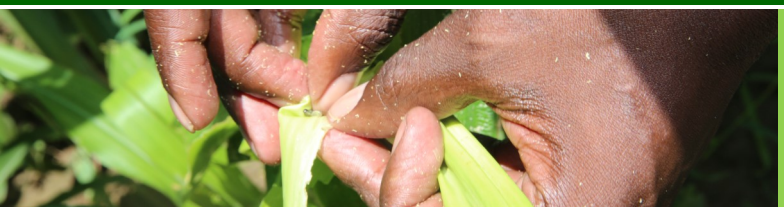
# ZIMBABWE LIVELIHOODS & FOOD SECURITY PROGRAMME



## Farmer Field Schools capacitating communities to sustainably manage Fall Armyworm

## KEY FINDINGS

In response to the outbreak of FAW in Zimbabwe LFSP set up 34, 36 and 38 FFSs in the 2018/19, 2019/20 and 2020/21 seasons respectively to help farmers better understand the invasive pest and come up with appropriate home grown management practices. The FFSs were run in the 12 LFSP districts covering natural regions II to IV. Below are the findings from the FFS studies.

* FAW activity was low during dry spells and high during wet spells. However, heavy rains were observed to wash young larvae off leaves, and drown those in the whorl leading to low infestation levels. In the dry spell the pest hibernates in the funnel of the maize plant. It actively feeds during the wet season. Newly hatched larvae were observed when the wet spell resumed
* Farmers witnessed cannibalism among FAW larvae. They observed old larvae feeding on newly hatched larvae
* Farmers were able to establish the time when the larvae actively feed, which is during the cool times of the day (from 6 to 10am and from 3 to 6pm). However on cloudy days the worm can be seen feeding at any time
* Farmers observed that birds are beneficial as they feed on FAW, and were usually seen feeding on FAW larvae early in the morning. Birds should therefore not be chased away from fields, provided they do not harm the crop. Rather, trees should be left to grow at the peripheries of the fields to provide perching sites for birds. Farmers concluded that the presence of birds in a field can be an indication of FAW infestation
* Farmers observed FAW damaged cobs, even when scouting had not indicated any infestation. This shows that farmers may live under the illusion that there is no infestation when in fact the crop is infested. This calls for very close observation and regular scouting
* Hand picking/crushing of FAW eggs/larvae is effective on small areas, but may not be effective at a large scale. However, it was not established what area is deemed small and suitable for this control method
* Farmers were capacitated and now able to identify beneficial insects. Ants, wasps, earwigs and beetles were observed eating FAW eggs and larvae. These predators need to be nurtured to help control FAW. Farmer skills on observing and analysing the ecosystem were enhanced
* The early planted maize crop had less FAW infestation than the late planted crop. Farmers also observed that FAW tended to prefer young tender leaves
* The fertility trials where manure was used to fertilise maize showed that FAW infestation levels were lower on the well manured maize crop. Generally, the better fertilised maize crop withstood FAW attack better than the poorly fertilised
* Efforts to control FAW larvae in later stages of development (4th to 6th instar) did not yield good results regardless of the control method (except crushing)
* Chemical control of FAW had varied performance results. Generally it was observed that coming in with chemical control when the larvae had reached development stages beyond the third instar did not yield good results.

## BACKGROUND

The Livelihoods and Food Security Programme (LFSP) aims to improve food, nutrition and income security among 250,000 smallholder households (approximately 1,250,000 people) in 12 districts. It actively addresses the specific constraints facing smallholder farmers, particularly women that limit the productivity of their farms and their participation in markets. Trans-boundary invasive pests and diseases, notably the Fall Armyworm (FAW) present threats to the attainment of increased crop production and productivity. FAW, which first appeared in Zimbabwe in 2016 is causing significant damage and accompanying yield loss to staple cereal crops, with estimated maize grain yield decrease of 58% (Chimweta et al, 2019: https://doi.org/10.1080/09670874.2019.1577514). Farmer education and community action have shown to be critical elements in the strategy to sustainably manage FAW populations, which is why Farmer Field Schools (FFS) are at the centre of FAW management. Farmer Field Schools, a community-driven approach to agricultural training and education, are an effective way to reach millions of smallholder farmers and successfully engage them in a learning process resulting in better management of their crops, animals and natural resources. FFSs blend well with integrated pest management (IPM) promoted by FAO. IPM emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms.

## LFSP RESPONSE TO FAW

In order to come up with community based FAW management practices fifty six (56) extension personnel (Department of Agritex and LFSP Implementing Partner staff) were trained as FFS facilitators and set up 34 FFSs in the 12 LFSP districts at the beginning of the 2018/19 cropping season. This was followed by 36 and 38 FFSs in the 2019/20 and 2020/21 seasons, respectively. Various FAW management options in a maize crop were studied at the FFS sites. The management options studied included: **i.** maize intercropping, **ii.** push-pull intercropping in maize, **iii.** effects of planting dates on FAW infestation and yield loss, **iv.** effects of nitrogen fertilization rates and manure on levels of FAW infestation and yield and **v.** Integrated Pest Management (IPM).

## KNOWLEDGE ON FAW GAINED FROM FFS

The FFS season-long practical training courses – “by farmers”, and not “with farmers” allow all plant, insect, disease, and weed development processes and management to be observed and validated over all crop stages. As a result of this experiential learning under the guidance of facilitators farmers gained knowledge to become experts in their fields. Knowledge gained on FAW includes: **i.** Identification (adult, egg masses and larvae), **ii.** Biology and life cycle, **iii.** Ecology, **iv.** Crop damage and **v.** Management options including monitoring and early warning.

