Crop protection in the 1990s

During the 1990s, there have been new awarenesses and developments in crop protection. There have been improvements in user, consumer and environmental protection at the product development level and in the approaches adopted. When we analyse the relevance of these improvements for small farmers in developing countries, however, it becomes clear that there is still a lack of progress in making the new crop protection practices available to them.

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Product development during the period under consideration is characterised by the intensive and aggressive development of products using biotechnology and genetic engineering. This can be seen from the following figures:

Table 1: Predicted US Market for biopesticides, 1992-2002 (in millions of US$)

	1992	1997	2002	AGR in %
Pyrethroids	410	487	560	3.2
Bacterial	68	137	275	15.0
Pheromones	42	56	75	6.0
Viral & fungal	26	44 69	10.3	
Others	13	16	23	5.9
TOTAL	559	740	1002	6.0

AGR = Annual growth rate

Source: *Pesticide Outlook*, February 1994

The US government is actively supporting this trend. Between 1991 and 1994, 50-70 % of all new pesticide registrations were issued for biotechnologically and genetically engineered products. In addition to developing products using these advanced technologies, another trend can be observed. The agrochemical industry is putting considerable effort into stimulating the market for conventional pesticides in Latin America and Asia, as these offer the greatest growth rates. Countries such as Brazil, China and India have become important producers of conventional pesticides in recent years, and in a number of developing countries these products are sold very cheaply at local markets. One consequence is that it is easier for farmers to buy these products so they are able to make more frequent applications, a practice that we know is harmful for users, consumers and the environment (Table 2). This table shows that resource-poor farmers have little access to the new developments being made in pesticide products. Resource-rich farmers, however, can afford the newer and safer pesticides. Poor smallholders are only able to afford the older generation of pesticides. These show widespread resistance and contain the most toxic substances. However, as we shall see in this article, small farmers can benefit from an integrated approach to crop protection.

Table 2: Access to pesticides, productivity, income and danger of pesticide poisoning for farmers with different resource endowment

FARMER		Pesticide	
		cheap Toxicity class I & II non-selective high resistance	expensive less toxic selective low resistance
Very resource-poor farmers	access to capital	-	-
	access to products	-	-
	productivity	-	-
	income	-	-
	user-safety	-	-
Resource-poor farmers	access to capital	+	-
	access to products	+/-	+/-
	productivity	+/-	-
	income	+/-	-
	user-safety	-	+
Resource-rich farmers	access to capital	+	+
	access to products	-	+
	productivity	+	+
	income	+	+
	user-safety	-	-

Approach to development

During the 1990s, important integrated approaches to user, consumer and environment friendly crop protection have been developed. These include integrated cultivation systems for organic cotton involving elements of preventive crop protection; Farmer Field Schools; Farmer First Research; Participatory Technical Development(PTD); and Local Knowledge.

With experience and confidence in these approaches growing, it became obvious that it is possible to secure yields using far less pesticides than had previously been suggested. Cotton provides an excellent example of this. With the development of integrated cultivation systems for organic cotton that contain elements of preventive/natural crop protection, it can be demonstrated that a crop that consumed 25% of the world's insecticides could be grown successfully without any insecticide at all. Tadeo Caldas (1997) has reported on the major crop protection strategies in cotton (Table 3). Interestingly, neither the Consultative Group on International Agricultural Research (CGIAR) nor the agrochemical industry contributed in any way to the development of organic cotton cultivation systems. Instead, its success was due to the concerted effort of private companies, advisers and farmers.

The following comparison of crop protection strategies adopted in conventional and organic cotton shows that yields are lower in organic cotton. However, the reduced costs involved in crop protection measures and the price premium offer compensation (Table 4).

The cotton example shows that belief in the indispensability of pesticides arises from a scientific bias, and that this is maintained by particular interests. It also shows that the development of a viable alternative crop protection concept requires a holistic approach incorporating elements of the natural, social and economic sciences. Finally, we see that non-traditional researchers can further develop results from basic research, through such strategies as adaptive research and PTD for example, and achieve acceptance in the field. Similar conclusions can be drawn from studies of rice production.

