Developing an African mo

There is growing concern in Africa about the dramatic rise in the use of pesticides by small-scale farmers. Cases of acute poisoning and problems with pesticide residues in local and export produce attract growing attention. Smallholders in the East African highlands grow cash crops such as coffee in a mixed cropping system that includes vegetables. Pesticides are increasingly being used on a calendar basis. The cost of agrochemicals is a heavy drain on the farmers' income, and sometimes pesticides destined for coffee are used for vegetables and other food crops. This puts human health at risk. Although alternative pest and disease control options exist, there is very little information on IPM and integrated crop management (ICM) available to this group of farmers. NGOs promoting organic farming often focus on kitchen gardens and subsistence crops.

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To address these issues, a small pilot project was started in Kenya in late 1995. Its aim was to develop and disseminate appropriate crop management options. The Farmer Field School (FFS) approach to implementing IPM has been used with great success in many Asian countries in rice and vegetable cropping systems. This approach combines training with field-based, location-specific research to give farmers the skills, knowledge and confidence to make ecologically sound and cost-effective decisions on crop health.

The Kenya pilot project set out to discover whether FFS training methods developed mainly in the paddy rice monoculture and small-scale, commercial vegetable production from the Asian farming context would work in Africa. The project team therefore adapted existing FFS curricula to develop a training programme tailored to the specific agro-ecological and socio-cultural needs of Kenyan smallholders who grow a variable mixture of annual and perennial crops for domestic consumption and for sale. In particular, the project team needed to develop learning exercises to help farmers explore integrated crop management options for long-established coffee gardens.

Running the project

Many IPM projects have failed to bring farmers, researchers and extensionists together, and poor linkages amongst these groups have been one of the major obstacles facing farmers when they try to implement IPM techniques. To avoid such pitfalls, this project aimed at developing inter-institutional collaboration between research, extension and an NGO, in order to build bridges between key players and better support farmers ready to experiment with IPM. The International Institute of Biological Control (IIBC) Kenya station, the Coffee Research Foundation, the Kenyan Agricultural Research Institute, the Extension Division of the Kenyan Ministry of Agriculture, Livestock Development and Marketing, and the Kenya Institute of Organic Farming (KIOF), an NGO, cooperated in running this project.

The project team ran a Participatory Rural Appraisal amongst farmers in the Kiambu area to identify immediate pest and disease problems in their coffee and vegetable production, and to discuss the wider implications of their farming systems. Many small-scale farmers in this area have virtually abandoned their coffee bushes, because of the low price of coffee and the rising cost of pesticides. Those growing tomatoes for the local market find that insecticide and pesticide form an increasingly large proportion of production expenses. Farmers tend to apply these pesticides as an insurance measure against pests and diseases, with little regard to need or timing, and as a result do not achieve higher yields or better quality produce.

The Farmer Field Schools project decided to focus on developing options that were cheap, sustainable and based on ecological principles. Farmers should be able to see the benefit of these options within one growing season.

Setting up Farmer Field Schools

The project team then put together a draft training and research curriculum for a Training of Trainers (TOT) course and for Farmer Field Schools, that combined discovery-learning exercises on pests, weeds, natural enemies and disease transmission with experimentation on organic methods, including liquid manures and botanical pest repellents. Eleven Ministry and KIOF extension staff were trained to become FFS facilitators and they set up FFS groups in four agro-ecological zones. About 65 farmers were involved in the project. The crops they grew included coffee, kale, cabbage and tomato.

Two of the groups had already been trained by KIOF and had no wish to use agrochemicals. However, they were having problems with vegetable diseases and were troubled by low coffee yields. The other groups were committed to treating their tomato crop with pesticides.

The FFS sessions were held for half a day once or twice a week in the fields of one of the farmers. The sessions were conducted over a period of six months. Each group carried out weekly observations on small plots in this field, in order to compare their usual cultivation practices with the pest control practices using IPM/ICM options developed by the project. They also conducted experiments on alternative crop management methods, including traditional non-chemical methods. The groups visited each other to discuss their experiments and findings.

Preliminary results

The Farmer Field Schools generated a great deal of enthusiasm amongst all the farmers who attended them. One of the contributing factors was that sessions were carried out in local languages. English, Kiswahili and the use of scientific names were kept to a minimum. There were no local names for some diseases or insects, so farmers invented their own on the basis of a careful observation of these organisms. For example, they observed that hoverfly larvae were common predators of aphids on vegetables and dubbed these new-found friends 'helicopter insects' because of the flight patterns of the adult insect. These activities helped give farmers a sense that they were in control of the learning process, and this gave them the confidence they needed to tackle experimentation.

Both the organic and non-organic farmers were able to learn useful new methods for improving the health and profitability of their crops. The interaction between the KIOF and the Ministry extension staff during the TOT gave rise to much discussion on integrated crop management, and highlighted the need for taking a critical look at all recommendations - whether these were for synthetic or organic compounds. The tomato growers in particular discovered the benefit of preparing compost and using liquid manures and plant tonics to produce more robust plants.

