PRISE-PAD Fall Armyworm SMS Alert Pilot Results

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Summary

This study evaluates the effects of a pilot mobile SMS messages campaign on farmers' knowledge and management of fall armyworm (FAW), an invasive pest of maize that is threatening food security in Kenya. The farmers' participation in the SMS message system was high, with almost 60% of farmers consistently participating through the season. The majority of farmers understood most of the messages, which they found helpful, especially on how to control and prevent FAW. We find that participation in the mobile SMS messages campaigns increased farmers' knowledge about FAW, and farmers reported reduced FAW infestation and increased maize production, as a result of implementing the recommendation actions. Male farmers were more likely to be aware of FAW and knowledgeable about the integrated management of FAW than women farmers. Recommendations are made to improve the clarity of some messaging, expand the service and undertake further analysis to ensure women farmers are able to benefit equally from the PRISE alerts.

Key highlights

- Fall Armyworm was the biggest problem on maize crops for 86% famers questioned in the 2019/20 short rains season

- PRISE alert SMS messages were 'fully understood' by 87% of farmers. Less than 1% of farmers reported that the messages were unclear, with those related to which pesticide to spray being the most confusing. Messages on how to control and prevent FAW were most highly valued.

- 85% of farmers who received PRISE alerts said they would opt-in to receive messages in future. 87% of farmers thought that SMS was the best method for sending pest information to farmers.

- 59% of farmers changed their practices based on message recommendations, and 43% of farmers changed their practices based on the recommended PRISE spraying dates. The most common outcomes were a reduced amount of FAW and an increase in maize harvest.

- Farmers who received PRISE alerts were found to be more knowledgeable about FAW than those who had not received the alerts.

Context

The PRISE project aims to disseminate information to farmers on risks posed by pests to crops. During the short rains season (Oct 2019-Dec 2019) in Kenya, PRISE partnered with Precision Agriculture for Development (PAD) to provide maize farmers with timely pest management information on Fall armyworm (*Spodoptera frugiperda*) (FAW). This built on PAD's existing service, which is run in partnership with the Ministry of Agriculture's Information two-way SMS platform (MoA-INFO). The MoA-INFO system sends a series of pre-determined calendar-based messages via short message system (SMS) to advise farmers on how to manage and control FAW. PRISE incorporated additional messages to this service, providing time- and location-based alerts on the best time to tackle FAW for maximum effect, if observed on their maize crop. The message timing is based on historic seasonal patterns. The PRISE system is dynamic, and provides messages with timely and actionable information. The PRISE dynamic alerts are actionable time estimates based on a variety of Earth Observation (EO) data sources and crop and pest models in the format of 'number of days to action' from crop planting, and is based on the time (in days) for the insect larval population to reach its maximum incidence after planting for each calendar month. Best practice suggests that taking action when FAW is at 20-50% emergence is most effective (Prasanna et al. 2017). This information can be used as a proxy to identify the time at which a farmer can apply, or perform the appropriate management practises to their crop to achieve the greatest impact on killing pest populations and thus limiting pest-induced damage. Within the MoA-INFO service, subsequent messages warn farmers when this period has been reached, and direct them to the appropriate information, according to the risk levels.

The pilot of integrated PRISE alerts into the MoA-INFO campaign was implemented during the short rains production season in Kenya (September to December 2019), in 48 of the 290 constituencies. PRISE messages were sent out to maize farmers. Farmers were directed to use the **FAW monitoring tool** which guided them around their field and assessed the level of FAW infestation and the crop development stage. Based on this assessment, advice was given to carry out, either cultural control measures, spray pesticides or take no action.

The aim of the pilot information campaign was to gain some experience of implementing PRISE alerts via a third-party dissemination channel and to gain insights on the following questions in order to improve project design and outputs:

- How effective is a direct to farmer approach for communicating pest risks?
- How are PRISE pest risk messages interpreted and valued?
- How effective is SMS as a dissemination channel for communicating with farmers?
- How effective is SMS/USSD as a method for crowdsourcing data?
- How can PRISE build better services for working with 3rd parties?

