



# *Success with cotton IPM*

A briefing for the *IPM in Developing Countries Project* funded by the European Commission *Environment in Developing Countries* budget (DGVIII)

**This PMN provides information on successful IPM case studies which are dramatically reducing pesticide use in cotton.**

## **The importance of cotton**

Cotton is an economically vital crop for many of developing countries. It is grown in over ninety countries and is the leading industrial crop in terms of dollar value of world production. The fibre is the single most important raw material used in textiles, and cottonseed is a source of vegetable oil and a high quality protein source for animal feed.

## **High inputs**

Cotton receives more pesticide applications per season than any other crop, and accounts for at least one quarter of all agricultural insecticides used in the world. In major cotton producing countries this proportion is often much greater. In Pakistan, for instance, cotton consumes 70-80% of all agricultural insecticides – and while in 1980 less than 1000 tonnes of pesticide active ingredients were used on cotton, since 1991 it has consistently exceeded 20,000 tonnes a year.

## **High costs, low returns**

High pesticide use does not guarantee pest control. Unaware of the problems arising from pesticide resistance and the destruction of natural enemies, farmers often respond to pest outbreaks by applying more pesticides, which merely aggravates the problem, a situation known as 'the pesticide treadmill'. Once on the treadmill, the farmer finds him or herself facing spiralling pesticide input costs, potentially increased pest problems and lower yields, leading to increasingly smaller returns on investments.

## **Farming families are affected**

Extremely and highly hazardous pesticides (WHO Class Ia and Ib) are widely used on cotton. The exposed farming families and rural communities suffer many health problems. Spray run-off into water sources contaminates drinking water and can cause fish and animal deaths.

## **IPM for cotton farmers**

The problems of heavy reliance on chemical pest control first became apparent in cotton, making it a priority target for integrated pest management (IPM). IPM is an approach to pest management based on ecologically sustainable control measures which are cost effective and safe for the farmer and consumer. Most success is achieved with IPM which works with farmers in a participatory way, using group discussions and farmer experimentation throughout a growing season. The emphasis is on reduction, and where possible elimination, of pesticide use.



*Farmers looking for whitefly and its parasites on leaf undersides, Farmer Field School training on cotton in Pakistan.*

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*In Pakistan, two farmer groups reached the end of the season without a single application of pesticides: and at seven of the ten sites, IPM plots achieved yields higher than conventional approaches.*

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### **Making IPM work**

A great deal of effort and money has been invested in developing cotton IPM systems. But successful IPM occurs when researchers, farmers and extension staff work together. Farmer participatory systems have proven to be an effective way to link research more closely with farmers. One such system, the Farmer Field School (FFS) was developed by FAO in rice systems and has been widely used in Asia and, increasingly, in Africa.

#### *Farmer Field Schools means farmers lead*

The success of the FFS approach lies in its focus on the farmer as the key decision-maker in pest management. Farmers become experts in agroecology by regular observation of their crop in the field. The field is the classroom, and no standard recommendations or packages of technology are offered. Farmers learn by doing and become independent decision makers. They collect data in their fields and take action based on their findings. Farmers suggest topics for experimentation according to their own needs and carry out comparative experiments on small plots in their own fields.

Efforts are now underway in several countries, supported by many international organisations, such as the FAO, the Asian Development Bank and CABI Bioscience, national programmes and NGOs, to extend the FFS approach to a range of crops including cotton and mixed farming systems in Asia, Africa and tropical America.

### **Impact of a cotton FFS in Pakistan**

FFS initiatives can have a great impact on pest management systems at farm level. In 1997 the Asian Development Bank supported the government of Pakistan and CABI Bioscience to run a pilot FFS project for cotton. Ten groups of 25 farmers were set up from July-December 1997 in the Vehari District, Punjab, conducting field exercises and experiments on the main pests, the crop's ability to compensate for pest damage inflicted early in the season, and the effects of pesticides on natural enemies and livestock. Farmers managing IPM plots were able to reduce the average number of applications of insecticides to 1.4 per season compared to 5.2 per season in the farmers' practice plots (FP: farmers continue current practice to compare results). Two FFS groups succeeded in reaching the end of the

season without a single application of synthetic pesticides. Moreover, at seven of the ten sites, IPM plots achieved yields higher than those in FP plots. FFS groups managing the IPM plots made savings of up to 68% on pesticide input. With reduced production costs and increased yields, FFS groups involved could translate IPM as Increased Profit Margins

The FFS gave farmers confidence and one group demonstrated the impact of unnecessary application to local agrochemical salesmen, Department of Agriculture officials and neighbouring farmers.

### **Indian cotton IPM**

An FFS initiative in Trichy area, Tamil Nadu, in 1997 helped farmers reduce their high input costs and increased the stability of cotton cropping systems through use of intercrops. Each FFS met for 23 sessions during the cropping season. They were able to eliminate chemical use in the IPM plots, compared with 8-10 applications in the FP plots, by using early sown cowpea as a border trap crop for pests, and castor to build up populations of beneficial insects. Farmers understood how the trap crop became a natural enemy breeding ground. Farmers had previously viewed pests from pulses as a problem, and used chemical applications on these crops.

One of the major benefits of reducing the number of pesticide applications, apart from financial, was that women were saved hours of time previously spent hauling water from 3 km away for 10 applications by knapsack spraying. Since 60-70% FFS group members in cotton are women the benefits of reduced pesticides were very apparent.

### **Participatory training in Zimbabwe**

In Zimbabwe small-scale and communal farmers produce more than 70% of cotton grown in the country, but most farmers lack the basic agronomic and pest management knowledge for efficient use of inputs, particularly with regard to pesticides.

