



# **Implementation of Fall Armyworm management plan in Ghana:**

## **An appreciative inquiry of process and lessons learnt**

Frances Williams, Anne van Marwijk, Harrison Rware, George Essegbey, Patrick Besah, Solomon Duah, Walter Hevi, Naaminong Karbo, Wilhemina Quaye, James Watiti

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**KNOWLEDGE FOR LIFE**

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## Acronyms and Abbreviations

ADVANCE II	Ghana Agricultural Development and Value Chain Enhancement
AEA	Agricultural Extension Agent
AEO	Agriculture Extension Officer
AGRA	Alliance for a Green Revolution in Africa
CSIR	Council for Scientific and Industrial Research
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organisation
FAW	Fall Armyworm
FASDEP	Food and Agriculture Sector Development Policy
GhAIP	Ghana Agricultural Investment Plan
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GoG	Government of Ghana
GSA	Ghana Standards Authority
IPM	Integrated Pest Management
MoFA	Ministry of Food and Agriculture, Ghana
NGO	Non-Governmental Organisation
NISSAP	National Invasive Species Strategy and Action Plan
NLA	National Learning Alliance
PFJ	Planting for Food and Jobs
PPRSD	Plant Protection and Regulatory Services Directorate, Ghana
SAIRLA	Sustainable Agricultural Intensification Research and Learning in Africa
SARI	Savanna Agriculture Research Institute
SPS	Sanitary and Phytosanitary
USAID	United States Agency for International Development
WTO	World Trade Organisation

## **Abstract/ Executive Summary**

The invasive pest, fall armyworm (FAW) was confirmed in Ghana in 2016. Stakeholders, including CABI worked to support FAW-specific activities and the development of a national FAW management plan. A review of the management plan implementation was undertaken using outcome harvesting, a Sprockler inquiry and key informant interviews. Results showed evidence of stakeholder collaboration, leading to increased public awareness of FAW and management practices, and more coordinated research into low-risk management options. The formal taskforce structure, common goals and ownership as well as effective collaboration and communication were considered key factors in the FAW response, as well as a commitment to implementing the action plan by all actors. Other factors included:

- The establishment of multidisciplinary taskforce
- The mobilization of financial, human and material resources, including at district level
- Effective planning and coordination, limiting duplication of efforts by different actors
- Farmer sensitization and training, including the technical capacity building of civil servants and farmers to be able to identify and manage pests

Challenges including a slow initial response, inadequate funds and the limitations in the agricultural extension system.

Key steps to ensure future preparedness include:

- implementation of the National Invasive Species Strategy and Action Plan (NISSAP)
- establishment of a standing taskforce and emergency fund to address new pest outbreaks;
- improved monitoring and surveillance especially at borders and ports of entry;
- strengthened research capacity especially in pest risk analyses;
- involvement of all stakeholders at central and local levels;
- development of generic and specific emergency response guidelines for future outbreaks.

## Background

The invasive pest, FAW (*Spodoptera frugiperda* J.E. Smith), was confirmed as being present in Ghana in 2016. In response to the FAW outbreak, CABI worked with other stakeholders in Ghana through its Action on Invasives programme to support a number of FAW-specific activities, through a collaborative effort with the Plant Protection and Regulatory Services Directorate (PPRSD) of the Ministry of Food and Agriculture (MoFA). A FAW management plan was developed that focused on four priority areas: co-ordination and collaboration; awareness-raising; monitoring and surveillance; and research and management. Most importantly, the national management plan aimed at ensuring coordinated efforts between public, private, and civil society organisations in the management of FAW. A national multi-stakeholder taskforce was created, and charged with advising the Minister of Food and Agriculture and coordinating the response to FAW.

The milestones highlighted above, namely the development of a national FAW management plan; the national multi-stakeholder taskforce and the specific components represent a learning journey whose full value was further explored through a structured retrospective inquiry that revisits key highlights of what exactly transpired by component of the response process. The components are summarised as:

1. A national FAW management plan developed and multi-stakeholder taskforce established to oversee and coordinate the implementation of the plan
2. Public sensitisation activities launched by various partners using multi-media approaches to increase awareness of FAW and management practices.
3. Taskforce research activities and impact studies provided evidence to inform policy discussions, particularly on the type of pesticides to use for FAW control
4. Collaborative research and validation trials launched for various pesticides and other cultural methods for control of FAW.

A review of these response components sought to focus on sign-posting the main strengths that enabled the response process, to inform future preparedness akin to asking the question 'How ready are we for a similar challenge in the near future?'. The inquiry also sought to capture the reality of the Ghana FAW response process from those stakeholders who were involved.

This review aims:

- To document the story of the Ghana FAW response
- To discover what worked well in the FAW response in Ghana
- To identify areas of weakness and opportunity for strengthening future invasive response efforts
- To identify the ingredients needed to sustain the FAW response interventions with lessons from Ghana

## Methodology

Multiple methods/approaches were used in this inquiry. Outcome Harvesting, which focuses on identifying, describing, verifying and analysing outcomes, was used to gather documented outcomes from available documents. This formed the basis for designing the Sprockler tool to gather data and information to validate the harvested outcomes regarding the FAW response in Ghana. Key informants were also purposely selected to respond on the thematic areas in the inquiry. Physical, online and phone interviews were used in gathering the data. Outcome validating information was gathered from government officials from the national to the local level, partners, NGOs, farmers and farmers advisors. Questions focussed on the likely changes at institutional, individual, groups or otherwise in the delivery of FAW management plan and then describing how the change happened and what ought to be done to sustain the change.

### Outcome Harvesting

Outcome Harvesting is a monitoring and evaluation methodology that is used to identify, describe, verify and analyse outcomes. We harvested outcomes that showed a change in the behaviour, relationships, actions, activities, policies, or practices of an individual, group, community, organisation, or institution in relation to response to FAW invasion in Ghana. Outcomes were harvested from relevant documents that detailed the FAW response, including Kansime et al (2020), Agboyi et al (2019), CABI (2019) and the Advance project document. Additional reports were sought from FAO, GIZ etc. but none were forthcoming, and their specific activities were part of the taskforce response. We then worked backwards to assess whether or how an organisation/institution, programme or project contributed to the identified outcome (Wilson-Grau and Britt, 2013). The outcomes harvested were grouped into categories, with five categories resulting from the analysis. These categories were used as the basis for the design of the Sprockler inquiry, and to guide the categories of stakeholders to be interviewed through the key informant interviews.

### Sprockler

Civil servants from local and national government institutes, farmers, NGO representatives, input dealers, journalists and development partners were asked to share their experiences with the FAW response in Ghana through an inquiry. This online inquiry was set up using [Sprockler](#), a methodology and an online platform that allows for collecting, processing, analysing and visualising quantitative and qualitative data. It is specially designed to evaluate complex contexts with different stakeholders playing a role. Sprockler has a strong narrative component and focuses on collecting stories that explain why change has happened and how people experienced it. The questions used in the inquiry can be found in Annex 3.

Data was collected through sending out an online link to participants or through interviews, both in person and telephonically. The results from the inquiry are presented through an online interactive report, which can be accessed and downloaded from here:

<https://visualizer.sprockler.com/en/open/FAWGhana>. In the online report, each dot represents one respondent. By clicking on a dot, the story shared by the respondent becomes visible. Clicking on the dot again closes the story.

## Key Informant Interviews

The sample of key informants was determined based on the roles of the actors in the FAW management plan. They include policy makers, researchers, farmers and mass media practitioners. The list of key informants interviewed within the second and third week of December is in Annex 1. The interviews were conducted by telephone, email and at face-to-face meetings. The face-to-face interviews were the ideal as they yielded more information and insights. However, given the COVID-19 situation, only a few face-to-face interviews were conducted. Notes were taken and recordings were made during the interviews.

Standard questions were used during the interviews (see Annex 2 for the interview guide with the list of questions). The questions sought to gather information from the key informants on the implementation of the FAW management plan as well as seek their suggestions for future implementation of an invasive pest management plan. Generally, few questions were asked to ensure the interview was completed within 30 to 60 minutes. The duration was much longer in the face-to-face interviews. The summaries of the interviews were further analysed to highlight the essential issues and their relevance to the formulation and implementation of future management plan for invasive species.

## Results

### Respondent demographic information

There was a total of 130 respondents to the Sprockler inquiry (Figure 1) including central (23) and local (58) civil servants, farmers (33) and researchers (8). Of the total of 81 respondents who were civil servants, 39 were agricultural extension officers, 20 district officers and 12 were regional officers. Other representatives from the private sector, NGOs, international organisations, the media and academia were invited to complete the survey, but despite follow up, did not respond. Some of these stakeholders were subsequently contacted for a KII.

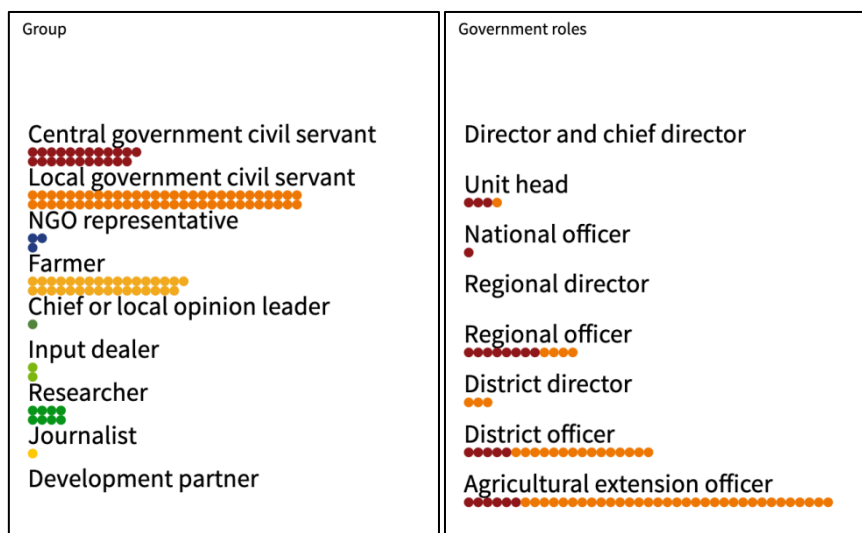
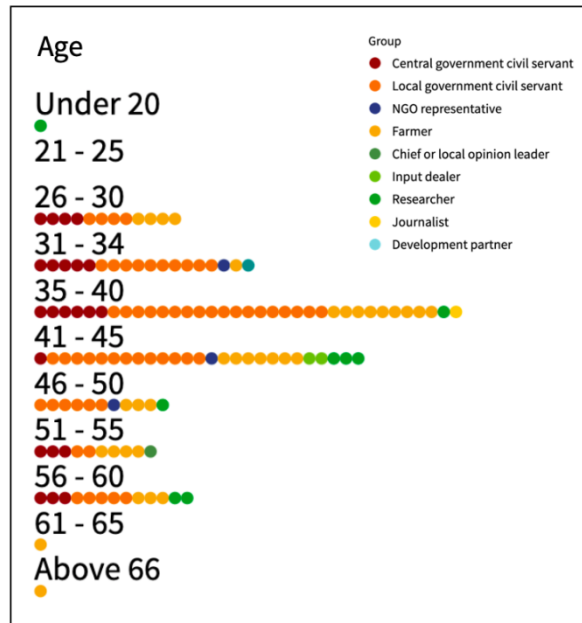


Figure 1: Respondent categories



Most respondents were men (111) with only 19 female respondents to this inquiry. There was a similar division in gender for the different age categories. The majority of respondents were aged between 35-41 years (35), with 27 respondents between 41-45 years. 30 respondents were aged between 26 – 34 years old, and one was under 20, all of which are classed as 'youth' in Ghana (Figure 2).



**Figure 2: Respondents' Ages**

The respondents had different levels of education. The majority (50) had undergraduate (university, college of education) education and 20 respondents had postgraduate education. 11 and 11 respondents had junior high and senior high school education respectively. Three respondents had primary level education while three respondents had no education. Analysis showed that it was mainly farmers who had no education or primary school and junior and high school levels of education, while the other categories of stakeholder groups had undergraduate or postgraduate levels of education.

*“Initially I thought it will just go by itself. It took one week before I realized how dangerous they can be. So I went to MoFA office at Asin Fosu but they couldn't get any chemical for me to fight them. So I lost everything in 2016. But now everything has improved, we get regular visits from agricultural officers who help us with education and sometimes with chemicals to fight the fall armyworms”*  
- Farmer

A total of 21 people were interviewed directly through the key informant interviews. Eight respondents were policy actors (central government officials); five were farmers or farmer representatives; three represented development partners and international organisations, two were from media houses and a further three respondents were from academia.

## Foundations of the FAW response in Ghana

### Policy framework

An analysis of the umbrella national development framework shows that the Food and Nutrition Security component of the Coordinated Programme of Economic and Social Development Policies (2017-2024), highlights institutionalization of measures to prevent food losses, strengthening early warning and emergence preparedness system in Ghana. This is further spelt out in the relevant policy documents concerned with food and nutrition security.

At the sectoral level, both Food and Agricultural Sector Development Policies (FASDEP II and FASDEP III) contain policy objectives on food security and emergency preparedness to guide the management of pests and diseases incidences, and climate change related risks of hazards and disasters affecting agricultural production and productivity. The current FASDEP III includes a policy objective on modernizing production systems, that capture developmental issues on misuse of agro-chemicals and inadequate plant and animal pests and diseases monitoring and surveillance system. Strategies to be deployed include promotion and support for disease surveillance and early warning systems to prevent the outbreak of scheduled diseases. Use of organic pesticides and bio-agents as well as the promotion of Integrated Pest Management (IPM) are some of the strategies recommended for the prevention and control of pests and diseases. There are also concerns for increasing awareness creation on the agricultural insurance policy to cover all stakeholders in the agri-food sector as risk-mitigating measures against eventualities such as FAW.