PRISE PAD Pilot SMS Campaign Approach

Farmers receiving the PRISE PAD Pilot SMS messages were randomized into two groups; treatment: N=6,024 and control: N=2,576. Farmers in the treatment group received push messages throughout the season corresponding to the five stages of the PRISE model, with stage four being the expected time when intervention would be most effective. Along with the intervention timing recommendations, farmers were sent push messages on corresponding sections of MoA-INFO content (at first, directly into content, then to the FAW menu, and finally to the monitoring tool). Farmers in this group could also access FAW content through the menu, or by sending certain key words (e.g. FAW & CHECK) to the MoA-INFO two-way SMS platform, see Figure 1. Farmers in the control group did not receive the push messages, they had access to all FAW content on the platform through the menu, and by sending key words.
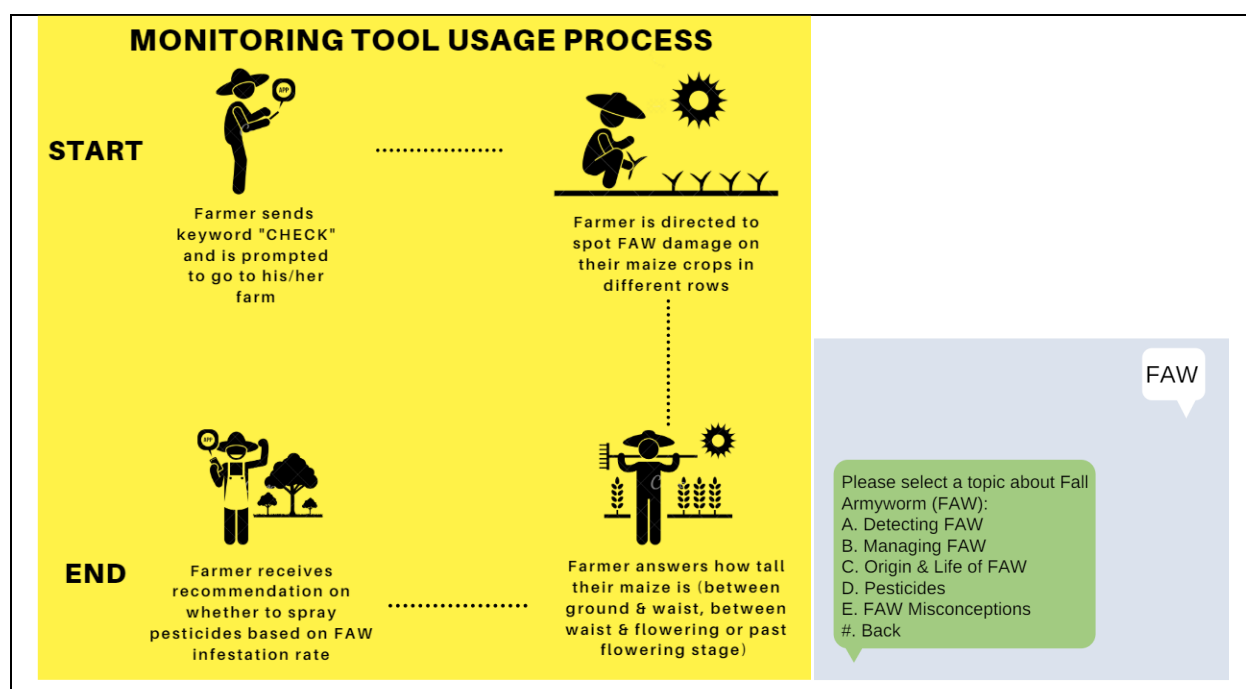

Figure 1: PAD FAW Monitoring tool usage process (Source: PRISE FAW information campaign results by PAD)

Assessment of the PRISE PAD Pilot SMS campaign through phone survey

PRISE FAW alert messages were sent as part of a push messaging schedule (weekly or biweekly), as part of the MoA-INFO service for maize farmers. At the conclusion of the pilot, PAD conducted a phone survey to assess whether the messages sent to farmers in the campaign had contributed to increasing farmers' knowledge, changing FAW management practices, and perceived impact on maize harvest.

Objectives of farmer phone survey

- The objectives of the phone survey were to:
- Collect information about FAW infestation in farmers' maize fields
- Assess how the MoA-INFO pest risk messages were interpreted and valued by farmers
- Examine the effectiveness of SMS as a dissemination channel for communicating with farmers

What we did

Study area and survey sample

The survey was conducted in Kenya in the PRISE PAD Pilot SMS campaign target constituencies. The study population comprised a representative sample of maize farmers that received the MoA-INFO service, including PRISE alerts. PAD ran the survey between 28th January and 12th February 2020, through a structured phone questionnaire with 1,920 farmers who agreed to participate. 1,572 were maize producing farmers, and are the basis of this analysis. Our sample consists of 1,213 (77%) farmers from the treatment area (291 women; 596 men; 326 gender unknown), and 359 (23%) farmers from control areas (98 women; 166 men; 95 gender unknown), who cultivated maize and had experienced FAW attack on their maize plots prior to, and during the information campaign season, see Table 1.

Table 1: Summary sample size distribution

Sample	Gender			
	Female n	Male n	Unknown n	Full sample n
Control	98 (27%)	166 (46%)	95 (27%)	359 (23%)
Treatment	291 (24%)	596 (49%)	326 (27%)	1213 (77%)
Total	389 (25%)	762 (48%)	421(27%)	1572

Row percentages are in parentheses

What was achieved?

The study focused on assessing whether the FAW SMS campaign increased farmers' knowledge, practices, and implementation of FAW management practices, based on information they received through the PRISE PAD Pilot SMS campaign. Farmers that received the campaign push messages were included in the treatment group, and compared with farmers that did not receive the push messages (control group), but who had access to all the FAW content on the MoA-INFO platform through the menu, or by sending certain key words to the platform.

