Ecological pest management

Editorial

More than twenty years ago, one of the first newsletters we published focused on the dangers of pesticides, highlighting the fact that its use was spreading rapidly. The negative effects of pesticides were already being seen: many pest species were becoming resistant (thus needing heavier dosages and more frequent applications), secondary pests were emerging, the number of acute poisonings was very high, and the overall effect of pesticides in the ecosystem was becoming apparent. This clearly showed the need for "alternative methods" and for a "different pest management system" for worldwide agriculture. As we mentioned then, rather than relying on external inputs, farmers needed to look at pests and diseases as part of the ecosystem, and focus on prevention through the diversification of production systems. A major component of managing pests and diseases was the relationship between pest incidence, soil fertility and soil organic matter content: "because of bad soil condition and consequent bad growth, plants become more susceptible to pest attacks".

Ten years later, in 1997, we looked at these issues again, mentioning the importance of substituting external inputs for labour, management skills and knowledge. These were the basic elements of "Integrated Pest Management", an attractive approach for small-scale farmers especially. Originally designed as a technical approach to reduce the number of pesticide applications, IPM developed into a comprehensive methodology, based on farmers' better understanding of their own agro-ecosystems. IPM first considered the integration of control methods and target pests as a combination of biological control methods, host plant resistance, cultural control and selective chemical control. When it was realised that many agricultural practices influence pest incidence, farm management was also added to the equation as an important part of an IPM approach, together with management of natural resources. Gradually, social aspects were also included, paying attention to women's roles in pest and disease management, to the role of local organisations and to the importance of indigenous knowledge in the process of developing the necessary skills and confidence to make ecologically sound and cost-effective decisions on crop health.

IPM has been strongly linked to processes which build on farmers' ability to learn, experiment and take appropriate decisions. Leaving behind more traditional "technology transfer" extension methods, IPM projects have developed around the Farmer Field School approach. Implemented first in Asia and then all over the world, Farmer Field Schools have proven to be a very effective tool for encouraging farmers to look for solutions to their problems, gaining the knowledge and the practical experience necessary to manage their farms successfully. IPM has therefore been built around farmers' own learning processes.

The situation today

As our magazine has regularly shown, there have been many positive pest management experiences during these last 20 years. As a result of a comprehensive IPM approach, farmers have been able to increase their yields and incomes. Many examples have shown a reduced reliance on pesticides, effectively diminishing their use. Lobbying and advocacy actions have led to new rules and regulations in many countries, forbidding the commercialisation and use of the most toxic products, and at the same time greatly increasing the awareness of farmers and consumers. But the problems persist, and these are not limited to large scale farmers or to intensive agriculture situations.

On a daily basis, small scale farmers in different parts of the world still experience many of the difficulties reported twenty years ago. Although reliable statistics are difficult to find, the impact of pests and diseases in worldwide agriculture is considerable, lowering yields and overall production, resulting in losses that are equivalent to millions of dollars. These losses are not only unpredictable; they are also greater in fragile ecosystems.

Furthermore, the most common and widely available "solution" of using pesticides has only made problems worse. Farmer suicides as a result of pesticide debt traps have become common in countries as different as India and Ecuador. And pesticide poisoning is a common story, having reached endemic proportions in many countries. Farmers and labourers who are regularly in contact with pesticides suffer from severe health problems, seriously affecting them and their families. In Peru's village of Tauccamarca, as in many rural areas in Africa, Asia and Latin America, accidental intoxications have resulted in the death of children and innocent people. Indiscriminate use of pesticides has also resulted in the contamination of soils and groundwater, leading to the disappearance of fish and birds. Because of the lack of regulations, or of the difficulties in effectively enforcing them, these problems are greater in the rural areas of the non-industrialised world.

Ecological Pest Management

IPM has had many successes, but the magnitude of the problem which farmers currently face forces us to look once again at pests and diseases and at their management. While it may be necessary to critically assess the extension methods followed during these last two decades, it seems equally relevant to stress and emphasise again one of the basic ideas behind the "different pest management system" which we called for more than twenty years ago: that pests and diseases are not an isolated part of agriculture, but rather a symptom of a broader problem, and need thus to be seen –and managed– accordingly.

Not surprisingly, this is known and recognised by many farmers. A few years ago in Tamil Nadu (India), at a meeting where farmers, NGO officials and government extension workers got together to discuss the most pressing problems in small scale farming, pests and diseases came out as the most important problem to be addressed. Farmers mentioned that the pesticides they used were increasingly ineffective, so that therefore they had to use more and more of them. Expressing the views of most participants, one farmer stood up to say that "… we can try to tackle these pest problems, but we must understand that a plant suffering from pest problems is like a diabetes patient suffering from skin boils. The boils are a symptom of a deeper problem in the human body, and so are pests in the paddy crop a symptom of a deeper level health problem. We need to tackle the symptom first and then go deeper to address the cause of the problem. We have to look at the paddy plants and the soil and at everything around".