Effective national capacity to detect and monitor plant pests and diseases is critical for creating the enabling environment for the private-sector-led modernization of Ghana's agricultural sector. Thus, one of the key investment areas of the Ghana Agricultural Investment Plan (GhAIP 2018-2021) is targeted at enhancing access to agro-chemicals and promoting access to plant disease prevention and control measures. The central government is expected to bear the cost of the design and operation of early warning systems to detect pests. This is to be implemented under the Emergency Readiness and Response investment pillar of the GhAIP.

An important thematic and cross-cutting policy document defining the policy context is the Ghana National Climate Change Policy of 2014. One of the focus areas is the development of climate-resilient agriculture and food security systems. A key challenge to be addressed in the policy is the increasing number of alien pests and diseases occurring as a result of changes in temperature and humidity. The key principle underlining this focus area is the understanding that the sustainability of natural resources including land, forests, water and genetic biodiversity is significantly influenced by agricultural practices.

With regards to Sanitary and Phytosanitary (SPS) measures, the Government of Ghana (GoG) has signed onto World Trade Organisation's (WTO) agreement and is committed to set and enforce standards that meet the WTO requirements to ensure food safety. Government institutions such as PPRSD, the Food and Drugs Authority and the Ghana Standards Authority are responsible for ensuring compliance with the SPS measures. Specifically, the GhAIP indicates that GoG will bear the cost of the following:

- Creating a national agency responsible for coordinating hazard identification, vulnerability and risk assessment
- Creating a monitoring and warning service

- Creating functional communication channels
- Instituting appropriate disaster preparedness measure
- The administrative cost for the preparation and adoption of early warning system regulation.

PPRSD plays a key role in providing the services which protect Ghana's biodiversity against invasive pests. The directorate was re-established by the Plants and Fertilizer Act, 2010 (Act 803). It was first established by the Prevention and Control of Pests and Diseases of Plants Act, 307 of 1965. Section 8 and Section 9 of Act 803 spell out the functions that the Directorate shall perform. Among other things, PPRSD shall:

- issue phytosanitary import permits for plants, plant products and other related articles;
- issue certificates for phytosanitary regulation for the import contracting party for the consignment of plants, plant products and other regulated articles;
- carry out surveillance of: growing plants including areas under cultivation, fields, plantations, nurseries, gardens, greenhouses, laboratories, wild flora; plants and plant products in storage or in transit; particularly to report the occurrence, outbreak and spread of pests and the control of the pests;
- inspect consignments of plants and plant products and where appropriate other regulated articles to prevent the introduction and spread of pests;
- protect endangered areas and designate, maintain and carry out surveillance of pest-free areas and areas of low pest prevalence;
- conduct pest risk analyses;
- ensure that the phytosanitary security of consignments after certification as regards composition, substitution and re-infestation of plants and plant products intended for exports are satisfactory;
- train and develop staff.

Part II of the Environmental Protection Agency (EPA) Act (Act 490) of 1994, governs the whole pesticide life cycle in the country. EPA has the mandate to regulate all pesticides that are sold, distributed and used in Ghana to ensure that the use of these chemicals is in accordance with label directions and that they do not have unreasonable adverse effects on human health and the environment. Under the EPA Act, Act 490, pesticides include herbicides, insecticides, bio-pesticides and other substances used in controlling a wide range of pests and diseases. PPRSD works to complement EPA's functions through Act 803, by supervising and training pesticides inspectors and registering and inspecting pesticide dealers. The Customs Division of Ghana Revenue Authority also tackle illegal trade in pesticides, regulate all imports into Ghana including chemicals under Act 791 (2009). The main challenges with the use of pesticides and agro-chemicals, in general, have been misuse/ misapplication, high cost, and resistance development (Clotey et al. 2018)

The most current policy document to consider is the National Invasive Species Strategy and Action Plan (NISSAP) – 2020 – 2030 which CABI and the EPA collaborated with other relevant stakeholders to formulate. (It is in press.) Given that the formulation of the Plan arose from the fight against the FAW and the experiences learnt, it elaborates on strategies to counter pest invasion and also elaborates on institutional responsibilities to achieve the goals and objectives. An important lesson carried into the formulation of the NISSAP is the need for inter-institutional collaboration and cooperation in fighting invasive pests. The coherence of actions and efforts to achieve synergy underscore the details of the institutional functions.

## **Project framework**

The most relevant current project to consider is the government flagship project, Planting for Food and Jobs (PFJ) which aims to increase food production and farm incomes, through efficient supplies of subsidized seeds, fertilizers and agro-chemicals for pest control. The PFJ propelled government actions when FAW struck late in 2016 and going into 2017 and 2018 and helped to enable the response. This was due to the high likelihood of the FAW infestation to erode expected gains from the project, which has maize, the most preferred host of FAW, as a major target crop. One key informant noted that:

*“The Government had just embarked on a massive agricultural transformation agenda by rebranding agriculture and increased subsidy support for farmers to enable them to use improved inputs. In the first year of the programme, the FAW outbreak occurred in the sub-region. To prevent the devastation of the crop fields by the pest and undermine the programme, the Government immediately established a national committee to address the problem and curtail its spread and negative impact on crop yield and farmers’ incomes.”* - Central government official

*“One unique aspect about the management of the FAW in Ghana was the formation of a multi-sectoral national task force with membership from both Governmental and Non-Governmental agencies with the taskforce having subcommittees. This was maybe due to the primary host crop (maize) being a staple crop and the importance of that crop to the Ministry of Food and Agriculture’s flagship programme Planting for Food and Jobs. Government set aside some funds to enable the national management of the pest.”* – Central government official

## **Food security threat**

Regardless of the strong policy and project framework, the government would still have taken action due to food security threat posed by the FAW infestation on maize which is a major staple crop to millions of Ghanaians. The government supported the distribution of pesticides to a total of approx. US\$11.6 million between 2017 and 2020.

*“The FAW pest invasion was a food security threat to the nation and it was Government’s responsibility to address the situation from management, human resource and financial perspectives”* – Central government official

Farmers’ livelihoods were seriously affected, especially at the start of the outbreak.

*“The FAW infestation was very serious in almost all the regions where maize was grown. In the Greater Accra Region for example, most farmers lost their crops in the early onslaught of the pest. This was because it took some months before the government through MoFA intervened with the needed agro-chemicals and other supplementary actions to fight the pests.”* - Farmer

*My main crop is maize, which is the crop FAW attacked. In 2017 when the FAW invaded Ghana, I was cropping 15 acres of maize. FAW destroyed at least five acres of my maize farm. It was a heavy loss. The FAW infestation came all of a sudden and taking most of us by surprise. This invasive species was difficult to deal with because of its behaviour. We had to go to the farms by 6 o’clock in the morning and spray to kill them. Otherwise,*

*the caterpillars manage to hide in various places. Within three days of infestation, the farm is devastated as the caterpillars eat up the leaves of the maize plants.” - Farmer*

## The FAW response in Ghana

Based on Outcome Harvesting approach, the outcomes achieved and as reported for the FAW response in Ghana were categorized into five areas: research and management; monitoring and surveillance; awareness; collaboration and; policy. Outcomes achieved in each area are discussed below.

### Research and Management

FAW research and management were important components for the FAW response in Ghana. Research provided new knowledge and effective ways of managing the pest and the taskforce facilitated collaborative research amongst the government, research institutions, the private sector and other partners, where previously they had worked separately and duplicated efforts. In 2017, a sub-committee of the taskforce made up of researchers, EPA and PPRSD was tasked to identify and recommend insecticides for the management of FAW. The committee examined insecticides used in the Americas for the management of the pest based on available literature and compared them to registered products in Ghana, out of which a final recommendation was made to the taskforce. The taskforce applied to the EPA for emergency approval for the selected products to manage the pest for which approval was granted. Thus, the insecticides approved for managing fall armyworm in 2017 was purely on emergency approval basis. In the same year parallel field efficacy trials were conducted on different insecticides for managing the pest and those that met the set criteria were approved by the EPA. Examples include three efficacious and effective products, namely Uphold (Methoxyfenozide + Spinetoram), Chemomectin (Emamectin-benzoate) and NOVA BTK (Bt) were successfully tested and launched, after registration by EPA for managing FAW.

Other research efforts included the establishment of FAW colonies to study the basic biology and ecology, and evaluate the effectiveness of different management tools. This particularly focused on bio-efficacy testing for biorational pest management tools and natural enemy assessment in different cropping systems. There was scouting for the local natural enemies of FAW. One natural enemy (an egg parasitoid), *Telenomus remus*, was identified to be effective and there was mass production at the PPRSD Head Office at Pokuase. For field trials, there were releases of this natural enemy at the research fields at the Soil and Irrigation Research Centre at Kpong and farmers' fields in Bono region. In addition, research was undertaken into the development of safer, non-synthetic control measures through the SAIRLA-funded Ghana National Learning Alliance. The research efforts were driven by public health concerns, and the need to ensure the maize crop did not have unacceptably high pesticide residue levels. The research data helped to shape policy discussions, particularly on the use of low-risk options for management of FAW, following the widespread use of synthetic pesticides across the country, and their associated health and environmental risks. As a result, in 2018, the government focused its efforts on the promotion of biorational products for FAW control (Kansiime et al, 2020).

Results from these research efforts were fed into training programmes for farmers, extension officers, input dealers, all PPRSD staff and all other stakeholders across Ghana, so the latest information was quickly shared with others involved in the FAW response. In particular, sensitisation/capacity building of extension personnel working directly with farmers was conducted rapidly throughout the country, using the high-quality up-to-date research information on Ghana-specific prevention, detection, and control measures for FAW. This led to increased coordination of FAW management activities and increased effectiveness and efficiencies in the use of resources in the management response at national, regional and community levels (Kansiime et al, 2020).

## **Monitoring and Surveillance**

Surveillance/monitoring was a key component in responding to the FAW outbreak in Ghana. Systematic monitoring and surveillance activities were led by extension workers and launched in all 216 districts, through the establishment of monitoring and early warning mechanisms. FAO supplied pheromone traps, mobile phones and laptops for monitoring and surveillance of the FAW populations. The Fall Armyworm Monitoring Early Warning System mobile application (app) was used for FAW data collection and transmitted to the Global Platform housed at FAO in Rome for analysis. The results of the analysis were fed into the taskforce decision-making in Ghana. The taskforce field monitoring team supported these efforts, and, leveraging additional finance from other projects such as USAID-ADVANCE II and FAO, enabled extension of the monitoring and surveillance to cover the entire country (Kansiime et al, 2020). This was through the training of at least two extension officers per district with the mandate of setting up and monitoring pheromone traps and conducting field scouting in all districts across the country. Over 2,811 technical staff received training in FAW identification, management, rapid assessment of infestation levels, and early warning efforts to enable them to monitor FAW levels, as well as educate the farmers on the identification and management of the pest. This work was coordinated and run by partners in the research and surveillance sub-committees.

The establishment of a monitoring and reporting system helped to solidify existing relationships and create several new linkages between research, extension and communication organisations in the public, private and civil society sectors, and new partners became involved in the monitoring and surveillance response. Call lines were established for farmers, which not only provided technical advice to farmers, but also enabled the development of weekly maps, based on farmer information, that showed current FAW infestations.

## **Awareness**

In order to effectively respond to FAW infestations, awareness of the pest at both national, regional and local levels is critical. In responding to the FAW infestation in Ghana, the government put in place strategies for awareness creation for the decision-makers, advisors and farmers. A harmonised plan ensured that there was consistent messaging to the public, in particular to farmers, from the partners carrying out awareness-raising activities sensitisation/capacity building of extension personnel working directly with farmers was conducted rapidly throughout the country, with the availability of high-quality up-to-date information on Ghana-specific prevention, detection, and control measures for FAW. This was

done through seminars and symposiums organised across the country to enhance awareness of FAW by MoFA staff. The efforts were supported through the establishment of a user-friendly communication and feedback system for extension officials in various communities utilising social media platforms – WhatsApp, Telegram and Facebook – to enhance the speed of reporting and peer support should anyone require technical support (Kansiime et al, 2020).

Additionally, through increased engagement and training of the media on FAW, public sensitisation for farmers was carried out via radio stations, in schools, worship places, and through plant doctors/extension workers. The use of print materials was also part of the tools used in awareness creation and more than 227,000 flyers and posters were developed and distributed alongside a multitude of articles published in the print and online media. English and 10 local languages were used in the multiple types of messaging, with a focus on ensuring technical information was presented in easy-to-understand formats. The messages focused on pest identification, field scouting for early detection, and management practices. Further targeted communication focused on educating farmers about the benefits of using biorationals and other low-risk control measures for FAW. These messages all showed increased consistency, accuracy and reliability of information, due to the involvement of the media in the FAW taskforce, in particular its communication sub-committee, as well as a strengthened working relationship between the National Plant Protection Organisation and the media (Kansiime et al, 2020).

These awareness raising measures were based on information from the research/management and monitoring/surveillance taskforce sub-committees, and increased farmers' awareness of and access to FAW information, recommendations and resources to help them manage the pest sustainably.