Table 2 presents the summary statistics of the farmers' variables, disaggregated by sample (treatment /control), and gender of the farmer. The average age of the sampled farmers was 40 years. Compared to the majority of other study findings on the average age of farmers, those targeted by the PRISE information campaign are younger by almost 10 years. For the overall sample, 25% of the farmers are women, while more than a quarter (27%) have an unknown gender, because this information was not captured during the phone survey. However, where the gender of the farmers is known, the information was collated from farmer registration details on the PAD database. Typically, sample composition in most studies of farmers in Kenya ranges between 21% and 30% women farmers (Otieno, 2019), so this sample is representative of women farmers in Kenya.

**Table 2: Summary statistics of key farmer variables**

Variable	Description	Full sample	Gender			Sample	
			Female	**Male**	**Unknown**	**Control**	**Treatment**
		(n=1,572)	**(n=389)**	**(n=762)**	**(n=421)**	**(n=359)**	**(n=1,213)**
Age	Mean	39.9	38.5**	40.3	40.5	38.6	40.3*
	SD	11	10.1	11.3	11.1	10.8	11
Type of phone owned	GSM Phone	68%	26.4%***	45.7%	27.9%	23%	77%
	Smart Phone	32%	21.3%***	54.3%	24.5%	22.5%	77.5%

*Note: ***, ** and * denote significant difference between groups at the 1%, 5%, and 10% significance levels, respectively.*

While smartphones are the ideal platform for crowd-sourcing and transmission of information because of their stronger hardware capabilities, extensive mobile operating systems, internet connectivity and functionality, the survey shows that the majority (68%) of farmers in the sampled areas had basic GSM mobile phones, while only 32% of the farmers had a smartphone (Table 2). This compares to the total penetration of mobile phones in Kenya of 116% (Communications Authority of Kenya, 2020), with more than one SIM card being used by an individual. In addition, 87% of the Kenyan population uses the internet (Internet World Stats, 2019). A GSM phone still serves the purpose of receiving and sending SMS to the majority of farming households. These results show that SMS should remain as the most widely used method to disseminate information directly to farmers, as any other means, such as advising farmers to follow an internet link for further information, would have reduced reach.

Time farmers planted maize in the season

The majority (84%) of farmers planted maize from August to October 2019 (Figure 3), whereas 8% of farmers planted in July 2019, and another 8% after October (6% in November and 2% in December) 2019.
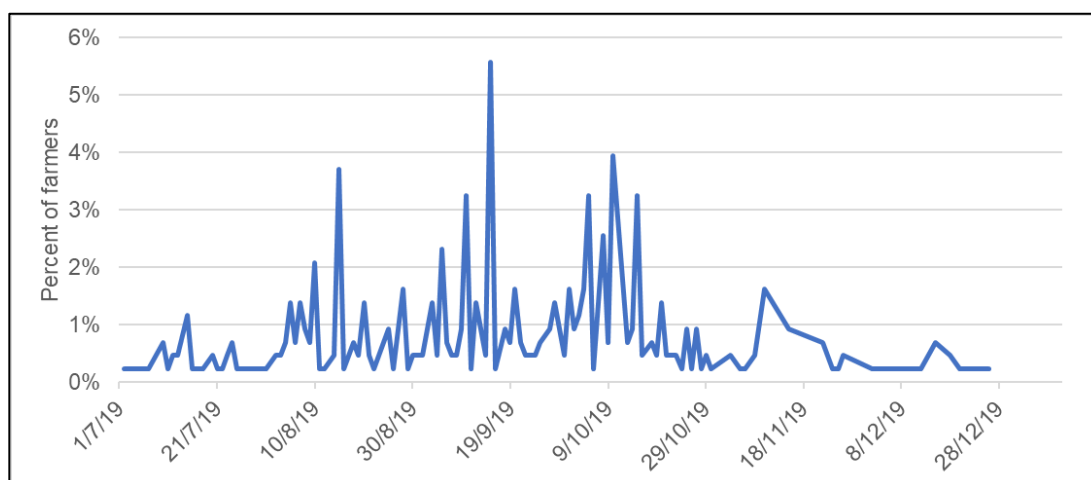
Figure 2: Farmers date of planting maize

The farmers that planted maize earlier than August 2019, and those that planted after October, planted outside the normal planting season. While it is typical to find this planting pattern, it is possible that these farmers may not have found the PRISE PAD SMS messaging so effective. This is because the PRISE alert timings are based on, amongst other things, 'number of days to action' from crop planting, and therefore if planting is early or later than the majority of the planting, then it is likely that the alert to take action will be received either too later (for early planters) or too early (for late planters) for the action to be most effective.

Fall armyworm identification and incidence

Most (85%) of farmers receiving PRISE messages reported observing FAW in their maize plots during the target season, and a similar proportion (86%) of farmers also noted FAW as the most problematic pest on their maize crop that season (Table 3). This demonstrates the widespread occurrence and highly damaging nature of FAW.

Table 3: Summary statistics (%) of key questions on FAW on maize during the study season, disaggregated by gender and sample

Description	Full sample (%)	Gender		
		Female (%)	Male (%)	Unknown (%)
a) Observed FAW on maize that season	85	24.6**	48.5	26.9
b) FAW was the biggest problem for your maize crop that season	85.9	24.1	48.4	27.6
c) Received messages about FAW from MoA-INFO	93.7	23.7	49.7	26.6

Note*: ***, ** and * denote significant difference between groups at the 1%, 5%, and 10% significance levels, respectively.*

Through the PAD decision support tool, referred to as the monitoring tool (Annex 4), farmers were sent messages and advised to inspect their maize plots to assess the presence and infestation rate of FAW, following a defined scouting methodology. Based on their response on the infestation rate and the height of their maize, they were advised to spray pesticides to control FAW.

