destruction of crop residues, trap cropping, soil management for control of pupae, habitat management, crop hygiene etc.	✓ Determine priorities. ✓ Design protocols. ✓ Conduct field trials. ✓ Analyse data and prepare reports. ✓ Publish results.	NARS NPPOs Universities	2.500
Develop a live repository for the current state-of-knowledge about FAW in Africa, including a portal and coordination and publication of the "Handbook of FAW in Africa"	✓ Develop FAW in Africa Portal ✓ Develop and agree to outline of "Handbook of FAW in Africa" ✓ Coordinate contributions, reviews, and publication.	Universities CABI Lancaster	1.500
Total Component			**20.500**

3. Communications & Training			
Objective	**Activities**	**Partners**	**USD ('000)**
Ensure consistent messages across public and countries based on best knowledge & develop mass communication campaigns.	✓ Develop key messages. ✓ Develop visual and audio training material on insect identification, biology, ecology and key management messages. ✓ Translate and edit into at least 20 languages. ✓ Conduct mass media campaigns – (rural radio, Dimitra Clubs, TV programmes, internet and social media), regional, sub-regional, national, and local. ✓ Train local journalists	CABI AGRA NPPOs NARS	2.000
At least 10.000 extensionists have the capacity to provide training to farmers regarding sustainable FAW management.	✓ Prepare technical material ✓ Identify and train 250 trainers. ✓ Host national workshops.	NPPOs NARS	1.000
At least 10 million farmers have the knowledge and information via 40.000 Farmer Field Schools to manage FAW sustainably.	✓ Development of curricula and training materials for incorporating FAW related topics in FFS curricula (Agro-ecosystem Analysis, experiments and special topics) ✓ Develop and conduct refresher courses and trainings for 300 FFS master trainers and 5000 FFS facilitators ✓ Develop and implement 70 000 FAW short crash courses of 2-3 days in the rural villages including through Open Day visits in nearby FFS. ✓ Farmer to Farmer Exchange visits and "farmer congresses" ✓ Facilitate the development of community management plans in communities where FFS are implemented	FFS Sub-regional Networks NPPOs	30.000

	✓ Mapping, coordination, and planning of FFS initiatives through the Global FFS Platform		
Ensure M&E of management options tested through FFS, and stocktaking of successful options through the Global FFS Platform	✓ Baseline data collection ✓ Action-research and Participatory Technology Development: facilitate farmer-researchers participatory processes to test and adapt sustainable management options through experiments in Farmer Field schools and in farmer fields ✓ Collection and consolidation of FAW curriculum and successful management options locally-adapted to African smallholders ✓ Facilitate interactive Community of Practice on FAW management through FFS, via the Global FFS Platform		5.000
TOTAL COMPONENT			**38.000**

4. Monitoring & Early Warning			
Pheromone traps Generating detailed and dependable knowledge on host range and migration patterns of FAW in the context of African agro-ecologies and cropping systems, to develop and disseminate appropriate management options	✓ Procurement of a limited number of pheromone traps. ✓ Determine the correct trap placement in the field based on existing knowledge. ✓ Develop guidelines on the operational use and maintenance of traps. ✓ Conduct regional workshops on the operational use and maintenance of traps. ✓ Conduct research on the use and effectiveness of attract and kill traps.	ICIPE Lancaster U CABI	6.000
Organize and conduct annual FAW research seminar and knowledge & service fair	✓ Organize annual 3-day international scientific seminars to assemble and share the best knowledge of FAW in Africa and host a knowledge and service fair, where service providers can present and explain their services.	CABI	2.500
Develop a harmonized monitoring system, consistent data collection and analysis system and early warning system.	✓ Conduct regional workshops, using Skype when possible, to obtain agreement on standardized FAW data. ✓ Evaluate different trap designs and pheromone lures. ✓ Determine the correct trap placement in the field based on existing knowledge. ✓ Standardize on a single trap design and pheromone lure. ✓ Develop guidelines on the operational use and maintenance of traps. ✓ Procurement and distribution of pheromone traps. ✓ Conduct regional workshops on the operational use and maintenance of traps.	ICIPE CABI U Barcelona PSU CIMMYT NARS AGRA	8.000

	✓ Agreement on scouting protocols and production practices to be included in field based (app) data collection system. ✓ Development and testing of field data collection system. ✓ System testing (two pilot countries per region i.e. West, Central, Eastern and Southern Africa). ✓ Field data collection. ✓ Transmission tools. ✓ Testing use of system – with NPPOs and farmers associations. ✓ Training. ✓ Development of a centrally located cloud-based Internet platform. ✓ Server hosting, hardware and software maintenance. ✓ Development of a database and GIS applications based on cloud and Internet (web) technologies. ✓ Identification of specific criteria information useful to farmers, and mechanisms for alerts, including field testing and validation. ✓ Preparation and dissemination of useful and timely advice and validation as a useful farmer decision-making tool and early warning products to stakeholders. ✓ Identify with countries specific advice and early warning products ✓ Prepare and disseminate useful and timely advice and early warning products to stakeholders ✓ Provide training to stakeholders on the use of early warning products.		
TOTAL COMPONENT			**16.500**

5. Policy & Regulatory Support			
Objective	**Activities**	**Partners**	**USD ('000)**
Develop risk transfer mechanisms and instruments accessible by smallholder farmers for FAW management.	✓ Hire consultant to develop a proposal for insurance instruments for FAW accessible by smallholders. ✓ Work with private insurers to develop and implement pilot programme.	Private Sector: Insurance & Seed Companies Syngenta Foundation for Sustainable Agriculture, NARS	300
Create appropriate policy framework for pesticide use for FAW.	✓ Create adequate awareness among policymakers and regulatory organizations on the need for fast-tracked testing, registration and quality management of FAW management options and the review of chemicals currently being used for FAW control and their hazards. ✓ Organize regional workshops for national pesticide regulatory authorities and their regional networks. ✓ Review registrations of pesticides for FAW	NARS NPPOs CABI Regional Pesticide Commissions	3.000
TOTAL COMPONENT			**3.300**

6. Coordination			
Objective	**Activities**	**Partners**	**USD ('000)**
Create and maintain fluid and coherent coordination among actors and levels	✓ Creation of National coordination platforms with leadership and terms of Reference established. ✓ Regular meetings of National coordination platforms. ✓ Creation of Regional coordination platforms with leadership and terms of Reference established. ✓ Creation of an Africa-wide coordination platform with leadership and terms of Reference established	AU RECOs National Task Forces	3.000
Provide adequate monitoring and impact assessment of programme	✓ Develop and implement monitoring and impact assessment programme		2.000
TOTAL COMPONENT			**5.000**

BUDGET SUMMARY	
	USD ('000)
1. Management of FAW: Immediate Recommendations & Actions	4.250
2. Short-term Research Priorities	20.500
3. Communications & Training	38.000
4. Monitoring & Early Warning	16.500
5. Policy & Regulatory Support	3.300
6. Coordination	5.000
TOTAL	**87.550**