His views reflect the need for an ecological perspective when addressing the presence of pests and diseases in agriculture. Building on the wide range of experiences gained with IPM during the last two decades, an ecological pest management approach is one which focuses on managing pests as part of a wider ecosystem. As such, EPM is based on:

(a) Minimising the disturbances which are caused by agriculture
In whichever setting it is practised, agriculture will always cause

disturbances and change the ecosystem, and one species (the crop) will nearly always dominate other plant species. These disturbances, however, need to be as small as possible. As Lanting (p. 6) points out, a successful pest management strategy is based on mimicking nature, redesigning a farm so that it resembles a complex ecosystem. This will mean maximising a farm's positive ecological processes (such as nitrogen fixation, nutrient mineralisation); while at the same time minimising undesirable processes such as nutrient loss or erosion. In many cases it may be convenient to reduce tillage and thus achieve minimal soil disturbance; in many others it will be necessary to include perennial species and enhance a farm's overall diversity. The interaction of different species, as Amudavi *et al.* (p. 8) show, can have interesting results, contributing to the system's overall resilience.

(b) Decreasing plants' vulnerability
Not all plants are equally susceptible to pests and diseases. This is even true for plants of the same species and variety: field observations show that pests prefer to attack plants under stress. Current studies, such as those falling under the theory known as trophosiosis, talk of a plant's "internal balance", directly related to its nutritional state. The best way to prevent the attack of pests and diseases is thus by providing a healthy and balanced environment and food supply. As Guazzelli *et al.* show (p. 14), there are many factors which can affect a plant's internal balance and thus lessen or increase its susceptibility to pest and disease attacks. These are related to the plant itself (such as adaptation to the local climate or its age) or to the environment (climate, light, temperature, humidity, wind). Plant vulnerability is also related to the different management practices which regularly take place in a farm, such as spacing, tilling, pruning, or the time of planting.

(c) Understanding pests and acting accordingly
The interactions between the components of an ecosystem vary greatly, and are specific to every location. In pest and disease management, one of the main considerations is the way the pest species behave: some show abilities to reproduce often and disperse widely, others are able to withstand competition or adverse conditions. To "know your enemy" (Belmain, p. 18) is thus a key strategy in every pest management approach. This knowledge needs then to be translated into action, considering, for example, the release of beneficial insects on a particular moment, adding bird nesting sites to a farm, or changing the sowing time of certain crops.

These principles are clearly visible in many traditional low input agricultural systems, where ecological principles form the basis for all pest management strategies. In brief, these refer to working with nature, and not against it. In agricultural terms, this means growing plants in the right soil, at the right time; nourishing the soil and relying on a system's biodiversity as a natural means to safeguard the whole system's health. Traditional wisdom is being maintained by many societies, while it is also being recreated in many "modern" farms. As shown by Reinders (p. 32), farmers in many of the intensive agricultural areas in the Netherlands have a very similar approach towards pests and diseases: this is not a separate problem which needs to be solved in isolation. Pests and diseases are dealt with by managing a farm as a whole. Managing a farm, however, and relying on its ecological processes, requires a thorough understanding of how these work. Therefore EPM is, above all, based on farmers' skills, abilities and knowledge.

Building knowledge

If EPM is based on farmers' understanding of their ecosystem and of the processes taking place in it, then training, education and knowledge building processes are essential. Many different participatory approaches for promoting sustainable agriculture have been developed, most of which work towards improving farmer decision making capacities and stimulating local innovations. Experiences showing the positive results of Farmer Field Schools, as a "model approach for farmer education", have been widely reported in the LEISA magazines.

Through Farmer Field Schools, farmers are trained to make an analysis of their agro ecosystem. In this way they become aware of the pest–predator balance and of the damaging effect of pesticides on such balance. They learn that it is better and more profitable to work with nature rather than against it. FFSs have become a very popular approach, taken up by NGOs and governments, on a small and a large scale. Their comparative advantage relies on a skilful incorporation of several principles: learner-centred, field-based, experiential learning; observation, analysis, assessment, and experimentation over a time period sufficient to understand the dynamics of key agro-ecological and socio-ecological relationships; peer-reviewed individual and joint decision-making based on learning outcomes; capacity building in leadership, social capital and empowerment.

The successes of the FFSs and other similar approaches show the truth of a common phrase: that knowledge is power. Understanding the ecological processes taking place in their farm not only helps farmers support and enhance such processes. It also helps to reduce the high degree of dependency many farmers have on chemical inputs and on the system –and vested interests– behind them.

Challenges

Ecological pest management is about bringing the balance back to disturbed ecosystems; it is also about learning to observe such balances. The enormous impact which pests and diseases have in today's agriculture forces us to pay special attention to these issues. Thinking of a cost-benefit analysis, for example, or on the need to easily visualise the impact of any pest management strategy on our health and on the environment, we need to continue developing tools to facilitate this learning process, building on the many successes seen.

However, as Schut and Sherwood show (p. 28), the widespread dissemination of Farmer Field Schools during the last ten years needs to be reviewed with a critical eye. In many cases they need to be modified so that they really reflect farmers' needs and are based on their knowledge and interests. In many others, it has to be recognised that the approach has "eroded" as a result of complex social matters and opposing interests. It is becoming clear that until and unless these are addressed, Farmer Field Schools will not lead farmers to a lasting independence from the pesticide trap. They may easily fall back into old practices or, even worse, they may resort to GM crops and find out later that their dependence on pesticides has only increased.

Our main challenge is therefore to keep the collective learning spirit that has been built by approaches like the FFS alive. In all situations, farmers need to decide on how to control the incidence of pests and diseases in their specific context, relying on the natural balances within their ecosystem. There are no standard recipes or solutions available. Yet, there is much wisdom to be tapped, both "old" and "new". Old practices are being "validated" by modern scientists. The challenge is to apply and adjust this wisdom in each specific situation.

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