Besides FAW, there are other crop problems that farmers experienced in their maize plots during the study season, key among them being water/flood stress (too much rain), which affected 53% of farmers; drought stress in 10%; weed problems affected 9%; other diseases /virus problems affected 8%, and other insect pest problems affected 7% (see Table 4). Chi square tests of the significance on the results show that there is no statistically significant relationship between the other pest problems experienced by male or female farmers during the study season, nor between treatment and control sample groups' experience of the other pest problems.

Table 4: Proportion (%) of other pest problems farmers experienced by gender and sample group

Description	Full sample (%)	Sample		Gender		
		Control (%)	Treatment (%)	Female (%)	Male (%)	Unknown (%)
Water/flood stress (too much rain)	52.7	30.6	69.4	27.6	55.1	17.4
Drought stress	9.1	29.4	70.6	11.8	58.8	29.4
Weed problem	8.6	18.8	81.3	37.5	31.3	31.3
Disease/virus problem	7.5	14.3	85.7	28.6	35.7	35.7
Other insect pest problem,	7	7.7	92.3	46.2	30.8	23.1
Management practices	3.2	16.7	83.3	33.3	33.3	33.3
Poor soil conditions	4.8	0	100	22.2	55.6	22.2
Poor seed quality	3.2	33.3	66.7	33.3	50	16.7
Poor quality fertilizers	2.7	0	100	0	60	40

Severity of FAW infestations in farmers' maize plots

For farmers to receive the appropriate recommendation on whether to spray against FAW with pesticide, they were asked to indicate the severity of infestation of the FAW on their maize, based on their plot size during the cropping season. Nearly a third (33%) of farmers indicated that a minor portion (less than 25%) of their maize plot was affected by FAW, while the majority of farmers (28%) had approximately a quarter of the maize plot affected by FAW (Table 5).

**Table 5: Maize cropping area infested with FAW that season, by gender and sample**

Description	Full sample (%)	Sample		Gender		
		Control (%)	Treatment (%)	Female (%)	Male (%)	Unknown (%)
A very minor part (less than 25%)	33	23.1	76.9	24.5	49.7	25.9
About a quarter (25%)	28	22.2	77.8	23.5	49.2	27.3
About a half (50%)	18	26.25	73.8	22.9	51.3	25.8
About three quarters (75%)	9.7	20	80	24.6	45.4	30
The entire area (>90%)	10.7	23.8	76.2	29.4	43.4	27.3

However, approximately 20% of farmers indicated that more than three-quarters (>75%) to the entire (>90%) of their maize plot was infested with FAW. With such high levels of infestations, these farmers are likely to have received recommendations to apply a pesticide. Such a large portion of the crop being affected comes with cost implications (i.e. purchasing the recommended pesticides, or taking any other non-pesticide measure). Failure to appropriately address the problem can lead to serious crop losses.

Fall armyworm management practices

In responding to FAW, spraying pesticides has been one of the most widely used treatment methods in Africa. To be legally used for FAW control, a pesticide must be registered, requiring information around its effectiveness and the health and environmental risk it poses (Abrahams et al. 2017)

After positively identifying FAW infestation, the surveyed farmers carried out various steps to control FAW. These can generally be grouped as chemical, cultural/physical, and biological techniques. Use of chemical pesticides was the most commonly applied measure, used by 65% of farmers. Physical/cultural practices included application of wood ash (27%), sand /soil (10%), and soap (9%) into the tunnel of the affected maize plants. These techniques are recommended best practices for cultural control of FAW as per the CABI Plantwise Programme's Pest Management Decision Guide (Otipa et al, 2017). Use of biological control methods was less common, and where used, biological control methods included farm-based plant extracts such as chili pepper (12%) and application of tobacco, or tobacco solution, (2%), see Figure 4.
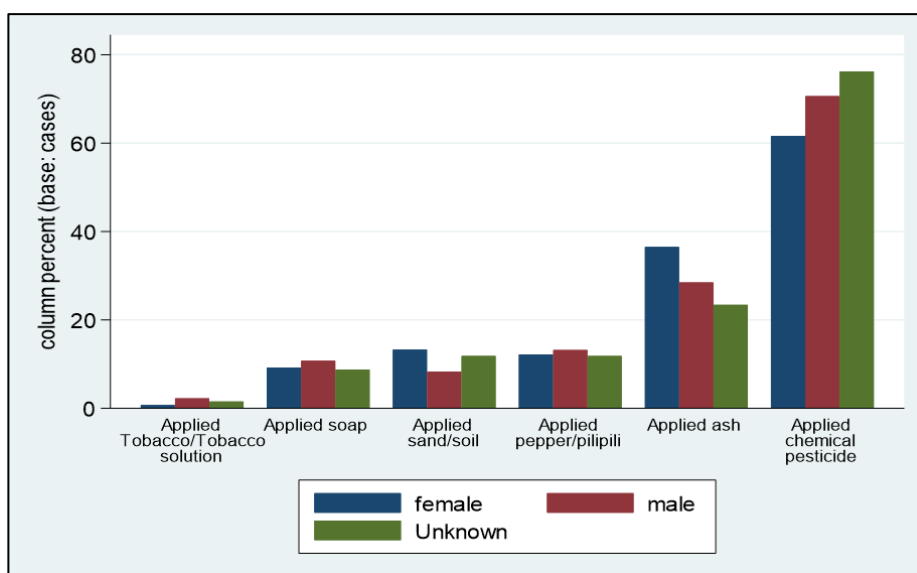
Figure 3: Actions taken in response to FAW infestation in maize plots