The Ministry of Agriculture, with the support of FAO, is taking a new direction in solving production problems by developing FFS-type initiatives. Integrated Production and Pest Management (IPPM) takes IPM as an integral part of the cropping system. With support of the Global IPM Facility, a project is training IPPM Facilitators to provide technical and organisational skills to local communities.

The two phase programme began in 1997, and focused on a mixed cropping system. Following a workshop in October 1997 with all the involved institutions to identify production issues and problems, a curriculum was devel-

## Training for organic farming in Zimbabwe

ZIP Research is an NGO in Zimbabwe dedicated to providing training and research in Natural Pest Management for the communal farming sector. The training programme is based on the FAO Farmer Field School approach, but modified to meet local circumstances in the following ways:

**1** Training is given directly to Farmer Field-Workers (FFWs) rather than to extension workers. FFWs are mainly women selected by their communities for their leadership abilities.

**2** To reduce costs and provide effective training, FFWs receive an initial month-long training in Natural Pest Management and organic farming in ZIP's Eco-Lab. The Farmer Field School takes place in the farmers' own fields, with support from ZIP Research staff.

**3** Simple experiments are adapted to local conditions.

**4** Training in Natural Pest Management within organic agriculture reduces production costs by eliminating all pesticides, and enables farmers to receive an organic

premium when they sell their produce. Training covers the requirements which enable crops to be certified as organic.

Emelda Wingwiri, one of the farmers trained by ZIP Research to train others, explains how she farms. *"I started organic farming in 1995-6. It was suggested that we spray our cotton using products made from some trees. We knew trees that we thought would be helpful. The area I started farming organically is about half a hectare. I planted both cotton and groundnuts. At the end of my organic plot I planted Leucaena trees as a windbreak. The organic manure gives fertility to the soil, while chemical fertilizers disturb the soil. In my second year I felt confident and needed less supervision. I planted nearly 1 ha. I had no problems with pests. Predators seen in my field were wasps, spiders, ladybirds and the Assassin bug. At harvest I got 600 kg."*



*Experimenting in organic production*

*Photo: S. Page*

oped for a season-long training of trainers on cotton IPPM. This first phase trains Core IPPM Facilitators, who will organise and facilitate the farmer field schools (Farmer School Groups [FSG] in Zimbabwe) in the second phase.

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### *Training the trainers*

During the first year, twenty agricultural extension officers from the Department of Agricultural, Technical and Extension Services, (AGRITEX), one crop specialist from the Cotton Company of Zimbabwe, one entomologist and five regional participants, took part in the core facilitators' course. The course was structured around the growth cycle of the cotton crop and lasted 18 weeks. Participants were

split into five groups to each organise five FSGs involving 160 farmers, of whom about one third were women. Participants planted small plots (approximately 1.5 ha) with cotton, maize, groundnuts and paprika and maintained them throughout the season. The trainers gained experience in non-formal education techniques and discovery-based learning, the vital participatory methods for FSGs. The Core IPPM Facilitators gained a broad range of skills and unique experiences necessary for running training programmes in the second phase.

By observing their fields, farmers identified predatory thrips that were not believed to exist in Zimbabwe. Farmers commented they had believed all insects were harmful to the crop, but now know some are beneficial.

Of equal importance, the FSG provides a forum where IPPM principles and practices can be discussed, tested and applied both by farmers and facilitators. The emphasis is on developing farmer knowledge and skills in a context which helps to raise both consciousness and confidence.

### *Benefits from the first phase*

The IPPM farmer plots averaged 0.2 sprays over the season, compared with 2.8 sprays on

## Key points

- ❖ Cotton consumes about 25% of all insecticide use, generally highly hazardous products, and most farmers in developing countries are untrained.
- ❖ The success of the FFS approach lies in its focus on training farmers as the key decision-maker in pest management.
- ❖ International organisations are supporting IPM cotton programmes and demonstrating they are a successful alternative to current practices.

research recommendation plots, and 5.8 on farmers' current practice plots. The main difference was in the reduction of early season sprays against aphids in IPPM plots, allowing the build up of predator populations for control of later pests.

Preliminary analysis showed that IPPM plots achieved an average of 1500 kg/ha compared to 700 kg/ha in farmers' current practice. Combined with savings of around 20% in input costs due to fewer spray applications, profits from IPPM plots were over Zim\$1100/ha, compared with under 1000 on farmers current practice. These are direct costs and do not take into account other benefits such as reducing the risks to farmers and environmental contamination.

None the less, the first IPM session met some problems which led to reduced yields and quality. The research on large commercial farms cannot be directly applied to the more diverse small-scale farms which have poorer soil and lack irrigation. Fortunately FFS provide opportunities to improve local management along with national programmes.

The Farmer Field School approach can also help strengthen a sense of community and increase co-operative efforts. For example a local extension officer in Zimbabwe found that in one FSG the owner of the group cotton field donated all proceeds from the farmers' practice plot and the money was used to start a broiler project by the group.

The project will continue into a second season in 1998/99, when the graduates will organise 32 field schools for about 1000 farmers with the assistance of local extension workers.

## Conclusions and recommendations

- ❖ Farmer participatory approaches to IPM have demonstrated that farmers can successfully reduce their pesticide applications while maintaining or improving yields after appropriate, field-based training.
- ❖ Development agencies can play a key role in creating awareness of the elements for success and supporting training projects.

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Projects cited:

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## Useful reading

Poswal, A. and S. Williamson, 'Stepping off the Cotton Pesticide Treadmill', preliminary findings from a farmer participatory cotton IPM training project in Pakistan, CABI Bioscience, 1998, 9pp.

Cotton Integrated Production and Pest Management: an Ecological Approach. Trainers 'Guide for Zimbabwe IPPM TOT/FFS Programme (1998)', Available from the Global IPM Facility, FAO, Rome (see above).



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