## **Policy**

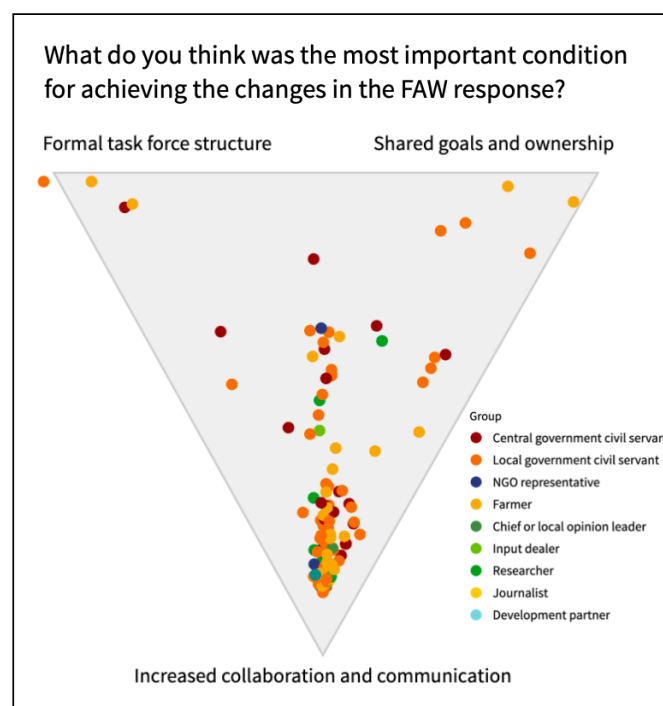
Policy shift/change during the FAW response may lead to sustainability of the FAW response and readiness for future pest infestations. The outcome harvesting revealed the following policy related outcomes and shifts as a result of FAW response as was found in (Kansiime et al, 2020).

- Results from the taskforce's research activities, and the fall armyworm evidence notes, provided data that helped to shape policy discussions, particularly on the use of low-risk options for management of fall armyworm, following the widespread use of chemical pesticides across the country, and their associated health and environmental risks. In 2018, the government focused its efforts to promote biorational products for control of fall armyworm. Also in 2018, the FAW taskforce organised a national consultative meeting on invasive pest management. At the meeting, it was agreed on the need to formulate a NISSAP. Subsequently, this was endorsed by the government, and the NISSAP is anchored on the National Biodiversity Strategy and Action Plan of the Ministry of Environment, Science, Technology and Innovation.

- The NISSAP was developed embedding policy recommendations from the FAW Taskforce, and builds on the key lessons from the taskforce to build future strategies for invasive species management in Ghana, including the need to be adaptable for the management of future invasive species; the need to harmonise and coordinate institutions' invasive species activities; the need to ensure effective national and regional collaboration; and the need to form a standing taskforce for a coherent holistic response to deal with general invasive species issues using experience gained from FAW.
- The establishment of the multi-stakeholder taskforce and three-tier monitoring, and therefore the national response framework, ensured a quick response to new FAW infestations. It also provided a platform for annual reviews, where new knowledge and information on the pest's behaviour and new communication materials are reviewed as they become available.

## Collaboration

The current results demonstrate that the FAW response in Ghana facilitated collaborative research amongst partners (see figure 3). Collaboration with MoFA through the taskforce, helped to synthesize the activities being managed by stakeholders, including enhanced research collaboration, increased interaction between communities and extension workers, and increased coordination between the ministries of agriculture, finance and information/communication. The taskforce ensured that actions being taken by partners in the FAW response plan were tracked across the country, ensuring coordination and complementary activities.



**Figure 3: Important conditions for change**

The results discussed in the other outcome areas demonstrate that increased coordination and collaboration was a key feature in enabling research and management, monitoring and surveillance, and awareness raising to response to the FAW outbreak. Collaboration saw the



establishment of a monitoring and reporting system that helped to solidify existing relationships and create several new linkages between research, extension and communication organisations in the public, private and civil society sectors, to strengthen Ghana’s coordinated response to FAW. It led to the harmonisation of plan that ensured that there was consistent messaging to the public, in particular to farmers, from the partners carrying out awareness-raising activities. The acting Director of the Council for Scientific and Industrial Research: Savanna Agricultural Research Institute (CSIR-SARI) said that there was a strong collaboration among relevant state institutions and international partners in a coordinated manner with each actor focusing on their areas of strengths. Significant efforts were made to avoid duplication of interventions and to ensure that each actor in the fight against the pest augmented the weaknesses of other partners (Kansiime et al, 2020).

## Road to results

This chapter addresses how the inputs led to the outcomes achieved as described in the previous chapter. It describes how the process towards the achievement of the outcomes was experienced by those involved, building mainly on the results from the Sprockler inquiry and the key informant interviews. In the Sprockler inquiry, respondents were asked to share their experiences with the FAW response in Ghana. The majority of these stories were about awareness (48%), research and management (28%) and surveillance (17%). A few stories were shared about collaboration (5%) and policy (1%) (see figure 4). The sections below will elaborate on the experiences in each of these key areas.



Figure 4: FAW story categories

In general, the stakeholders involved are very positive about their experiences with the FAW response in Ghana. 81% of respondents indicated that their experiences were very positive (see figure 5). There were only three respondents (2%) who shared negative stories. These stories were shared by two farmers and one input dealer and included experiences with the FAW destroying their crops.

The majority of the respondents also considered their experiences with the FAW response in Ghana to be highly significant (83%) in terms of the national response (see figure 6). This shows that the respondents consider the FAW response to be critical to address the outbreak. However, one respondent shared that their experience is not significant in terms of the national response to FAW. This respondent, who is a farmer, shared a story about losing their whole income in 2016 due to FAW and limited government assistance to supply suitable chemical for its management, which has since then improved.

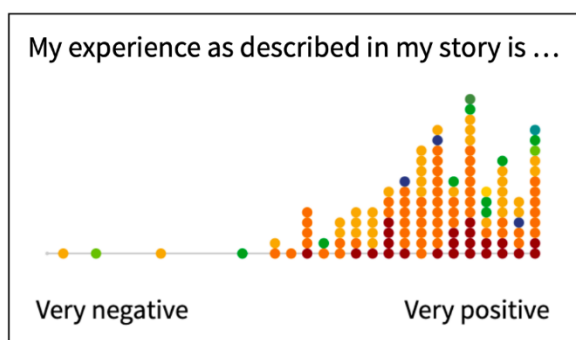


Figure 5: FAW story experience

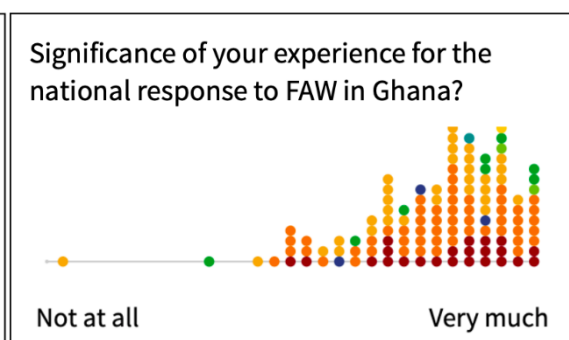


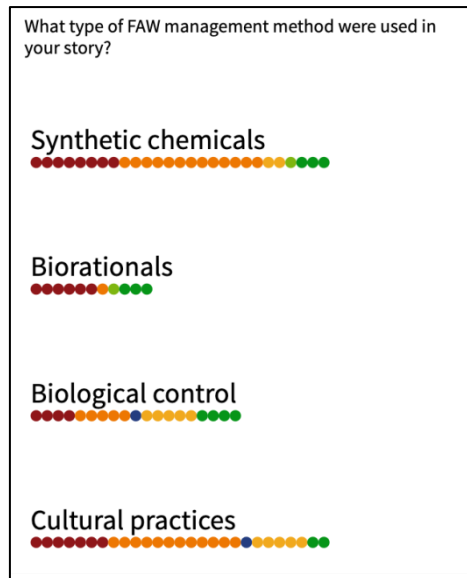
Figure 6: FAW story significance

## Research and management

Several civil servants from central and local government institutions, farmers and researchers shared their experiences with regards to research and management during the FAW response. Researchers shared stories about the research they conducted on the efficacy of the different management options. Civil servants shared experiences of identifying the issue and assisting farmers in the management process by providing information, distributing products and monitoring the ways to manage the FAW. Farmers shared experiences of managing FAW on their farm and finding out what works to control and prevent it.

*"I spearheaded the organization of a symposium to share ideas of FAW research and set a research agenda for the FAW in Ghana. The symposium was well attended by stakeholders from Government ministries, academia, research development partners and private sector. In the end, we came up with a book of abstracts on research being carried out across the country and a research agenda for FAW." - Researcher*

In the stories, a variety of different means to manage FAW were shared. In 73% of the stories, synthetic chemicals and cultural practices were indicated to have been used (see figure 7). Biological control was mentioned in 51% of the stories and biorationals in 30%.



**Figure 7: Types of control options used**

Respondents mentioned different examples of each of these means to manage FAW, which had varying degrees of effectiveness against FAW, and were not necessarily registered treatments:

- Synthetic chemicals: such as Uphold (Methoxyfenozide +Spinetoram), Chemomectin (Emamectin-benzoate), Ema Star (Emamectin benzoate + Acetamiprid) and Warrior Super (Sophora flavescen plant extract + Emamectin-benzoate)
- Cultural practices: such as sand, palm fronds, powdered pepper, laundry blue (synthetic ultramarine), worm water, alata samina (local soap made from plantain peels, coconut oil, cocoa pods, and shea butter), neem leaves or pounded neem seeds, wood ash, etc.
- Biological control: parasitoids like Telenomus remus
- Biorationals: Nova BTK (Bt), Bypel (Bt + Perisrapae Granulosis virus), Agoo (Bt + Monosultap)

*“We also try to put on board our own innovation by controlling the FAW by using neem extract mixed with pepper which really is effective and helping our farmers.” – Farmer*

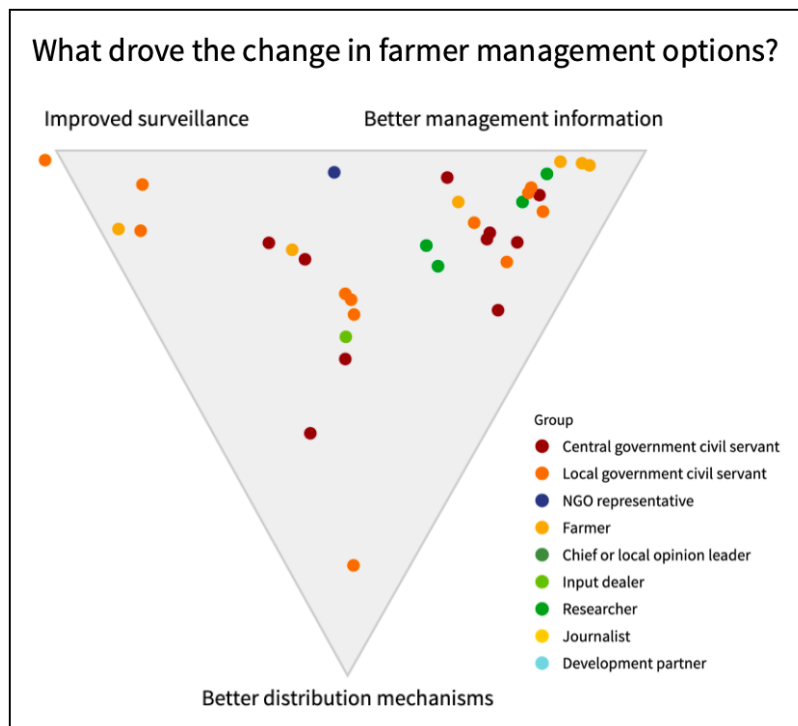
Next to different management options, respondents also shared that they have started taking into account other elements, such as the effect of the weather, the timing and manner of spraying and effect on the environment and farmers’ health of the products.

In the key informant interviews, farmers shared examples of locally developed solutions that were used, such as water with detergent and neem leaf extracts or trying pesticides that worked on other pests. The interviewed farmers all shared that they started using the government freely supplied pesticides when they became available, since without the free supply, they could not all afford the pesticides.

*“During the initial stages of the FAW infestation, farmers attempted to control the pest with their own developed innovations. Some farmers used soapy (detergent) solution to spray on the FAW. However, when the soapy solution was too much, it harmed the plants. Others used neem extracts in solution. Some others also used some of the agro-chemicals used against other pests on trial-and-error basis.” - Farmer*

*“A major failure of the implementation of the FAW management plan was the poor response to farmers’ cry for help at the early stages of the infestation. Apparently, the responsible institutions such as MoFA was caught unawares and were not prepared to deal with the emergency. Going forward, PPRSD should have in stock certain key pesticides for early response action. Some farmers are so poor that they could not afford to buy chemicals.” – Farmer*

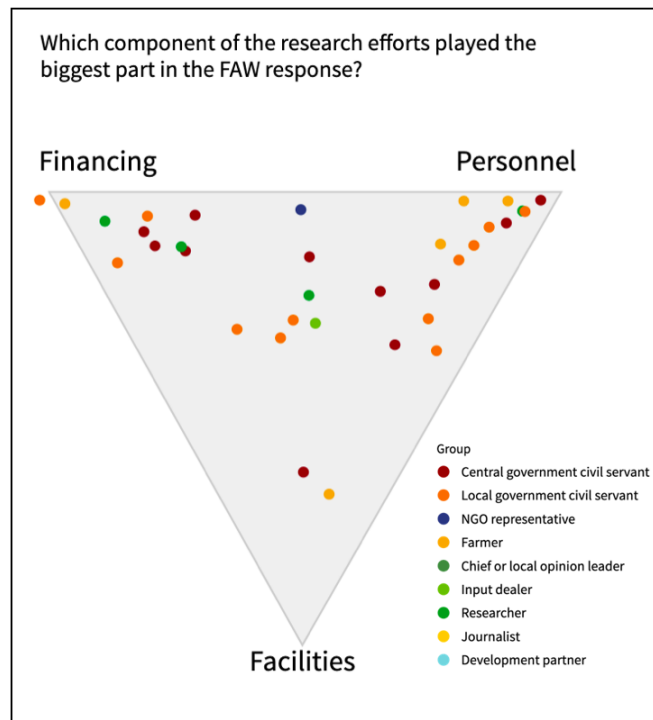
According to the respondents, a change in their use of management methods was mainly due to more information on management techniques (see figure 8). Some respondents also selected improved surveillance as a reason for changing management techniques or stated that improved surveillance was the main reason for them.