All the groups came to appreciate the value of predators and parasites in controlling pests, and developed an understanding of the consequences of pesticide application and other management practices on these natural enemies. For example, the organic coffee farmers were able to observe higher numbers of parasitised *Antestia* bugs (a pest that sucks and damages developing coffee berries) in well-pruned IPM plots. They could compare this to conditions in the plots where coffee bushes were currently left unpruned. All the groups learned the value of making management decisions based on a regular monitoring of crop ecology, input costs and labour effort.

The FFS process clearly demonstrated the need for farmers to experiment with options in order to find the best solutions for their particular situation and problem. Mulching vegetable crops is commonly

del for effective IPM training

recommended as a means of conserving moisture and reducing the diseases spread by rain splash. During their weekly observations, the groups discovered that many crickets and cutworms were found hiding under the straw mulch and that these were destroying young seedlings. Farmers concluded that it was better not to apply mulch until the transplants were well established.

The farmers chose to test a variety of local methods for controlling soil pests and diseases in nursery beds. These were methods which they had heard of, but never used. Many farmers simply sow in topsoil enriched with compost, and disease incidence among seedlings is high. In the FFS, comparison plots were set up to investigate the effects of different treatments. Three of the groups found that burning plant trash on the top soil before sowing was most effective when measured in terms of percentage germination, seedling vigour, and the reduction achieved in the incidence of rootknot nematodes.

Preparing a coffee agro-ecosystem analysis poster

After producing immediate, visible results in vegetable plots, the FFS persuaded participants that it would be worthwhile to invest more time and effort in their coffee bushes and to try out IPM and ICM options. In the groups where coffee bushes had been neglected, farmers were able to see a marked difference after a few weeks. Plant health and potential yield improved as a result of pruning, mulching and the application of organic matter. Where farmers were using pesticides, IPM experiments showed that good coffee husbandry and decisions taken on the basis of agro-ecosystem analysis could halve the number of fungicide applications needed, without causing any reduction in potential yield.

The season-long interaction in the FFS also allowed coffee researchers to discuss the question of coffee management. The informal setting made it possible to address some issues that were difficult to tackle through official channels, such as the extent to which current research was relevant to smallholder systems.

Of major concern to smallholders is the lack of guidance on which food crops can be intercropped without negatively affecting coffee yields. Preliminary research from the Coffee Research Foundation showed that maize, sweet potato and cassava compete heavily with coffee, but potato and legumes can be grown so long as they are not planted directly under the coffee canopy. The project team was able to discuss these findings in the FFS, and relate them practically to learning activities showing the position of coffee feeder roots and where mulch and manure should be applied for maximum benefit. The interaction generated informative responses to farmers' and extensionists' questions. The information provided was immediate, and more direct that the communications that emerge from the formal recommendations handed down from research to extension.

The FFS provided a forum in which farmers and researchers could study topics that were not on the formal research agenda, and they were able to complement each other's experimentation. For example, an interesting disease management method suggested by one farmer - and later tested by several groups - involved diluting skimmed milk in water and spraying this onto tomato plants to delay the onset of blight. By using milk, one group was able to halve the usual number of applications of the expensive *Ridomil* (metalaxyl) fungicide. Another group found that the protective effect was not sufficient to prevent blight in cool, wet weather. As a result, researchers are now studying the usefulness of milk solutions and other non-chemical pest and disease controls that showed promise in the FFS plots.

The next stage

This FFS project provided many interesting and encouraging results. It was a first attempt to develop an African model of IPM training in smallholder cash crops. Most farmers were extremely keen to continue FFS sessions and many were already sharing their new experiences with family members and neighbours. Other groups asked for FFS to be organised in their area. Both farmers and extension staff gained not only skills and knowledge, but also the confidence to take decisions and set up small experiments. Researchers involved in the project were generally positive about this new form of collaboration and felt they had learned a great deal about non-chemical crop management practices, and gained an insight into the way farmers view production problems. The FFS pilot project succeeded in stimulating farmers to set up experiments in their communities. In this they were supported by a set of guided learning activities that were flexible enough to accommodate the different ideas and particular interests of the groups concerned.

This approach has much to offer in cropping system situations where pesticide misuse is not a major issue, as the experience of organic farmers and those with badly neglected coffee bushes confirmed. This small pilot, even though it was short and had limited resources, nevertheless raised several questions. IIBC and collaborating organisations are planning a full impact assessment of the FFS pilot project, in order to assess the lessons that can be drawn from it for farmer participatory integrated pest and crop management research and training in perennial cash crop systems. The assessment will analyse the technical output and the results of FFS experiments, as well as the cost/benefit of IPM/ICM options and whether ecological principles learned in the annual crop context can be readily transferred to perennials. It will also focus on indicators in the process, such as the sustainability of FFS impact at farm and community level and the likelihood of continued collaboration between project partners. Decision-making in coffee cultivation was an area where important gender differences emerged in the FFS groups and this needs to be considered in future programmes. Other issues to be explored include the best way to build farmer participatory methods into the state extension system, and the relevance of the experiences of this FFS project to other smallholders operating in mixed cropping systems.

The Kenya FFS pilot project generated a great deal of enthusiasm among the farmers, extension staff and researchers involved, and created a demand for further FFS training. As one of the FFS participants said during the evaluation session, "We are researchers too and we are proud of our findings". ■

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