Nearly 78% of farmers reported that they were satisfied with the results from the actions they took in response to FAW infestation on their maize crop. The main sources of recommended actions which farmers acted upon were; advice from MoA-INFO (58%), recommendations from other farmers (31%) and agrodealers (26%) as illustrated in Figure 5. This result indicates that PRISE messages sent through the MoA-INFO platform helped farmers to tackle the FAW infestations in their maize plots. In addition, the results indicate the importance of farmer-to-farmer information exchanges. This is desirable if the farmers have and share the correct information amongst themselves. However, this can lead to negative outcomes if farmers share incorrect information, especially what control options to use, and recommended application and dose rates. Apparently, agrodealers play an important role in advising farmers on chemicals to use to control FAW.
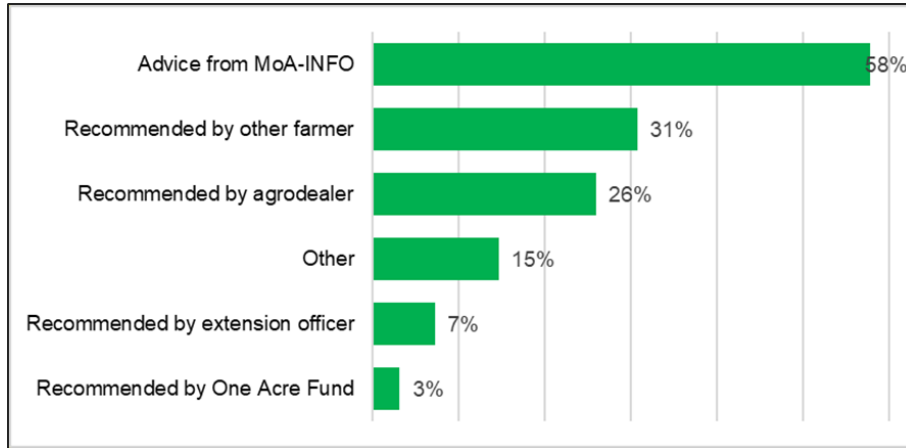
Figure 4: % farmers acting on FAW advice from different sources

Fall Armyworm Advisory

One of the key objectives of the PRISE PAD Pilot SMS campaign was to promote the uptake of appropriate FAW management practices among farmers in the target sites. FAW advisory messages were sent to famers to provide knowledge, and enable them to assess the most appropriate sustainable integrated management practices to prevent and to control FAW infestation. Analysis on how farmers perceived the messages, their usefulness, and changes in practices after receiving the messages are reported for treatment farmers only (Tables 6 to 13).

A majority of farmers (94%) received messages about FAW from MoA-INFO, (24% female, 50% male and 27% unknown gender). Out of these farmers who received messages, about 87% indicated that they understood all of MoA-INFO SMS campaign messages sent to them, while 12% stated that they understood some of them. The majority (66%) perceived the messages on FAW to be helpful, while 13% said message was useful and 10% message was clear (Table 6).

Table 6: How the farmers perceived the messages on FAW, by gender and sample

Description	Full sample (%)	Gender*		
		Female (%)	Male (%)	Unknown (%)
Helpful	66.5	24.5	49.2	26.3
Useful	13	27.3	50	22.7
Clear	9.8	18.1	53	28.9
Interesting	2.1	27.8	55.6	16.7
Not helpful	0.8	14.3	57.1	28.6
Not useful	0.6	100	0	0
Unclear/confusing	0.2	0	0	100
Other	5.8	12.2	55.1	32.7

These questions were asked to farmers in the treatment group only
*percent breakdown by gender is within each reported group

However, there were instances where a few farmers found the messages to be of less help, or unclear. Table 7 lists the messages that farmers identified as unclear on managing FAW. The correct pesticides to spray was listed by most (18%) farmers: this was listed more often by female farmers (37%) than male farmers (12%). However, almost 45% of the farmers could not recall which of the messages were unclear.

