SUSTAINABLE PEST MANAGEMENT IN SMALLHOLDER TREE CROPS: FARMERS AS IPM EXPERTS

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Like many tropical plantation crops, cocoa has a long tradition of over-dependence on chemical pesticides. But it has the distinction as well as being a birthplace of integrated pest management or IPM. In the 1960s, the ecologist Gordon Conway, now President of the Rockefeller Foundation, identified chemical insecticides as the cause of outbreaks of bagworms and nettle caterpillars on cocoa (Conway 1969), and worked out the process which we have come to call the “pesticide treadmill” long before these concepts became popular in the USA and Europe.

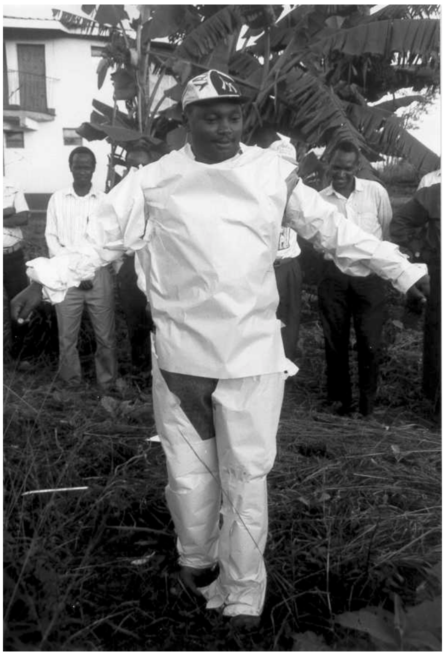
IPM has been an underlying principle of cocoa pest and disease management for some time, and has been effectively implemented in plantation systems where company technical specialists make crop protection decisions for large areas of planting. But over the past 30 years, cocoa like many tropical plantation crops has become increasingly a crop of the small-scale farmer, as a result of changes in demography and national policy in many countries. And as a cash crop of smallholders, cocoa has become something of an “orphan commodity”. Well-organised plantation extension systems are not available to smallholders. In any case the problems and options faced by smallholders may be very different than for large plantations. Many national agricultural research and extension programmes are oriented towards food crop production and do not have expertise or experience with cocoa. Finally, its private sector association has left cocoa and other smallholder plantation crops like cotton, coconuts and coffee without the kind of international research programme or support institution as exists for subsistence food crops in the CGIAR.

This problem was highlighted in the recommendations of the 1991 Conference on Integrated Pest Management in the Asia-Pacific Region, organised by CABI and the Asian Development Bank, in which representatives from 25 Asian countries endorsed a regional initiative to support IPM in smallholder cocoa, noting the lack of both extension of known IPM methods and research into new methods for management of difficult pests (Ooi et al. 1992). Initiatives coming from this Conference focused, however, on more traditional targets for development funding: rice, vegetables and cotton.

While IPM implementation for smallholders in cocoa stood still, IPM implementation in these other crop systems during the 1990s met with considerable success by focusing attention away from research and the development of “IPM packages” towards a more farmer-participatory approach. In doing this, IPM addressed the fundamental failure of the extension-to-farmer model in national programmes (e.g. the Training and Visit (T&V) system of extension). A new model emerged out of a pesticide crisis in rice in Indonesia, called the “farmer field school” or FFS.