**Figure 8: Reasons for change in farmer management practice**

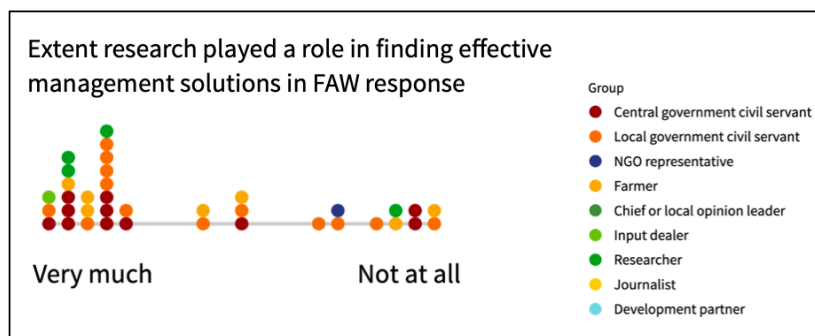
About 89% of respondents sharing experiences about research and management felt knowledgeable and informed about the management of FAW in Ghana, 59% of respondents felt involved and 48% felt empowered. However, one researcher reported having felt anxious

and frustrated and shared an experience about the information gap on the sustainable management of FAW by the Ghana National Learning Alliance (NLA). Finance and personnel played the biggest part in enabling the research efforts in the FAW response, more so than facilities (see figure 9).



**Figure 9: Enabling factors in the research and management response**

About 59% of respondents believe that research played an important role in finding effective management solutions to the FAW in Ghana, while 27% thought research did not play a role at all (see figure 10).



**Figure 10: Role of research in effective management solutions**

In the key informant interviews, researchers shared examples of knowledge or techniques that were obtained from other FAW-infested countries to improve Ghana's FAW management plan. Initially, management strategies from Central and South America, where the pest originated and has been controlled, were used in research. This provided information on the type of insecticides and natural enemies of the FAW. Next to that, knowledge of indigenous

practices such as the use of soap and wood ash were shared. According to one researcher, there is one additional option that had been shared from other countries but has not been implemented in Ghana and that is the use of Bt maize, a genetically modified maize variety with the genetically engineered trait of producing toxins to kill pests.

## Surveillance

Civil servants from local and central government and farmers shared several experiences about surveillance. Civil servants shared how they found the right means to manage FAW, how they monitored the distribution and correct use of these products and how they monitored the spread of FAW in general, checking affected fields and keeping track of FAW infestations. Farmers shared experiences of how they have been able to monitor FAW occurring on their farms and prevent it from returning. Some respondents shared that when FAW was detected initially, the surveillance was not very clear, but after the initial response when intensive training and sensitization activities took place and early warning systems were put in place, the management and surveillance of FAW become easier.

*"I think the beginning we, as in staff and farmers, abused the application of pesticides in attempting to control the pest. All types of chemicals were sprayed not thinking about beneficial insects and other natural enemies. In the future, we need to avoid panic reactions."* - Local government civil servant (regional officer)

87% of respondents stated that scouting worked best for them as a monitoring and surveillance method (see figure 11), 46% chose pheromone traps and 9% used the farmers' mobile app.

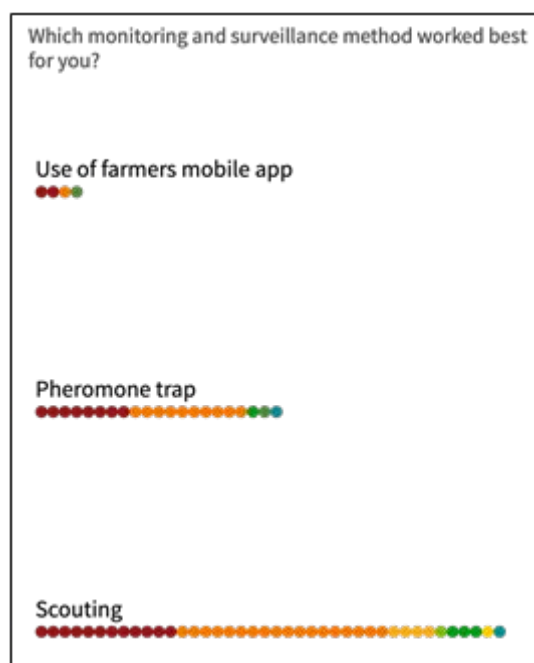
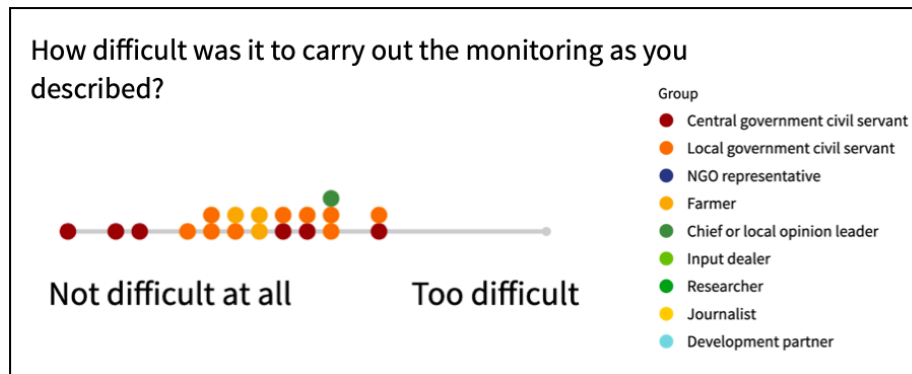


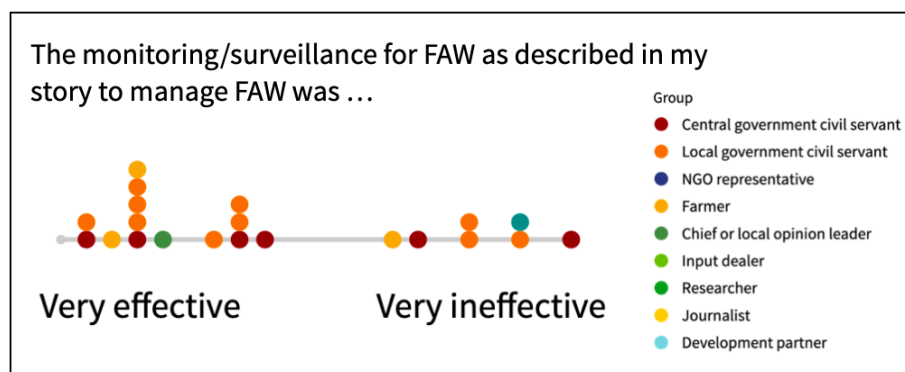
Figure 11: Monitoring and surveillance methods that worked best

As can be seen in figure 12, 37% of the respondents who shared experiences about surveillance considered FAW monitoring and surveillance as not difficult to carry out. No respondents considered monitoring/surveillance to have been too difficult to carry out. This reflects the simple methods used in pest monitoring, including “window pane” damage on leaves, checking in the maize whorls, and checking early in the day.



**Figure 12: Difficulty of carrying out monitoring**

About 47% of respondents thought that the monitoring/surveillance of FAW was very effective, while 28% of respondents considered the surveillance to be very ineffective (see figure 13). The stories of those respondents do not suggest a reason that the monitoring/surveillance was considered ineffective. In other responses, potential reasons for the perception of limited effectiveness of monitoring/surveillance included delays in the initial response to the outbreak, the lack of resources for monitoring, the need to cover more remote areas, and a more effective application of methods learned during the awareness-raising activities, such as timing of spraying by farmers.



**Figure 13: Effectiveness of monitoring and surveillance**

## Awareness

Civil servants from central and local governments, farmers, NGO representatives and input dealers shared their experiences with the awareness-raising activities part of the FAW response in Ghana. Some respondents shared their experiences in being able to recognize a destructive insect on the crops and being able to raise this with governmental institutes to tackle the issue. In one of the farmer stories, they confirmed that they raised alarm with their

municipality or to PPRSD or journalists reporting the issue in newspapers. Many respondents shared experiences about awareness-raising for farmers and communities about FAW, including programmes run by plant doctors and the Department of Agriculture that train farmers and agricultural staff on the Identification, prevention and management of FAW. Some of the examples they shared include fixed or mobile plant clinics, group meetings, home and farm visits, training of trainer sessions, or farmers fora that were set up to raise awareness. These were supported by tools such as flyers, posters, booklets, radio broadcasts, and crop samples. Government officials, extension officers, and farmers shared experiences of participating in such awareness programmes and what they have learned from them, such as how to recognize the different stages, how to detect their presence and how to report on FAW with reliable data. Farmers shared experiences about how their farms were affected and how the awareness programmes enabled them to respond to the FAW. Other experiences shared highlighted the cooperation between the different actors involved, such as farmers, governmental institutions, chiefs, assembly members, unit committees and opinion leaders in ensuring the spread of the awareness messaging. The support of international organisations such as USAID, GIZ, and FAO also supported this wider awareness-raising.

*“FAW would have made me incur high loses but the government intervention by providing fall armyworm insecticides have really helped me in managing the pest. Besides, he also added that the training organized by agricultural extension agents (AEAs) has really helped me in the management of the pest and during the time of spraying my farm to control the pest, I spray the farms of my neighbours to help me efficiently control the pest.” - Farmer*

Respondents also confirmed that the involvement of different actors mainly farmers, central government, input dealers and local government enabled the changes described in the experiences about awareness. Most respondents (97%) felt knowledgeable and informed, empowered (57%), involved (49%), 36% felt prepared (37%) while 19% felt hopeful after taking part in the FAW awareness activities (see figure 14). There were no respondents who reported feeling frustrated, disappointed or annoyed. There was a similar spread among the different groups but feeling hopeful was mainly selected by farmers. This suggests that the awareness campaign achieved key aims of increasing knowledge and preparedness, as well as enabling farmers and others to feel in control of taking action against FAW on their farms.





Figure 14: Feelings about awareness creation activities

51% of respondents (farmers and local government civil servants) think that the awareness creation was very sufficient while 15% of respondents think awareness creation was not sufficient at all (see figure 15). A senior reporter of the Ghana News Agency, elaborated in a key informant interview that he considered the communication plan on FAW to be very effective, as the media had the chance to go into the field with researchers and report directly on evidence. In addition, multiple channels were used, such as e-mailing, WhatsApp platforms, seminars, field visits, newspapers and flyers. A key for him was the fact that the media had been involved as a stakeholder from the beginning of the process.

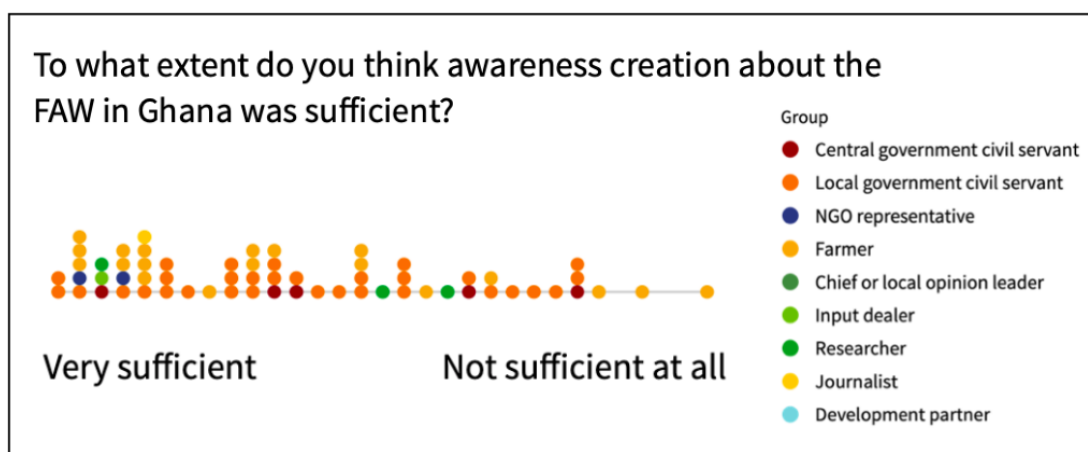
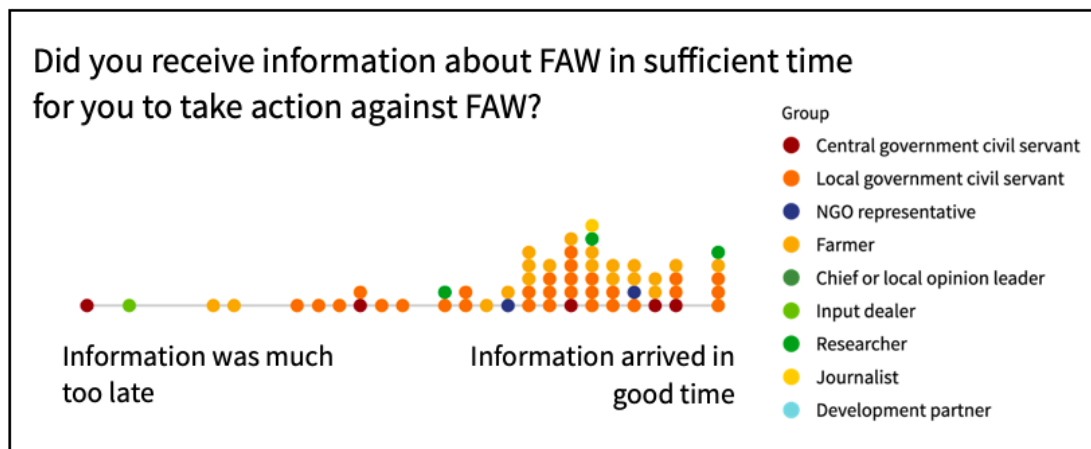


Figure 15: Sufficiency of awareness creation

Pest infestation response information must be timely to get to the farmer so that the farmer can launch important measures in time. Results from this study, show that 71% of respondents felt that the information about FAW was received in good time while 7% of respondents reported that the information was received much too late (see figure 16).