Table 7: Information that was perceived as unclear, by gender and sample

Description	Full sample (%)	Gender*		
		Female (%)	Male (%)	Unknown (%)
Don't remember	44.7	40	42.9	51.6
Which pesticides to spray	18.5	36.7	9.5	12.9
Dates for spraying pesticides	9.7	13.3	11.9	3.2
How to recognize FAW/ How to check maize for FAW	7.8	6.7	11.9	3.2
How to control FAW	7.8	0	11.9	9.7
Origin of FAW	6.8	3.3	9.5	6.5
Explanation of what FAW is	5.8	6.7	4.8	6.5
How to prevent FAW	3.9	0	4.8	6.5
Other	5.8	3.3	7.1	6.5

percent breakdown by gender is within each reported group

Despite the low proportion of farmers that found the messages unclear, these farmers, especially female farmers, may not have been able to implement the recommendations provided to them. This should be studied further as ultimately, they could have suffered undesirable outcomes of FAW.

Table 8 shows that 'how to control FAW' was the particular message or information that approximately a third (34%) of the farmers found most useful. Other messages found to be useful were: how to prevent FAW (15%), how to recognize FAW, or check maize for FAW (13%), and which pesticides to spray (11%).

Table 8: Particular messages or information farmers found most useful on managing FAW

Description	Full sample (%)	Gender*		
		Female (%)	Male (%)	Unknown (%)
How to control FAW	33.9	25.4	53.7	20.9
How to prevent FAW	14.9	28.6	40.5	31
How to recognize FAW/ How to check maize for FAW	13.1	20.7	52.3	27
Which pesticides to spray	10.6	20	54.4	25.6
Explanation of what FAW is	5.3	20	44.4	35.6
Dates for spraying pesticides	2.4	10	60	30
Origin of FAW	1.1	44.4	22.2	33.3
Other	8.6	20.6	46.6	32.9

percent breakdown by gender is within each reported group

Table 9 is a summary of the particular messages, or information farmers found least useful. It seems that farmers were least interested in information regarding the explanation of what FAW is and its origin, either because they already knew this information, or were not interested in knowing that. However, they were still interested in information on how to prevent and control the pest. It is surprising that farmers found information on how to control FAW and dates for spraying pesticides to manage FAW, least useful. This may be because they already know this information, or that the messages on this subject were unclear and not easily understood. The survey did not explore the reasons for why farmers found the messages useful, or not.

Table 9: Particular message or information farmers found least useful in managing FAW

Description	Full sample (%)	Gender*		
		Female (%)	Male (%)	Unknown (%)
How to control FAW	3.8	21.9	59.4	18.8
Dates for spraying pesticides	3.2	18.5	51.9	29.6
Origin of FAW	2.7	34.8	30.4	34.8
How to recognize FAW/ How to check maize for FAW	2.2	21.1	63.2	15.8
How to prevent FAW	1.5	15.4	61.5	23.1
Explanation of what FAW is	0.9	25	62.5	12.5
Other	39	23	48.8	28.2

percent breakdown by gender is within each reported group

Changes in farmer practices based on the PRISE PAD SMS Pilot information/ recommendations

More than half (59%) of farmers who received the PRISE PAD SMS alerts, changed their practices based on the information/ recommendations, and 86% will choose to continue to receive maize advisory messages through the PRISE PAD SMS (via MoA-INFO code) in the upcoming season (Table 10). When asked if PRISE and PAD should send these FAW SMS advisory messages to farmers nationwide, 79% were of the view that, farmers nationwide should be sent the messages, and that SMS was the best method for sending the information about pests to farmers.

Table 10: Summary statistics for FAW questions (% of 'Yes' responses)

Description	Full sample (%)	Gender*		
		Female (%)	Male (%)	Unknown (%)
	(n = 1,572)	(n = 389)	(n = 762)	(n = 421)
Did you change your practices based on the MoA-INFO recommendations?	59.3	23.1*	51.1	25.8
Will farmer opt-in to receive maize advisory messages from MoA-INFO again in the upcoming season?	85.7	23.4	48.1	28.6
MoA-INFO should send these Fall Armyworm advisory messages to farmers nationwide?	79.2	23	51.3	25.8
Is SMS the best method for sending information about pests like FAW to farmers	87.2	24.8	47.9	27.3

Note: ***, ** and * denote significant difference between groups at the 1%, 5%, and 10% significance levels, respectively

*percent breakdown by gender is within each reported group

The large proportion of farmers that would like to continue receiving messages shows that farmers value information to help them make decisions on managing crop pests, and especially FAW.

Results of implementing recommendations of preventing and managing FAW

Spraying insecticides early in the crop cycle is most likely to kill the natural enemies and may not be economical (FAO, 2018). The effectiveness of insecticides against FAW also greatly depends on the application technique, dose and formulation. Farmers were advised when to spray against FAW if observed on their maize crop during the target season. Once farmers received the MoA-INFO recommendations, some acted on the advice and changed their practices. 64% of these farmers experienced a reduction of the amount of FAW infestation on the maize crop, and 45% realized an increased amount of maize harvested (Table 11).