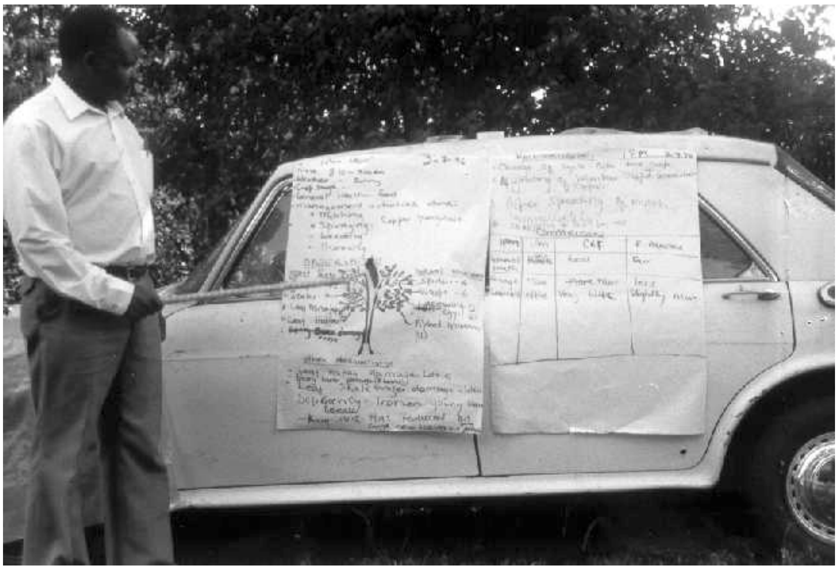
FFS is based on a process of discovery learning by farmers, in which extensionists (called trainers, and drawn from national and local extension services, NGOs and the farming community) help farmers to learn for themselves about IPM in their own fields. Farmers from a single village or area meet in schools at regular interviews over the entire crop season, where they conduct, compare and discuss surveys of their crops on a regular basis (called agro-ecosystem analysis) and compare their practices with IPM methods (e.g. those developed by local research institutions), which they can later go on to develop further in their own on-farm research. The principles of the FFS approach are (1) grow a healthy crop, (2) observe fields regularly and (3) conserve natural enemies of pests. Pioneered on rice by Indonesia, Philippines and other countries with the assistance of FAO, the FFS approach has contributed to dramatic reductions in pesticide use and greater small farmer profits, associated with improved levels and stability of production.

A common FFS exercise involves farmers wrapping each other up in white paper and spraying their crops with their own sprayers filled with red dye. The amount and distribution of dye on the farmer's body helps them to discover and address the risks of pesticide application



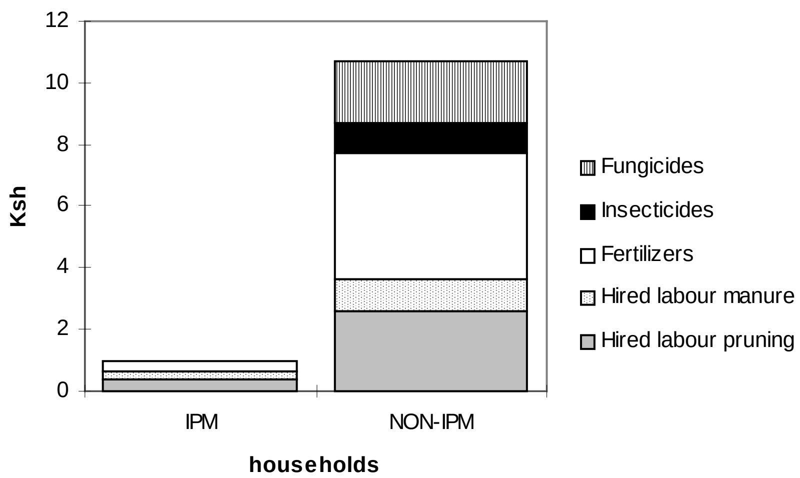
Farmer Field Schools represent one of a range of farmer-participatory IPM approaches now being extended by governments and community groups, with assistance from international NGOs, FAO and CABI Bioscience into vegetables, cotton and coffee, and into Africa and tropical America. Farmer participatory IPM is proving an effective means of building successful farmer extension systems on the scale necessary to meet the needs of small holders in developing countries. Interest in the FFS approach in cocoa has emerged in regions where FFS has been established in other crops. In 1998, for instance, the Government of Indonesia begins to implement a $30m national IPM programme in estate crops, including cocoa, based on the success of the national FFS IPM programme on rice. An analysis for this project by the FAO Investment Centre gives a positive economic rate of return on IPM training in this project of about 5% when compared to continuing current practices. In West Africa, successful pilot programmes in rice IPM are also now generating national interest in extension of this method to cocoa systems.

Farmers present to other farmers the results of weekly agro-ecosystem analyses in which they identify the state of the crop, pests, beneficials and the management decisions they wish to make, which are then discussed.