**Figure 16: Timeliness of awareness-raising**

Respondents ranked activities that they considered most effective in creating awareness where activities were ranked in order of importance or influence as follows: training, seminars by extension, information materials, public sensitisation meetings, symposiums, media activities. More than half (54%) of respondents, selected training as most useful awareness activity (see figure 17). This suggests that while general information shared through media channels (radio, newspapers etc.) is useful, most farmers and local government officials prefer more direct means of communication, where presumably there is more opportunity for interaction and asking specific questions, through which additional knowledge is gained.

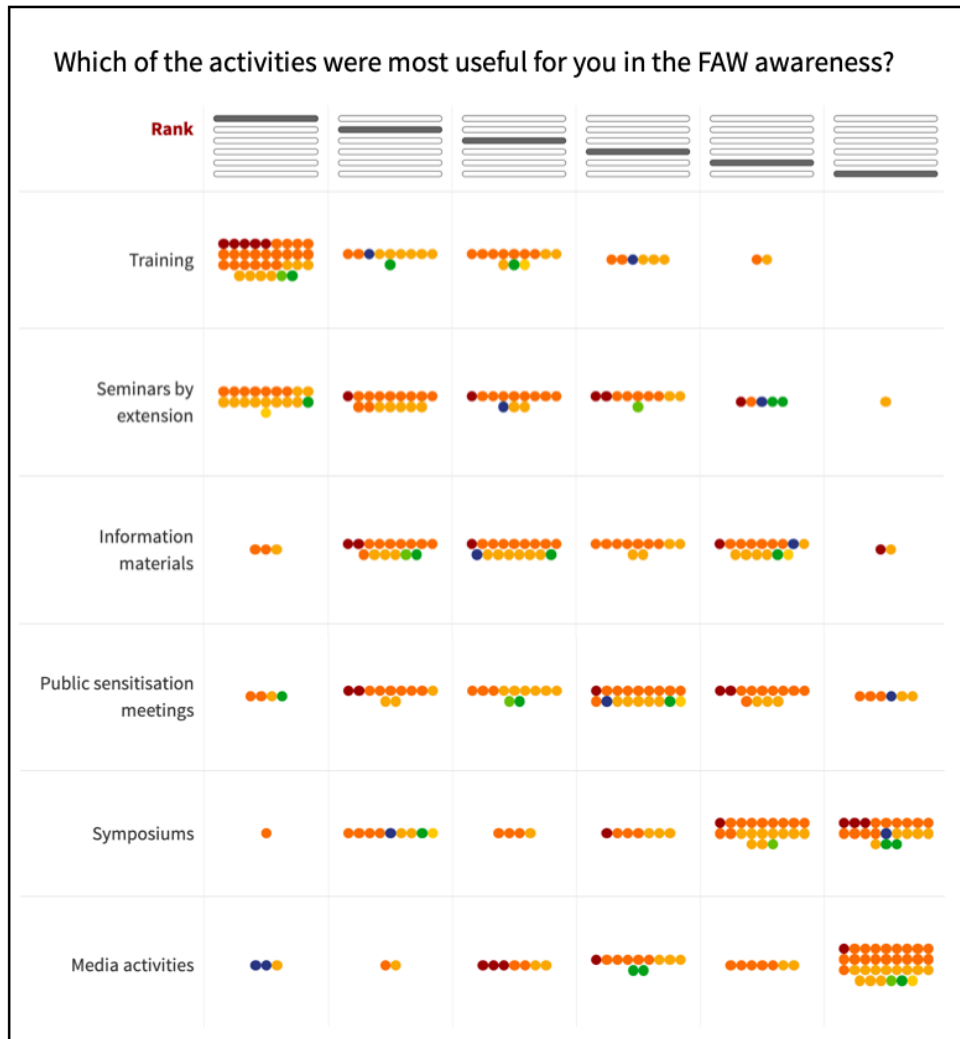


Figure 17: Ranking of most useful awareness activities

## Collaboration

Out of the stories shared by respondents, only 5% of the stories were about collaboration during the FAW response. These stories were shared by farmers, civil servants from local government and one researcher. Different examples of collaboration were shared including the collaboration between government officials and farmers to update farmers on FAW and how to manage it. Other collaboration experiences shared include between government officials and researchers to learn more about prevention and management options, or collaboration between different government entities such as PPRSD with AEAs and plant doctors.

*"I had the opportunity to share with farmers nearby (Kwaprow) our institution (University of Cape Coast) the nature of the fall armyworm and appropriate measures they could take in managing the pest. The farmers at Kwaprow had indicated how they had initially been given wrong information on the kind of pesticide to use for the management of the FAW." - Researcher*

In addition, to the shared stories about collaboration, all respondents of the Sprockler inquiry were asked about their general feeling about the collaboration as was implemented in the FAW response in Ghana. 83% of respondents stated that they felt that the collaborative efforts made them feel empowered, 78% felt involved, 62% felt prepared, 27% felt hopeful and 13% felt inspired (see figure 18). Anxious and disappointed were selected by one or two respondents. Frustrated, confused and annoyed were not selected. One respondent shared an additional feeling of satisfaction. Civil servants from central government most frequently selected feeling involved, civil servants from local government and researchers most frequently selected feeling empowered, and farmers mostly selected feeling prepared. These positive responses suggest that one of the key aspects of the response, the engagement of many stakeholders through the FAW taskforce, was effective in ensuring that the response was inclusive at all stakeholder levels.



**Figure 18: Feelings of collaborative efforts FAW response**

There was stakeholder collaboration that led to the successful FAW response in Ghana. About 80% of respondents think the collaboration between the different stakeholders in the national response to FAW strengthened enormously since the start of the intervention (see figure 19). Again, this supports the suggestion that the inclusive approach of the FAW taskforce was effective and enabled strong collaboration between different stakeholders, that may not previously have worked together. Two respondents think the collaboration between the different stakeholders has become a lot worse, which may be attributable to the poor information flow and funding issues before the establishment of the task force. After the task force was established, coordination and response became easier and transparent.



**Figure 19: Strengthened or worsened collaboration**

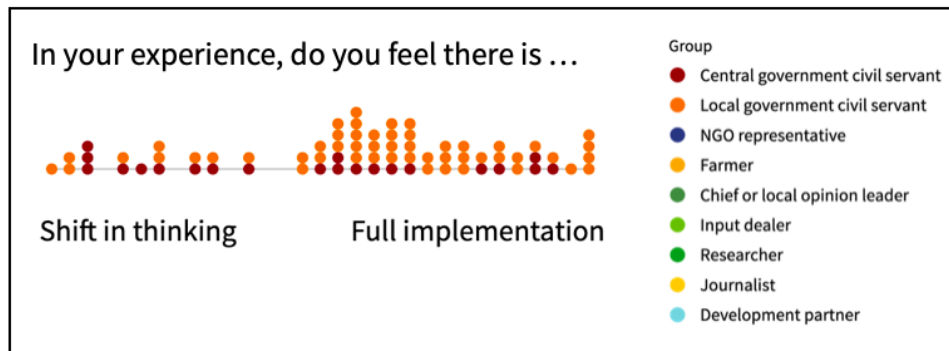
## Policy

Only one respondent, a civil servant from the central government (Agricultural officer), in the Sprockler inquiry shared their experience about policy during the FAW response.

*“FAW was incorporated in government planting for food and job programme. Free agrochemicals were distributed to farmers, though it was inadequate. There were GIZ and PPRSD trainings of trainers for agricultural Extension agent with posters, handouts, flyers for farmer field schools. In addition, were some good traditional homemade pesticides farmers shared knowledge about among colleague farmers.” - Civil servant from central government (agricultural officer)*

All respondents were asked to state whether they observed/experienced any policy shift in thinking or a full implementation of change. About 40% of respondents reported full achievement of behavioural change while 22% thought what was experienced was mainly a shift in thinking at farmer level (see figure 20).

Full implementation of behavioural change was reported mainly by civil servants at the local government level, mainly in how farmers manage FAW. Respondents shared that farmers now conduct more monitoring, spray their fields at different times (early in the morning or late afternoon) and collectively, and report instances of FAW to the agricultural office more often. Not many references were made to government policy or implementation. With respect to shifts in thinking, respondents shared how farmers now no longer treat FAW like any other pest or as witchcraft but instead, they think about how to manage it specifically, including which products to use, what effects those have, when to spray, etc.



**Figure 20: Policy shift in thinking or in implementation**

*“A lot of farmers thought it wasn’t going to be possible to find effective chemicals that could control the pest. Since the control methods implemented are working, they are no more afraid to plant maize.”* Civil servant from local government (district officer)

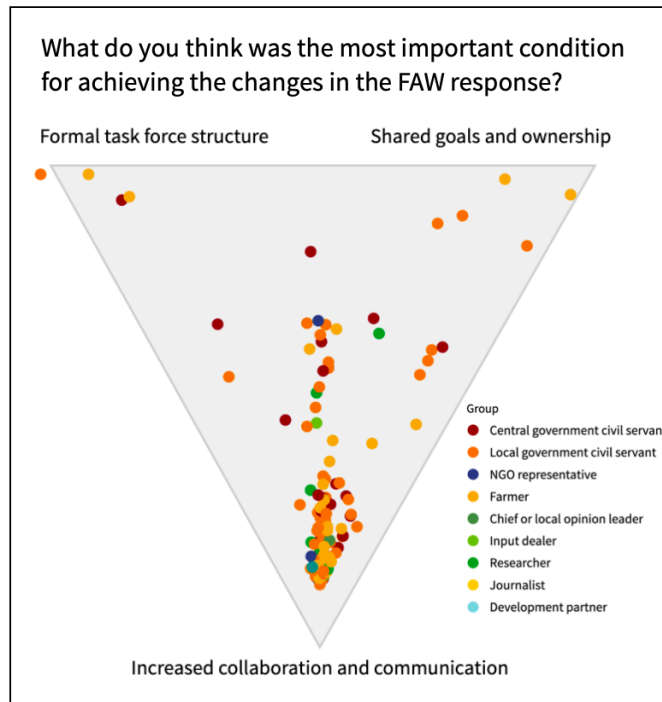
*“Many farmers now contact the agricultural offices for advice and even take prescription from officers and purchase chemicals and report back the efficacy of the chemicals They even rate the effectiveness of the chemicals”* - Civil servant from local government (unit head)

## Lessons learned for the future

### Lessons learned

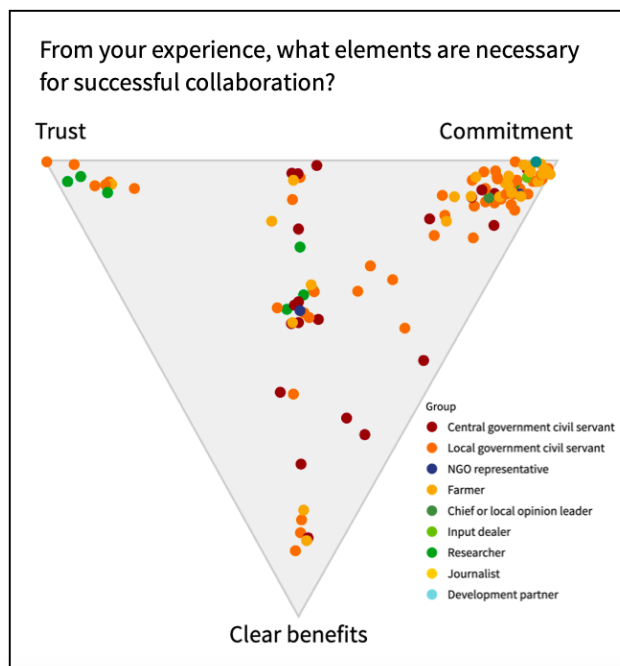
#### *Success factors*

Respondents to the Sprockler inquiry were asked to say what they considered the most important condition for achieving the change in the FAW response and responses were that a formal taskforce structure, shared goals and ownership, or increased collaboration and communication would be key conditions. The majority selected increased collaboration and communication, sometimes in combination with formal taskforce and shared goals and ownership (see figure 21) while only a few respondents selected only formal taskforce structure or only shared goals and ownership. This shows that increased collaboration and communication were considered key conditions for the success of the FAW response in Ghana, though interestingly this was not clearly attributed to the formal taskforce structure, despite this seeming to be a key collaboration forum.