## RECOMMENDATIONS FOR FUTURE PROGRAMMING

Given that the FFSs were not conducted as standard research, there is need to undertake further research to scientifically verify the results. A number of the findings need further research scrutiny and packaging so that the control methods are well spelt out with specific guidance on such critical aspects like dosage, application rates, stage of application, among others. The knowledge on FAW that farmers gained and the various management options that they trialled can form a solid basis for a fully-fledged community fall armyworm monitoring, early warning and management system. This would form a good basis for further programming as well as inform and influence policy.

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UKaid from the British people

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## FAW MANAGEMENT OPTIONS

During the FFS sessions farmers tried out various FAW management options, and the table below summarises the performance of some of the tried options. However, there is need for more data to support some of the observations.

| TREATMENT/CONTROL METHOD | OBSERVATIONS/COMMENTS |
|---|---|
| **Mechanical and local controls** | |
| Ash from *Tephrosia (mutika), Euphorbia* and other unspecified plant species | *Tephrosia* gave the best results among all ashes since it killed FAW larvae regardless of their development stage. The other ash types were only effective for young larvae in instars 1-3. |
| Sand | Sand, when placed in the funnel controlled FAW. However, there is need for more research to determine a number of factors: type/texture of sand, quantity to be placed in whorl, timing of placement etc. |
| Human urine | Effective, with women urine reportedly more potent than that from men. Farmers in Honde Valley noted that urine from pregnant women is more effective on FAW. Some farmers reportedly diluted the urine, whilst others did not. Need for more studies to determine concentration and application rates required. |
| Marula *Sclerocarya birrea* fruit juice (crushed Marula fruits soaked in water over several days) | Very effective in controlling FAW larvae when poured into the maize whorl. Farmers decided to try out the Marula juice after observing that maize plants in areas adjacent to Marula trees remained free of FAW infestation despite the rest of the field being infested. |
| Ammonium nitrate fertilizer granules | Controls FAW when applied at 2-3 granules into the whorl. It was also observed that application of too much fertilizer (AN) burns the crop. However, some farmers observed that the granular form of AN may not kill all larvae, so they started dissolving the AN in water and poured the solution into the whorl. The concentration of the solution needs to be established with further study. |
| Detergents (washing powder: QAM, Omo) | Solutions of these detergents were found to be effective when poured into the whorl. There were reports that adding salt to the soap solution would enhance efficacy. There is need for further investigation to establish the concentration of the solution as well as the application rates. |
| Beef soup | Pouring beef soup over the plant and letting it drip down the plant attracts ants which will feed on FAW larvae. Farmers were able to observe a higher population of ants, with some managing to witness the ants feeding on FAW larvae. Literature mentions that fish soup can also be used |
| Chillies *Capsicum* (crushed chillies placed in water) | Reported to be effective in controlling FAW when poured into the whorl. Further studies needed to determine concentration and application rates |
| Sodom apple *Solanum incanum* (crushed ripe fruit placed in water) | Reported to be effective in controlling FAW when poured into the whorl. Further studies needed to determine concentration and application rates |
| **Cultural methods** | |
| Early planting of crop | The early planted crop suffered less from FAW infestation compared to the late planted crop which suffered as much as 60% infestation. Farmers observed FAW larvae moving from the older maize leaves (early planted crop) to the younger and tender leaves of the late planted crop. The gap filled maize crop was heavily infested, compared with the older crop. The very late planted crop was almost a write off due to heavy FAW infestation. The significance of early planting was proven beyond any doubt. Farmers now appreciate the importance of early planting in combating FAW attack. |
| Crushing of FAW egg masses and crushing/picking of young FAW larvae | Effective on small areas as it is labour intensive. The success of this method relies on the farmer's capability to identify FAW larvae and egg masses and availability of labour in the household |
| Fertilization of the crop with organic fertilizers (manure) | FAW infestation levels were lower on the well manured maize crop. This tallies with literature that manured crops withstand FAW attack better than crops on which inorganic fertilizers are used. |
| High plane of soil fertility (well fertilised crops) | Well fertilised crops were better able to withstand FAW damage. Most of the crop regenerated after the attack, especially when control was early. Generally a healthier crop withstands FAW attack better than a poorer crop. |
| Birds | Birds feeding on FAW larvae early in the morning helped reduce FAW populations. Once the FAW numbers decreased the frequency of birds visiting the fields decreased. Birds can be a good proxy for FAW presence. However, scouting rather than the presence of birds should inform FAW presence. By the time birds appear it will already be late. |
| Intercropping | Intercropping maize and cowpeas reduced FAW levels, while intercropping with pumpkins did not have a similar effect. Studies elsewhere have shown that a maize-pumpkin intercrop predisposes the maize crop to FAW damage. |
| Integrated Pest Management (IPM) | IPM is the careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce and minimise risk to human and animal health and/or the environment. In the FFS studies IPM helped reduce the FAW populations. There was also a general increase in populations of predators under IPM compared with conventional practice |
| Push pull technology | The technology entails using a repellent intercrop (*Desmodium* as a "push") and an attractive trap plant (Napier/Brachiaria grass as a "pull"). Minimal infestation levels were observed where the *desmodium* and napier crops got well established. Generally farmers have experienced challenges particularly with the establishment of desmodium due to dry soil conditions. |
| Use of synthetic pesticides | Various synthetic pesticides were applied and they had varying degrees of efficacy. Generally it was observed that application of pesticides at later development stages of the FAW larvae was less efficetive. |