An FFS approach has not yet been extended to cocoa, but a recent pilot project in Kenya on coffee gives an impression of some of the challenges facing IPM in smallholder tree crops. This project was supported by the World Bank through the Global IPM Facility, and implemented by CABI Bioscience (formerly IIBC) in co-operation with the national extension service, the Coffee Research Foundation of Kenya, the Kenya Agricultural Research Institute and the Kenya Institute of Organic Farming. The project was undertaken in the central highlands of Kenya where smallholders grow a mixture of cereals, vegetables and coffee. The average number of coffee trees per household is about 400. The curriculum for training of trainers (TOT) and subsequent FFS covered production of all crops grown, but for coffee curriculum focused on major problems including tree health, fertilisers and disease management. FFS involved meetings of farmers with trainers at roughly two week intervals during 1996.

Figure 1. Cash expenses per coffee tree (in Kenya Shillings) for IPM and non-IPM farm households in Githunguri (Kenya), 1996. Average number of trees per household: FFS trainees 420, non-FFS 490. (Data from Loevinsohn et al. 1998)



One major output of the training was a decision by farmers to reduce fertiliser and pesticide use and rely more on organic sources of plant nutrition. Improved pruning methods were also adopted and farmers showed an interest to test coffee varieties resistant to disease. This impressed the Coffee Research Foundation, who had experienced difficulties with extension of their new varieties through traditional instructive sessions with farmers.

Sixty five farmers graduated from four FFS's and their practices were evaluated in 1997 and compared with non-FFS farmers. FFS farmers used significantly less chemical fertiliser, and reduced use of pesticides as well. They also utilised less labour for pruning, achieving substantial reduction in costs per tree as shown in Figure 1. This was associated with an average doubling of yield. Perhaps more importantly, there was substantial evidence of farmers continuing to meet in groups following FFS and of continued innovation in pest management practices. Innovations by farmers included experimentation with cultural controls, botanical pesticides, composting, manuring, pruning and new coffee variety.

At the time of assessment, there was active diffusion of methods between trained farmers and untrained farmers. Taking this process and applying a demographic model developed to predict the spread of innovation in farming communities (Sperling & Loevinsohn 1993), it appears likely that improvements involving pruning methods, use of manure and compost and botanical pesticides will spread without specific extension intervention.

The results of this project on FFS in tree crops are highly preliminary and the small scale of the project must be stressed. Also, while coffee and cocoa have similar management practices in smallholder systems, coffee is not cocoa. Bearing all this in mind, it has emerged that improvements in cost effectiveness, farmer confidence and farmer-driven experimentation can be obtained by an FFS approach in smallholder tree crops. Further, feedback from extension and research services has been very positive, because they have learned skills which increase their own capacity to do their job, namely extending technologies and training successfully to farmers. Finally, sustainability and cost effectiveness of this approach appear promising, given the early indication that farmers continue IPM practices and share these with new farmers. It is also noteworthy that an FFS developed in the context of pest management has ended up successfully addressing a broader spectrum of coffee production issues including soil fertility. This is a characteristic of the FFS approach because it addresses the needs of the farmers, and compels the trainers to deliver on those needs, rather than on their preconceptions of those needs.

There exist many technical research challenges for cocoa IPM, including the development of biological methods for control of diseases such as witches broom, and for insects such as cocoa mirids, as will be discussed by others in this meeting. New advances and perspectives on the use of pathogens and semiochemicals may make this possible in the near future. However, for many serious cocoa pest and disease problems, IPM methods exist already, but lack a mechanism for extension and refinement at the farm level across a larger smallholder community. The promising results reported at this meeting of a recent IPM pilot in Sulawesi, with cocoa pod borer as the major target pest, shows how existing methods can be deployed with farmers to manage very difficult pest problems. The challenge now is to develop extension systems which can cost effectively empower thousands of smallholders in this IPM knowledge. Farmer-participatory training systems, like the FFS, may provide the solution. Farmers trained in IPM will become informed customers for the cocoa IPM technologies of the future.

The Global IPM Facility was established in 1997 to help governments, communities and sponsors accelerate the implementation of IPM through facilitating links between IPM implementers and necessary technical, policy and training expertise. It is supported by the World Bank, FAO, UNEP, UNDP and bilateral agencies. CABI Bioscience runs a Technical Support Group to the Facility from its Centres in UK, Africa, Asia and tropical America. Because of its experience in IPM on cocoa and other tropical tree crops, CABI Bioscience is also helping the Facility to develop pilot projects in farmer participatory IPM in cocoa systems.