**Figure 21: Important conditions for achieving change**

When asked to elaborate on the key conditions for collaboration and communication, respondents mainly selected commitment of those involved as the key driver (see figure 22). Smaller groups of respondents stated that they considered trust or clear benefits to be most necessary, others selected a combination of trust and commitment, clear benefits and commitment or all three options. For civil servants from the central government, commitment and clear benefits were the main elements for successful collaboration. For researchers, trust and commitment were most necessary. Other groups are spread out.



**Figure 22: Key conditions for collaboration**

In the key informant interviews, researchers, policy actors and development partners shared what they considered to be the success factors of the FAW response.

Researchers stated that collaboration between state institutions, farmers and international partners is a key factor for success. It is shared that this increased collaboration ensured that each actor focused on their strengths, limiting duplication of interventions and ensuring that each actor augmented the weaknesses of other partners. Another researcher elaborated that the involvement of researchers, learning more about FAW, and development partners to fund research activities led to the generation of key knowledge about the pest and the tools to effectively manage it.

Interviewed policy actors also share some factors that they considered to have contributed to the success of the FAW response:

- The establishment of taskforce made up of multidisciplinary teams
- The mobilization of financial, human and material resources, particularly those to purchase and distribute chemicals
- Effective planning and coordination
- Continuous monitoring and management, including emergency control systems and efficacy tests
- Farmer sensitization and training, including the technical capacity building of civil servants and farmers to be able to identify and spray pests
- The district level structures put in place and use of community gangs to spray

### Suitability of intervention

Some lessons were also learned about the suitability of the interventions employed during the FAW response in Ghana.

From the Sprockler inquiry, most of the respondents (79%) consider the interventions to be exactly what was needed (see figure 23). No respondents think that the interventions did not fit at all.

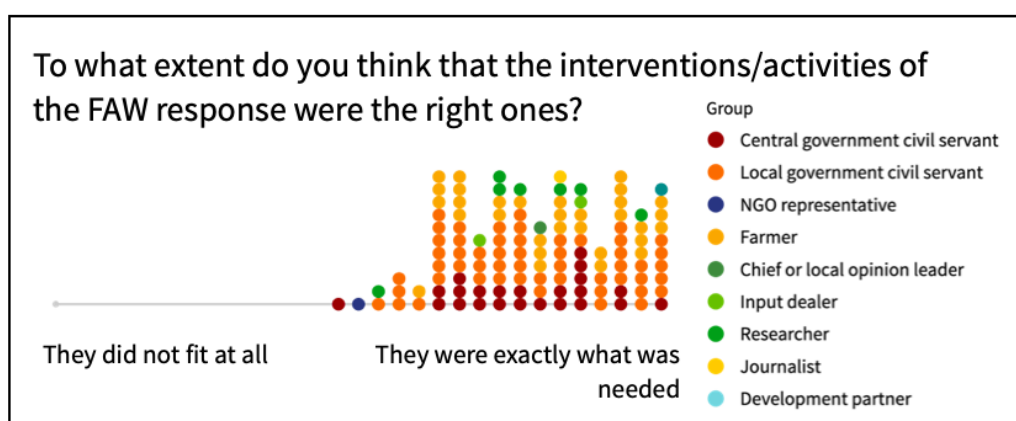


Figure 23: Suitability of interventions



*“Sensitization across the district was carried out in every community throughout the district and the response were awesome because we carried some chemicals which we later distributed after the sensitization.”* - Local government civil servant (Agricultural extension officer)

*“Before the meeting most of us (farmers) were confused about what exactly the Fall Army Worm looked like, it's stages of growth, monitoring and control. The Agric Extension Officer on the said day came with flyers and posters illustrating the Fall Army Worm, it's stages of growth and control and explained them to our understanding.”* - Farmer

### **Effectiveness of intervention**

Key informants and Sprockler respondents also reflected on the effectiveness of the interventions that were implemented during the FAW response.

They considered the response to have been slow at first as farmers were surprised by the FAW and government institutions seemed unsure what to do. However, when the response was rolled out, the interventions were considered effective by the informants. One researcher clarifies that whereas the general response appeared slow, the government did quickly set up a multi-stakeholder meeting to discuss steps to take, which formed the start of a coordinated and collaborative response.

Informants considered it effective mainly because of:

- The necessary and quick procurement of agro-chemicals
- The extension services educating farmers on what to do
- Awareness creation about FAW to the general public
- Enhanced stakeholder participation, especially of farmers and development partners
- Multi-stakeholder collaboration (and formation of taskforce)
- National budgetary support

One farmer clarified that effectiveness of the FAW response did depend on the region, with Ashanti and Volta regions scoring very well and the Northern Region not so well.

### **Limiting factors**

Lack of funding was mentioned as the main factor limiting the effectiveness of the interventions. Government funding was late and coverage was not as complete as expected. One farmer shared that due to limited funding, the provision of agricultural extension services in various municipalities and districts was limited. The agricultural extension officers (AEO) could not reach out to and visit all farmers, especially those in remote areas. The farmers who consequently benefitted most were those who were closer to the offices of the AEOs.

Lack of funding was also observed by researchers and because of this, awareness and research activities were delayed. One researcher shared that funds were expected from central government, but that because such funds were not received, they had to rely on internally generated funds until substantial funds were received from donors, such as AGRA, CABI and GIZ. Another researcher added that lack of funding also affected effective coordination of research efforts on a regional scale, as the infrastructure, including equipment and supplies, were not the same across the country. A third researcher added that lack of

funding support affected the direction of research, as funding agencies influenced what kind of research should be carried out. Several interviewed policy actors and development partners recognized that lack of funding was initially a challenge, and shared that this was later overcome.

Another factor limiting the effective implementation of the response is that not all farmers were able to purchase the agro-chemicals and were not able to fully adopt the innovations being shared by the research institutions. One farmer presents an example of the spaces between maize plants. He explains that the scientific recommendation is to plant maize in rows, whereas farmers often use the traditional method of broadcasting the maize seeds and do not plant in rows.

One farmer also remarked that in the initial stage of implementation, farmers and researchers were not sufficiently consulted. This inclusion was corrected in the process of implementation. The late inclusion of farmers led initially to the half-hearted commitment to the implementation. The farmer continued to remark that this might also be due to the present organisational structure of the Ministry of Food and Agriculture.

*“One may also trace this problem to the present organizational structure of the Ministry of Food and Agriculture, which has the Department of Agriculture under the district assemblies and therefore under the Ministry of Local Government. There is a disconnect in the policy implementation at the district levels. Ideally, MoFA, which has the national and regional organs should maintain them all the way to the districts.”*

Another obstacle that was faced during the implementation of the FAW response, according to policy actors, was the lack of knowledge of farmers in the initial stages, leading to the misappropriation of chemicals and a preference for free chemicals. Another obstacle was the lack of immediate solutions and the need for long-term research evidence from researchers, requiring more time. Policy actors also mentioned that in some cases there was limited extension coverage and inadequate sensitization on the FAW. One development partner also mentioned the slow pace of policy decision-making on the use of IPM leading to increased synthetic chemical use and low use of bio-rationals as an obstacle to overcome in the implementation.

### **Effectiveness of government response**

Sprockler respondents were asked to specifically reflect on the effectiveness of the government's response to the FAW infestation where 77% of respondents assessed it as very effective. The reasons provided included:

- Supply of (free) chemicals to farmers
- Availability of a variety of pesticides
- Awareness campaigns of farmers and the public through different media channels
- Training and provision of funds to agricultural officers and extension officers
- Training of farmers was effective
- Establishment of a national taskforce

- Multi-stakeholder collaboration
- Sponsored research to FAW management
- Helpfulness and swiftness in the response of agricultural officers to reports from farmers.

*“Their response was very effective because in all seasons throughout the year, chemicals were procured and distributed to the districts which really helped the farmers to combat and control this FAW, even though they were not enough for everyone.” - Local government civil servant (Agricultural extension officer)*

*“At least I could boldly say that based on the efforts made by the Central government I was able to combat the pests when they invaded my farm.” – Farmer*

Some respondents stated that they considered the response to be effective, but that they thought more was needed to ensure continued successful management of FAW in the future, such as the development of local maize varieties that are resistant to FAW. Three percent (3%) of respondents considered their response to be very ineffective. This was shared by farmers and one local government civil servant. The main complaint shared was that chemicals did not always arrive on time at all locations or in enough supply to adequately assist farmers to manage FAW. The central government’s response was seen by some as a fire-fighting approach initially, rather than a systematic approach, which developed with the taskforce establishment. Other comments included chemicals being close to their expiration date, a requirement for more training on how to apply the chemical products, especially for farmers not used to using chemicals for maize cultivation, confusion on who leads the programme and lack of spraying gangs in local communities.

*“it was very effective from the beginning but not now. Only awareness creation is working now. A lot more is needed such as developing our local maize variety which is more or less resistant to FAW.” - Central government civil servant (Agricultural extension officer)*

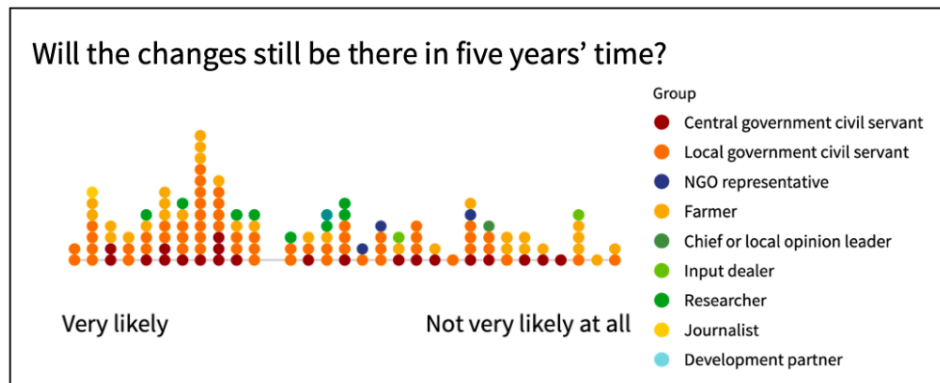
## **Prepared for the future**

Key informants and Sprockler respondents were also asked to look at the future and assess whether they felt ready for a similar infestation as the FAW and if not, what was needed to ensure preparedness for the future.

## **Sustainability**

Sprockler respondents were asked how likely they think it is that the changes in the FAW response will still be there in five years (see figure 24). 48% of respondents think that it is very likely that the changes in FAW response will still be there, 24% of respondents think it is not likely at all that the changes will still be there in five years’ time. The majority of those who think that the changes will not last are farmers, who possibly expect that in the long term they will no longer be supplied with free pesticides, which is a key element of the current response for them, or might expect that future outbreaks will require other management techniques. All

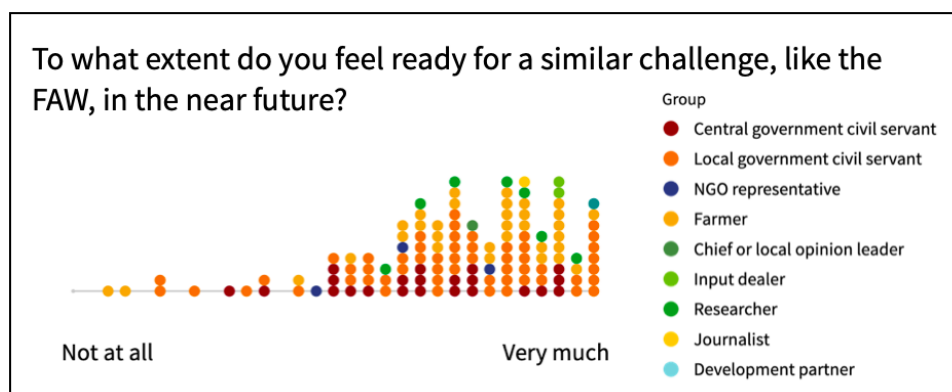
researchers and journalists who responded, who are aware of the efforts being undertaken to find long-term sustainable solutions to managing FAW, think that the changes will last, all input dealers and NGO representatives who responded are not sure.



**Figure 24: Sustainability of changes in FAW response**

### Ready for the future

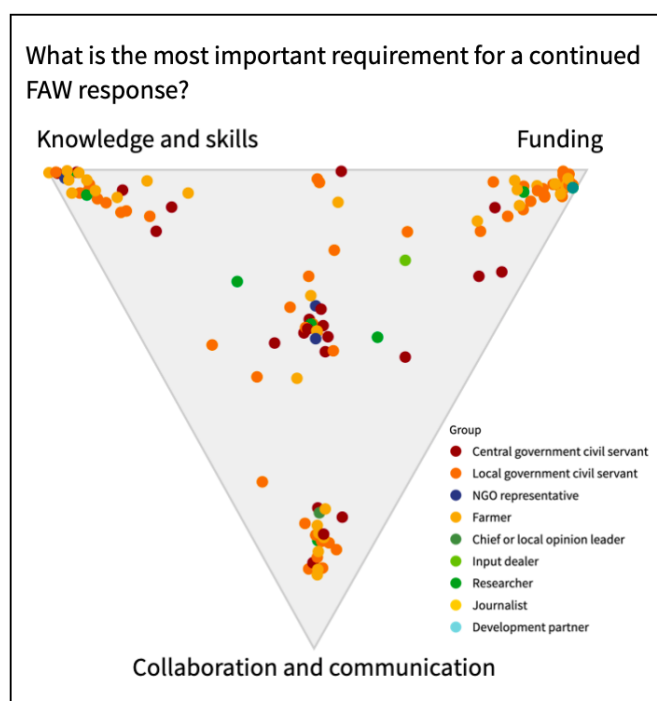
68% of respondents stated that they feel ready for a similar challenge like the FAW in the near future (see figure 25). 5% of respondents (farmers and civil servants from local government) stated that they do not feel ready at all. Respondents who shared experiences about the topic of collaboration all stated they feel very much ready for the future. On average, farmers indicate they feel prepared for similar challenges in the future to a higher extent than other groups despite not expecting the current changes to be sustained. Those that feel ready for a similar challenge elaborated that they are now aware of the FAW and how to manage and control it. They shared that early warning and methods of identification are in place and that there are surveillance systems monitoring progress. They shared that they have more experience dealing with such an outbreak and that collaboration between different partners has been set up, including plant doctor clinic sessions or research across the world. The respondents who do not feel ready share that they feel that they do not have enough funding or the required logistics to front another outbreak of FAW. This shows that there is largely a feeling of being prepared for the future as the past experience has proved positive, but that there are some concerns about the practicalities of a future challenge.