Table 11: Results from changing practices based on the MoA-INFO recommendations (% of cases*)

Description	Full sample (%)	Gender		
		Female (%)	Male (%)	Unknown (%)
	(n = 792)	(n = 183)	(n = 405)	(n = 204)
Reduced amount of FAW	64	63.9	66.2	59.8
Increased amount of maize harvest	45.1	39.9	45.7	48.5
Reduced number of other pests	2.4	2.2	3	1.5
No effect on FAW	2	2.7	1	3.4
Increased amount of FAW	1.4	3.3	0.7	1
Reduced amount of maize harvest	1.4	0.6	1.7	1.5
No effect on maize harvest	1.3	1.1	1.2	1.5
No effect on other pests	0.4	0	0.7	0
Increased number of other pests	0.1	0.6	0	0

*Multiple response question - Farmers were able to give more than one answer.

Almost a fifth (19%) of farmers sprayed earlier than they would have, 13% decided to spray on the recommended date, while 9% did not spray. However, over half (56%) of famers in the sample did not change their actions even after receiving a recommendation on spraying date (Table 12). It is unclear why these farmers did not act despite receiving advice on when to spray. It could be that once they assessed the level of FAW infestation they decided that the area affected was minor, hence could bear any accruing loss. Alternatively, it could be that farmers have had experiences of FAW infestations in previous seasons, and realized that not acting to control the FAW results in bearable produce losses.

Table 12: Action of farmers upon receiving recommended spraying date (% of cases)

| Actions of farmers | Full sample (%) | Gender | | |
| | | Female (%) | Male (%) | Unknown (%) |
	(n = 330)	(n =87)	(n =160)	(n =83)
No, I did not change	56.1	52.9	56.3	59
Yes, I sprayed earlier than I would have	18.5	12.6	22.5	16.9
Yes, I decided to spray	13	16.1	12.5	10.8
Yes, I decided not to spray	8.5	12.6	6.3	8.4
Yes, I sprayed later than I would have	3	4.6	2.5	2.4
Other	0.3	1.2	0	0

Reasons farmers opted out of receiving the MoA-INFO information

Despite farmers registering to receive the PRISE PAD SMS information (via MoA-INFO code), at some point, some farmers stopped receiving the messages i.e. if a user didn't respond to a series of messages over a set number of weeks they were automatically 'opted out' of the system. Within the sample, a majority (59%) of farmers continued to receive the messages. However, the remaining proportion didn't interact with the service continuously, citing various reasons. About 14% did not interact with the service by mistake, 5% did not interact with the service because they felt that they were receiving too many messages, 4% because they did not find the information helpful, and 2% each, couldn't understand the messages, or thought that they were being charged for those messages, (Table 13).

Table 13: Reasons farmers chose to stop receiving MoA-INFO messages (% of cases)

| Description | Full sample (%) | Gender | | |
| | | Female (%) | Male (%) | Unknown (%) |
	(n = 760)	(n =186)	(n =370)	(n =204)
I did interact with the service throughout	59.1	61.8	60.8	53.4
I didn't interact with the service throughout by mistake	14.3	14.5	13.5	15.7
I was receiving too many messages	4.7	3.8	6.5	2.5
I did not find the information helpful	3.6	2.2	3.5	4.9
I could not understand the messages	1.8	2.2	1.9	2.9
I thought that I was being charged for these messages	1.5	2.2	0.5	2.5
I never chose to receive these messages	0.8	1.1	0.5	1
Other	15.1	12.9	15.4	16.7

Some farmers' responses are worth consideration: for example, some farmers opted out of receiving the messages because they were receiving too many messages. It is common knowledge that there are various actors within the agriculture and commercial sectors pushing messages to people. Some messages could be relevant to the various needs of the farmers targeted by MoA-INFO platform, whereas some are irrelevant. Irrelevant messages can make even the relevant ones to become a nuisance. This should be considered as further developments take place of the PRISE PAD SMS alerts.

Farmers' knowledge of FAW

In this study, FAW knowledge refers to what farmers know about FAW, including myths surrounding the pest. To assess farmers' FAW knowledge, all survey respondents (treatment and control) were asked to respond to five questions related to FAW awareness, identification, monitoring and management (Annex 2). Irrespective of the response farmers gave to these questions, the interviewer was required to provide the correct information at the end of the interview. The first and third questions are related to common myths about FAW, whereas the second question is related to the integrated pest management approach of FAW. The last two questions are related to the safe use of pesticides. A summary of the five FAW knowledge questions is presented in Table 14. Responses to the FAW knowledge questions are mixed; most (77%) farmers correctly answered that it is important to use different pesticides from one season to the next, as FAW can develop pesticide resistance when one pesticide is used repeatedly. Approximately 69% of farmers correctly answered that intercropping maize with beans, groundnuts, soybeans, green gram (ndengu) and cowpeas slows the spread of FAW. Although some farmers know it is inefficient to apply a pesticide when only one plant is affected, a third (33%) indicated that a pesticide application should be made when only one plant is affected, which is not economical. Close to half of farmers (47%) know that it is safe for livestock to eat crop residues that contain FAW. However, about half (52%) of the farmers indicated that FAW could come from seeds or fertilizer, which is incorrect.