**Figure 25: Readiness for similar challenge in the future**

### Requirements for the future

Respondents were asked what they considered the most important requirement for a continued FAW response in the future categorised as knowledge and skills, funding and/or collaboration and communication (see figure 26). Five clusters of respondents were identified in the answers. Numerous respondents stated that funding or knowledge and skills were critical. Another smaller group said that mainly collaboration and communication were needed, while another group stated that all the three elements were essential for future response to FAW. A small group considers knowledge, skills and funding to be most important for the future. Farmer respondents mainly selected one of the three options, whereas central government civil servants mainly selected a combination of the three elements. For local government civil servants, funding is most frequently selected. This potential reflects the challenges they generally face in securing sufficient funding to implement their duties.



**Figure 26: Requirements for the future**

*“It is real and here to stay, so be prepared.”* - Local government civil servant (Agricultural extension officer)

### Advice for the future

In the key informant interviews and Sprockler responses, stakeholders shared what they thought could have been done differently and what they would advise for the future. Their suggestions are categorized per outcome area below.

## **Research and management**

- Strengthen research capacity and conduct continuous research into:
  - likely new pests that will enter Ghana, including possible routes of entry, especially considering climate change, though the use of risk assessments
  - breeding resistant varieties of maize against FAW
  - appropriate chemicals for use for FAW and new pests
  - use of biorationals from the local environment
  - monitoring and control systems
- Development management plans for high-risk species
- Strengthen collaboration between field staff and researchers, as well as subject experts from other countries with experience in managing the same pests and diseases
- Promote the use of crop rotation, intercropping, planting resistant varieties and other IPM measures to reduce effects of FAW, and to take action immediately when the pest is spotted
- Ensure farmers use chemicals safely, including using personal protective equipment. Proper handling and disposal of the chemicals should be part of the response programme
- Continue supplying chemicals in a timely manner for free or at a subsidized price, if possible, and use more spray gangs if appropriate

Research capacity building is important. CABI's collaboration with the PPRSD is yielding capacity in the identification and development of local biological control agents for invasive pests. This is necessary for avoiding the costs and risks of importing foreign biological control agents with their unpredictable effects on the environment. Research and development activities to generate long-term solutions and evidence-based planning processes are critical. Deployment of emerging technologies such as Bt-maize, use of drones for effective spraying, risk assessment using modern techniques, sharing of data among countries and within the country, and scientific assessment of impact have emerged from the discussions as well.

## **Surveillance and monitoring:**

- Build the capacity of quarantine officers in the identification of invasive species at ports of entry, including through regular refresher courses.
- Put in place surveillance networks at the borders and in-country for early detection and rapid response to any invasion.
- Improve quarantine and phytosanitary measures to detect and prevent the introduction of harmful organisms.
- Start monitoring and surveillance earlier during pest outbreaks
- For FAW, use pheromone traps more to monitor population fluctuations
- Ensure continued scouting and surveillance by farmers, plant doctors, AEAs, including through the provision of necessary resources
- Ensure PPRSD officers are trained and involved in surveillance work, including newly recruited staff

The key to effective attack of invasive pests is an early warning system. Surveillance is a necessary function that has to be performed rigorously and regularly.

### **Awareness:**

- Develop and make available a framework for strategic communication and awareness-raising to use during pest outbreaks learning from the FAW experience
- Ensure the communication and awareness-raising programme:
  - includes training for farmers and extension workers on a regular basis and includes a training of trainers' approach to enable further information dissemination
  - targets women farmers, including ensuring women are strongly represented in any community level awareness-raising activities and training workshops
  - takes account of the different needs of women and men farmers, their differing education levels and information interpretation
  - includes information on chemical and biorational control methods for FAW or other pests in the future
  - includes information on identification, symptoms and effects of the pest in question
  - uses opinion leaders, farm days, field days, community demonstrations, local community centres, local radio, posters, schools, churches and NGOs as part of the dissemination approach
  - delivers information in a timely manner, as soon as appropriate after a new high-risk pest is identified
  - includes training for journalists on emergency reporting and communication
- Ensure sufficient resources are available for extension workers to carry out dissemination and training activities
- Ensure the information technology infrastructure is sufficiently developed to enable effective public education and stakeholder sensitisation.

The mobilization of the mass media for awareness creation and public education was effective. Farmers in particular got information on how to save their crops from the FAW infestation. However, most farmers had to experiment with various locally developed solutions such as using soapy water and neem extracts before they received the necessary information. A good communication strategy should be an integral part of the management plan for invasive pests.

### **Policy**

- Print and share the NISSAP 2020 – 2030, including management plans to counter new incursions of invasive species
- Put in place an emergency preparedness plan for key risk areas, including poor and vulnerable communities
- Put in place prevention measures and contingency plans to contain future pest outbreaks

- Maintain the national taskforce and extend it to cover more invasive species, building on the experience gained through the FAW outbreak
- Establish a contingency or emergency fund to ensure new pest outbreaks can be responded to in a timely manner
- Ensure dedicated funds are available for surveillance activities, including at quarantine points
- Strengthen the policy cycle of policy formulation, implementation, monitoring, evaluation and review

The seriousness of the invasive pest attack was due to the sudden onslaught and the fact that there were no plans to manage the pest. The experiences have shown that when there is a plan, it enables good management of the invasives. The key informant interviews underscored the constraint of funding. Some institutions could not perform their roles rapidly because of lack of funding. It means that a management plan will need to create funding mechanisms that will facilitate the implementation of the plan effectively.

### **Collaboration**

- Harmonise and coordinate institutions' invasive species activities, increasing collaboration and communication between stakeholders and removing barriers to implementation
- Ensure effective national and regional collaboration, ensuring pest and disease information from neighbouring countries, as well as those which Ghana imports from is shared
- Form a standing taskforce for a coherent holistic response to deal with general invasive species issues using experiences gained from FAW, ensuring the presence and participation of technical experts, policy officers, local government, the media, a gender and farmer representatives
- Ensure a farmer-centred bottom-up approach, that enables farmers to contribute to any management plan based on their practical experience, and ensures farmer buy-in to the management response
- Strengthen the stakeholder network, as well as the capacity of relevant institutions

The successful control of the FAW infestation is the result of stakeholder mobilization and collaboration. The implementation of the management plan meant AEOs could reach out to farmers with the necessary agro-chemicals and farmers could also reach out to each other. Most key informants suggested that the envisaged management plan for invasive pests should provide for rapid mobilization of the stakeholders for action in times of pest invasion. The critical roles played by AGRA, USAID and GIZ in terms of technical and financial support were evident. Collaboration must necessarily extend to neighbouring countries with a need for collaboration and coordination of efforts in the sub-region as national borders present no barriers to invasive species.



## Conclusions

This assessment of the response to the FAW outbreak in Ghana has shown that there is a strong policy foundation on which to address invasive species. It is clear that PPRSD, together with the EPA have a strong mandate to carry out quarantine, monitoring and surveillance activities to identify new threats from invasive species, to manage any outbreaks that do occur, and to ensure appropriate control measures are put in place. They have a clear responsibility for setting up and running early warning and preparedness systems, and managing the response to pest outbreaks.

Despite this clear mandate, it is clear from the FAW response, that there are still challenges in implementation. The response was considered slow to begin with, with many farmers experiencing large losses of maize during the first season after the FAW infestation. This was mainly attributed to a lack of resources in the form of an emergency or contingency fund, that could be accessed quickly to enable response measures to be put in place. Results from this study confirm that financing, at all levels from central to local government, is still an issue that needs addressing.

However, as evidence of the economic impact of FAW became apparent, and therefore financing was released, the response was considered very effective. At a central level, stakeholders considered that the collaboration fostered through the taskforce played a critical role. All stakeholders were involved and it enabled them to work together, focusing on their individual strengths. There was greater sharing of knowledge, less working in isolation, and the involvement of the media within the taskforce enabled faster and more accurate dissemination of knowledge to farmers. The success of the taskforce at central level, led to a conclusion among the stakeholders, that this should be replicated at local level, to ensure that the response to pest outbreaks was better coordination at that level as well. This would also enable a more farmer-centred approach, bringing in their practical experience of the new pests and ensuring strong buy-in of the country-wide response.

At local level, the collaborative approach taken was also considered effective. Again, after the initial slow response, farmers and extension agents were satisfied with the information shared, and the pesticides that were distributed. Little mention was made of non-chemical control measures, though some extension officers recognised that they were needed in the future and would provide longer term solutions, especially if resistant varieties could be found. Information sharing, though a structure communication plan, was considered essential. In particular, the direct, face-to-face communication methods were highly appreciated by farmers and local government officials, where they had more opportunity to discuss management and control options, rather than just being a passive recipient of information. This should be taken into account in future communication plans that focus on information dissemination to farmers and extension workers.

On the whole, the implementation of the national FAW management plan was a success as was observed by most of the key informants. However, the challenges of the seemingly slow response, lack of funds and the limitation in the agricultural extension system were also highlighted as some of the key challenges. The envisaged invasive pest management plan needs to be informed by the lessons and adequate measures put in place to address these challenges.

Going forward, there was consensus from all stakeholders that the country needs to be ready for future outbreaks of invasive species. Key steps to ensure this future preparedness include:

- implementation of the NISSAP (2020-2030);
- establishment of a standing taskforce to address new pest outbreaks;
- establishment of an emergency fund that will enable quick responses;
- improved monitoring and surveillance especially at borders and ports of entry;
- strengthened research capacity especially in pest risk analyses;
- development of a strategic communication plan to be used in the case of a pest outbreak, with clear information for decision making, especially by farmers;
- involvement of all stakeholders at central and local levels.

These measures should be put in place so that future responses are not dependent on whether the pest affects a food security crop such as maize, or another seemingly less important species, such as pasture species, aquatic species, or those that are key to maintaining the natural environment of Ghana.

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## Annex 1: List of key informants interviewed

KI Category	Institution & Position	Contact Details
Policy actors	Minister/ Deputy/ Special Advisor, MoFA	Mr. Asante Krobea
	Director, Policy, Planning, Monitoring and Evaluation Directorate	Mrs. Angela Danson
	Director, Crops Services Directorate	Mr. Michael Owusu
	Director, MoFA-Women in Agricultural Development Directorate	Ms. Paulina Addy
	Director, Directorate of Agricultural Extension, Ministry of Food and Agriculture	Mr. Paul Siameh
	Former Regional Director, Department of Agriculture, Greater Accra and Volta Regions	Mr. Delali Nutsukpo
	Former Coordinator of the National FAW TaskForce/ Head of Crop Pests and Diseases Division of PPRSD	Mr. Ebenezer Aboagye
	Deputy Director, PPRSD	Mr. Copperfield Banini
Farmers/ Farmer Based Organisations/ Community Service Organisations	President/, Farmers Organisation Network in Ghana	Dr. King David Amoah
	Farmer in Ejura	Mr. Kwadwo Nrumah
	Farmer & Innovator, Bolgatanga	Mr. Joseph Abarike Azumah
	Gender Expert/ Merhan Foundation	Dr. Hannah Nyamekye
	Farmer and Vice President of the Ghana National Association of Farmers and Fishermen	Mr. John Dziwornu
Development partners/ International Organisations	Regional Representative, CABI West African Centre	Dr. Victor Attuquaye Clotey
	Country Director, FAO	Mr. Benjamin Adjei
	Representative of AGRA	Regina Richardson
Mass media	Head, Ghana News Agency	Mr. Christian Akorley
	Country Manager, Farm Radio International	Mr. Benjamin Fiafor
Academia (Research institutes & universities)	Director, CSIR-Crops Research Institute	Prof Brandford Mochiah
	Director, CSIR-SARI	Dr. Saka Buah (Ag. Director), Jerry Nbyine, (Senior Research Scientist)
	Deputy Director General, Ghana Atomic Energy Commission	Dr. Michael Osae

# Annex 2: Interview Guide

## General Questions to all Actors

- Were you involved with the formulation of the National FAW management plan?
- What was your specific role in the formulation and implementation of the plan?

## Policy actors

- Why was it very important for the government to address the FAW pest invasion of Ghana?
- What were the success factors in the implementation of the government's plan to address the FAW pest infestation?
- What were the obstacles in the implementation of the plan?
- For a Ghana Pest Management Plan to address future pest invasion in all areas (i.e. crops, livestock, fishery, environment) what key issues should be covered?

## Farmers/ FBOs

- How serious was the FAW infestation on your farm? In your community and district? What did you do to contain the situation?
- How do you assess the effectiveness of the national response to the FAW invasion?
- What locally developed solutions to the FAW did you use?
- For a Ghana Pest Management Plan to address future pest invasion in all areas (i.e. crops, livestock and fishery), what key issues should be covered?