Table 14: Summary of FAW knowledge questions (% correct responses)

FAW Knowledge	Full sample (%)	Sample		Gender		
		Control (%)	Treatment (%)	Female (%)	Male (%)	Unknown (%)
	(n = 1,572)	(n = 359)	(n = 1,213)	(n = 389)	(n = 762)	(n = 421)
1 FAW could come from seeds or fertilizer	51.7	21.4	78.6	20.4***	52.8	26.7
2 Intercropping maize with legumes like beans, groundnuts, soybeans, ndengu and cowpeas slows the spread of FAW)	68.9	22.7	77.3	23**	50.4	26.6
3 It is safe for livestock to eat crop residues that contain FAW	47.3	23.3	76.8	22.2*	50.5	27.3
4 It is important to use different pesticides from one season to the next	76.8	22.6	77.4	22.5***	50.8	26.7
5 You should apply pesticide even if just one plant is affected	33.2	21.5	78.5	24.5*	51.9	23. 6

Note: ***, ** and * denote significant difference between groups at the 1%, 5%, and 10% significance levels, respectively.

These tables were created with asdoc program, written by (Shah, 2018)

PRISE-PAD Fall Armyworm SMS Alert Pilot Results

Significant differences were observed in all the FAW knowledge questions between genders. Male farmers were more likely to be aware of FAW and knowledgeable about the integrated management of FAW, including use of pesticides, compared to their female counterparts. This indicates that women farmers should be specifically targeted with tailored messaging about FAW, in formats that are known to be accessible to them. Across the treatment and control groups, no significant differences were observed in all the FAW knowledge questions despite the large differences in percentages. This is due to the large variation in sample size between the two groups. However, the generally high levels of FAW knowledge suggest that farmers in both groups can differentiate between myths and truths about FAW.

Conclusion and Recommendations

This study was conducted as a follow up to an information campaign jointly implemented by PRISE and PAD, through the MoA-INFO platform, to provide information to farmers on managing FAW. The PRISE PAD Pilot SMS campaign targeted maize farmers during the September to December 2019 production season. PRISE alerts were sent out to maize farmers informing them of the optimal intervention time for their locality, based on the PRISE maize crop pest model and their planting date. After the SMS campaign was completed, PAD conducted a phone survey between January and February 2020 to assess whether the FAW SMS campaign increased farmers' knowledge, changed practices, and improved implementation of FAW management practices. Farmers surveyed were drawn from 22 counties in Kenya.

About three quarters of surveyed farmers observed FAW in their maize plots during the study season, and 86% of farmers stated that this was the biggest problem they experienced on their maize crop in the season. To manage FAW, most farmers sprayed infested maize plots with pesticides, complemented by application of wood ash, sand/soil and soap. Acting on management recommendations, farmers were satisfied with the results of the interventions taken to manage FAW.

Over 90% of the surveyed farmers received messages about FAW through the MoA-INFO platform, the channel that disseminated the PRISE messages. 87% of farmers understood the messages they received and found them helpful, especially on how to control and prevent FAW. After receiving the PRISE messages, more than half of the surveyed farmers changed their practices, and as a result witnessed reduced FAW infestations and realized increased maize harvest.

Farmers who received the PRISE alerts displayed increased knowledge about FAW, as compared with farmers who had not received the alerts. On average over 70% of farmers who had received the alerts responded to the knowledge questions correctly as opposed to just over 20% of farmers in the control group. This give a strong indication that the information shared in the alerts helped to increase farmers' knowledge, on FAW itself as well as the most appropriate control and management practices.

Overall the pilot campaign can be considered a success in terms of reaching farmers with timely advice on FAW management. In addition, the farmers found the advice clear, and useful and therefore the majority of them acted upon the information and advice received. This led to reduced FAW infestations and increased maize harvest for some farmers. As PRISE continues to collaborate with PAD and the Ministry of Agriculture to deliver pest alerts, it is recommended that the following steps are taken to improve the messaging:

- It is made clear to farmers that if they do not interact with the messaging service, they will be automatically opted-out of the service.

- The clarity of some of the messages should be improved, especially relating to which pesticides to use.

- Messages should concentrate on actions that can be taken to control and prevent FAW infestations, rather than ones related to what FAW is or its origins, despite the increase in knowledge that was demonstrated as a result of receiving content on the origins of FAW.

- Expansion of the messaging service should be considered as the majority of farmers who received the alerts thought that all maize farmers should receive the same alerts, via SMS.

- Future messages should be pre-tested with women farmers to ensure the messages are clearly understood. The suitability of the delivery mechanism for women farmers, through SMS, should also be investigated as the study findings consistently show less comprehension of methods to control FAW by women than men farmers.

- Further research could be undertaken to understand why 56% of farmers did not change their practices as a result of receiving the pest alerts. This may have been because they were undertaking the correct measures already, or they may not have considered the information received sufficient to induce them to change their practices. This study did not provide any evidence to support these theories and they should be investigated further to see if further changes are needed to the PRISE alerts to improve uptake of the management practices for FAW.

- Finally, additional research should be carried out on future campaigns to understand the effect on maize yields for farmers who have received the alerts, as compared to those who were not involved in the information services and did not receive the PRISE PAD pest alerts. This will be critical to demonstrate whether the alerts are making a significant change in the lives of the farmers.

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