## Private Sector (Dealers in farming inputs e.g. agro-chemicals, seeds, fertilizers, etc.)

- How did the FAW affect your business?
- What were the negative and positive aspects of the FAW infestation on your business?
- What agro-chemicals were effective in the fight against the FAW?
- What percentage of bio-rationals were used?
- Were there constraints in the importation of the agro-chemicals?
- How do you assess the effectiveness of the national response to the FAW invasion?
- For a Ghana Pest Management Plan to address future pest invasion in all areas (i.e. crops, livestock and fishery), what key issues should be covered?

## Mass media practitioners

- How effective was the implementation of the communication plan?
- How do you assess the channels of communication used in the creation of awareness and public education on the FAW? (radio, television, newspapers, flyers, handouts, seminars, etc.)
- What constrained the performance of your role in awareness creation and public education on the FAW?
- What factors enhanced your performance?
- How do you assess the effectiveness of the national response to the FAW invasion?

## Development partners

- How do you assess the effectiveness of the national response to the FAW invasion?
- What was the impetus for participating in the formulation and implementation of the FAW management plan?
- What was your role (actual activities) in the FAW Management?
- What were the main obstacles to implementation from your perspective?
- What would you have done differently?
- For a Ghana Pest Management Plan to address future pest invasion in all areas (i.e. crops, livestock and fishery and environment), what key issues should be covered?

## Researchers/ Knowledge actors

- How do you assess the effectiveness of the national response to the FAW invasion?
- What factors accounted for your effective functions in surveillance and research and training of the frontline workers?
- What factors constrained the effective performance of your functions?
- As regards to knowledge flows, what kinds of knowledge/ techniques were obtained from other FAW-infested countries to improve Ghana's FAW management plan?
- For a Ghana Pest Management Plan to address future pest invasion in all areas (i.e. crops, livestock and fishery and environment), what key issues should be covered?

## Annex 3: Sprockler Inquiry questions

The invasive pest, Fall armyworm (*Spodoptera frugiperda* J.E. Smith), was confirmed as being present in Ghana in 2016. In response to the fall armyworm outbreak, different stakeholders joined hands like the Plant Protection and Regulatory Services Directorate (PPRSD) of the Ministry of Food and Agriculture (MOFA), Environment Protection Agency (EPA), Biopesticides suppliers and manufacturers, Council for Scientific and Industrial Research (CSIR), Universities and CABI. The main initiatives supported included the development of a national fall armyworm management plan; a collaborative effort with PPRSD and various stakeholders.

To learn more about the results of this collaboration, we are interested in hearing your experiences and opinions. To this end, we have developed this inquiry. This inquiry is a bit different from usual questionnaires. It will start with a story question and some of the following questions have an unusual shape. These questions can be answered by placing a dot on the line or inside the triangle at the point that best represents your answer.

The results of the inquiry will help to signpost the main strengths that enabled the response process, to inform future preparedness akin to asking the question 'How ready are we for a similar challenge in the near future? If you wish, you can be involved in the interpretation of the results.

The responses to the interview will be processed anonymously. It will take approximately 30 minutes of your time.

1. Fill in: I am ... (single choice)
  - Central government civil servant
  - Local government civil servant
  - NGO representative
  - Farmer
  - Chief or local opinion leader
  - Input dealer
  - Researcher
  - Journalist
  - Development partner

### Part 1

The first part of the inquiry asks you to share a story about the changes you have experienced or observed in the FAW response and asks several short follow-up questions about that story.

2. Can you share an important experience you observed or were part of with regards to the Fall Army Worm response in Ghana?

You can think for example about changes in how the fall army worm threat was managed or researched, how the response was monitored, how different parties collaborated together, how awareness about the FAW was raised or how the response was included in policy.

Please explain what happened, when and where it took place, how you were involved and who else was involved. (open question)

3. What is your experience about? (multiple choice)
  - Research and management
  - Surveillance
  - Awareness
  - Collaboration
  - Policy
4. My experience as described in my story is ...  
Place a dot on the line at the point that best corresponds with your answer. (bipole)  
Very negative -- Very positive
5. On which level did your story take place? Multiple answers are possible. (multiple choice)
  - National level
  - Partner level
  - Local/community level

6. Which actors were essential to the change in your story? Multiple answers are possible. (multiple choice)
- Central government/public sector
  - NGOs
  - Farmers
  - Chiefs or local opinion leaders
  - Input dealers
  - Researchers
  - Journalists
  - Local government
  - Private sector
  - Development partner
7. According to you, to what extent is the experience you described significant for the national response to FAW in Ghana? (bipole)  
Not at all -- Very much

## Part 2

The second part of the inquiry asks you to elaborate in more detail on the topic your story is about, such as surveillance, research and management, collaboration, awareness and policy.

### Specific follow-up questions for Research and Management (only those who selected that option)

8. What feeling do you get from the story you have shared about the management of FAW in Ghana? (multiple choice)
- Knowledgeable and informed
  - Empowered
  - Involved
  - Prepared
  - Confused
  - Hopeful
  - Anxious
  - Frustrated
  - Inspired
  - Disappointed
  - Annoyed
9. To what extent do you think research, in general, played a role in finding effective management solutions to the FAW in Ghana? (bipole)  
Very much -- Not at all
10. What type of FAW management method were used in your story? (multiple choice)
- Synthetic chemicals
  - Biorationals
  - Biological control
  - Cultural practices
11. What drove the change in farmer management options?  
Place your dot inside the triangle at the point that best corresponds with your answer. (tripole)  
Improved surveillance -- Better information on management techniques -- Better distribution mechanisms
12. Which component of the research efforts played the biggest part in the FAW response? (tripole)  
Financing – Personnel – Facilities

### Specific follow-up questions Surveillance (only those who selected that option)

13. The monitoring /surveillance for FAW as described in my story to manage FAW was ... (bipole)  
Very effective -- Very ineffective
14. How difficult was it to carry out the monitoring as you described? (bipole)  
Not difficult at all -- Too difficult
15. In your opinion, what should be done differently in monitoring/surveillance of FAW? (open question)

16. Which monitoring and surveillance method worked best for you? (multiple choice)

- Use of farmers mobile app
- Pheromone trap
- Scouting

**Specific follow-up questions Awareness (only those who selected that option)**

17. After awareness creation activities were implemented on FAW prevention, detection and control options, I mainly feel ... (multiple choice)

- Knowledgeable and informed
- Empowered
- Involved
- Prepared
- Confused
- Hopeful
- Anxious
- Frustrated
- Inspired
- Disappointed
- Annoyed

18. To what extent do you think awareness creation about the FAW in Ghana was sufficient? (bipole)  
Very sufficient -- Not sufficient at all

19. Did you receive information about FAW in sufficient time for you to take action against FAW? (bipole)  
Information was much too late -- Information arrived in good time

20. Which of the activities were most useful for you in the FAW awareness?

Please order the following options by placing the ones on top that were most useful for you.

(ranking question)

- Seminars by extension
- Symposiums
- Training
- Public sensitization meetings
- Information materials
- Media activities

21. What could be done differently in awareness creation to make it more effective and to reach more farmers?  
(open question)

**Specific follow-up questions Collaboration (only those who selected that option)**

22. From your experience, what influenced the success of the joint effort on FAW the most? (tripole)  
Financing – Personnel -- Facilities

23. In your story, how would you assess the effectiveness of the joint effort? (bipole)  
Very effective -- Very ineffective

**Specific follow-up questions Policy (only those who selected that option)**

24. My story is about ... (tripole)

Development of low-risk control measures -- Development of surveillance systems -- Policy coordination and strategic planning

25. In your experience, do you feel there is ... (bipole)  
Shift in thinking -- Full implementation of change

26. Please briefly describe the shift in thinking that you observed. (open question)

**Part 3**

The third part of the inquiry asks you to reflect on the FAW response in general.

27. What do you think was the most important condition for achieving the changes in the FAW response? (tripole)  
Formal task force structure -- Shared goals and ownership -- Increased collaboration and communication

28. How did the collaborative efforts in the FAW response make you feel? (multiple choice)
- Empowered
  - Involved
  - Prepared
  - Confused
  - Hopeful
  - Anxious
  - Frustrated
  - Inspired
  - Disappointed
  - Annoyed
29. Since the start of the project, I believe that the collaboration between the different stakeholders in the national response to FAW ... (bipole)  
Has become a lot worse -- Has strengthened enormously
30. To what extent do you think that the interventions/activities of the FAW response were the right ones? (bipole)  
They did not fit at all -- They were exactly what was needed
31. How do you assess the central government's response to the fall army worm? (bipole)  
Not effective at all -- Very effective
32. Please explain your answer. (open question)
33. From your experience, what elements are necessary for successful collaboration? (tripole)  
Trust – Commitment -- Clear benefits
34. What is the most important requirement for a continued FAW response? (tripole)  
Knowledge and skills – Funding -- Collaboration and communication
35. How likely do you think it is that the changes in FAW response will still be there in five years' time? (bipole)  
Very likely -- Not very likely at all
35. To what extent do you feel ready for a similar challenge, like the FAW, in the near future? (bipole)  
Not at all -- Very much
36. Please elaborate on your answer. Why do you think this? What piece of advice would you give to those responding to future invasive species outbreaks? (open question)
37. Is there anything else you wish to share about the FAW response in Ghana? This is the last open question of the inquiry. (open question)

#### **Part 4**

Almost done! The last questions are about you.

38. What kind of role do you fulfil? (single choice)
- Director and chief director
  - Unit head
  - National officer
  - Regional director
  - Regional officer
  - District director
  - District officer
  - Agricultural extension officer
39. I identify as ... (single choice)
- Male
  - Female



40. My age is ... years old. (single choice)

- Under 20
- 21 - 25
- 26 - 30
- 31 - 34
- 35 - 40
- 41 - 45
- 46 - 50
- 51 - 55
- 56 - 60
- 61 - 65
- Above 66

41. The highest education I have completed is ... (single choice)

- No education
- Primary school
- Junior high school
- Senior high school
- Undergraduate (university, college of education)
- Postgraduate

42. In which district do you live? (open question)

43. Do you consent to sharing your story with others? This will always be anonymous. (single choice)

- Yes
- No

44. Would you like to be involved in the interpretation of the results of the inquiry? (single choice)

- Yes
- No

45. If yes, what is your email address or phone number you can be contacted on? To keep you informed and invite you. (open question)

## Africa

### Ghana

**CABI**, CSIR Campus  
No.6 Agostino Neto Road  
Airport Residential Area  
P.O. Box CT 8630,  
Cantonments  
Accra, Ghana  
T: +233 (0)302 797 202  
E: westafrica@cabi.org

### Kenya

**CABI**, Canary Bird  
673 Limuru Road,  
Muthaiga  
P.O. Box 633-00621  
Nairobi, Kenya  
T: +254 (0)20 2271000/20  
E: africa@cabi.org

### Zambia

**CABI**, Southern Africa  
Centre  
5834 Mwange Close  
Kalundu, P.O. Box 37589  
Lusaka, Zambia  
T: +260967619665  
E: southernafrica@cabi.org

## Americas

### Brazil

**CABI**, UNESP-Fazenda  
Experimental Lageado,  
FEPAP (Escritorio da  
CABI)  
Rua Dr. Jose Barbosa De  
Barros 1780  
Fazenda Experimental  
Lageado  
CEP: 18.610-307  
Botucatu, San Paulo, Brazil  
T: +55 (14) 3880 7670  
E: y.colmenarez@cabi.org

### Trinidad & Tobago

**CABI**, Gordon Street,  
Curepe  
Trinidad & Tobago  
T: +1 868 6457628  
E: caribbeanla@cabi.org

### USA

**CABI**, 745 Atlantic Avenue  
8th Floor  
Boston, MA 02111  
T: +1 (617) 682-9015/ +1  
(617) 682-9016  
E: h.jansen@cabi.org

## Asia

### China

**CABI**, Beijing  
Representative  
Office  
Internal Post Box 85  
Chinese Academy of  
Agricultural Sciences  
12 Zhongguancun Nandajie  
Beijing 100081, China  
T: +86 (0)10 82105692  
E: china@cabi.org

### India

**CABI**, 2nd Floor, CG Block,  
NASC Complex, DP  
Shastri Marg  
Opp. Todapur Village,  
PUSA  
New Dehli – 110012, India  
T: +91 (0)11 25841906  
E: india@cabi.org

### Malaysia

**CABI**, PO Box 210  
43400 UPM Serdang  
Selangor, Malaysia  
T: +60(0)3 894329321  
E: cabisea@cabi.org

### Pakistan

**CABI**, Opposite 1-A,  
Data Gunj Baksh Road  
Satellite Town, PO Box 8  
Rawalpindi-Pakistan  
T: +92 51 929 2064/ 2063 /  
2062  
E: cabi.cwa@cabi.org

## Europe

### Switzerland

**CABI**, Rue des Grillons 1  
CH-2800 Delemont  
Switzerland  
T: +41 (0)32 4214870  
E: europe-ch@cabi.org

### Head Office

**CABI**, Nosworthy Way  
Wallingford, Oxfordshire  
OX10 8DE, UK  
T: +44 (0)1491 832111  
E: corporate@cabi.org

### UK (Egham)

**CABI**, Bakeham Lane  
Egham, Surrey  
TW20 9TY, UK  
T: +44 (0)1491 829080  
E: microbialservices@cabi.org  
E: cabieurope-uk@cabi.org