Table 3: Crop Protection strategies in organic cotton cultivation in India, Senegal and Zambia

	India		Senegal		Zambia
	Site 1	Site 2	Site 1	Site 2	Site 1
Pheromones, lures, traps	Y, loc	Y, loc	Y, imp	Y, imp	no
Mating disruption	N	N	Y	N	N
Trichogramma	Y	Y	N	N	N
Chrysoperla carnea	Y	Y	N	N	N
Ladybird beetle	Y	Y	N	N	N
Bacillus thuringiensis	Y	Y	Y, imp	Y, imp	N
Nuclear Polyhedrosis Virus	Y	Y	N	N	N
Neem	Y	Y	Y	N	Y
Other botanicals	Y	Y	Y	N	Y
Cow urine	Y	Y	Y	N	N
Trap cropping	Y	Y	Y	Y	Y
Border crops	Y	Y	Y	Y	Y

Farmer Field Schools (FFS)

The concept of FFS was originally developed as an extension methodology for IPM in rice. This methodology is based on a structured learning process. The concept allows farmers to explore areas of research that are of particular interest and importance to them. This training concept is not only limited to IPM in the strict sense. In Asia, many NGOs and farmers' organisations have adapted and interpreted it to suit their own specific situations and interest. Some of these organisations apply the FFS concept not to IPM as such, but to agricultural system development in general. The flexibility of the concept and the experiential learning on which it is based have made it a widely used and valuable extension tool.

These approaches start with a participatory problem analysis and local knowledge. The experimental site is usually the farmer's field or a special experimental site identified by the farmers' group. The key to this approach is to teach farmers to experiment with their local knowledge or new/external information in order to make it effective and suitable to their specific situation. Farmers and extension workers gain methodological skills to develop their own solutions. This challenges conventional research paradigms and calls for a new relationship and respect between the various actors involved. Examples of this approach are the development of neem extracts in Thailand, the MASIPAG programme in the Philippines where farmers select and breed rice varieties according to their own criteria, and coffee farmer cooperatives that rear their own beneficial insects.

Smallholder options

Now we have to answer the question we posed earlier: what access do resource-poor farmers have to natural crop protection practices? Let me quote the participant from a workshop on natural crop protection held in Tanzania in December 1996 who said, "There exists a significant amount of knowledge on natural crop protection, but we believe it is not well organised and developed. It is still largely undervalued, not well experimented and there has been little diffusion. There is, therefore, a need for us to share the various experiences and methodologies used here and there and to develop this field further".

This participant acknowledges that access to information on natural crop protection practices in the widest sense has improved. But this does not mean that the information is getting to the right place. Information only becomes relevant when it is enlivened, that is when it has been transformed in such a way that it can be incorporated into people's daily life and work. However, this is the 'big gap'. The interplay between the various actors is still not optimal when one looks beyond the small islands of innovations. Research topics are still determined more by who and what receives financing, rather than by what is relevant to small farmers. This means that topics important to this group are largely under-represented.

Final reflections

During the last 10 years, and particularly while working with the people of Southeast Asia on the development of natural crop protection practices, I learned by observation and experience that they are guided more by the concept of *'but-as-well'* than by the Western concept of *'either-or'*. Underlying the 'but-as-well' is the concept of multiple approaches capable of responding to multiple realities, realities which might seem to contradict each other if we take the 'either-or' perspective. If we relate this insight to crop protection, we create room for multiple approaches where the one does not hinder the other. ■

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References

- table 3: Caldas, T **There is no recipe - Methods and conditions of organic cotton projects in Asia and Africa** GATE 1/1997:12-17
- table 4: Elzakker, B van **Cultivation and processing - Comparison of cost building of organic and conventional cotton** GATE 1/1997:21-27

Table 4: Comparison of crop protection strategies and yields for conventional and organic cotton

		conventional	organic
India	crop protection strategy	Endosulfan Monocrotophos BHC	Trichogramma
	yield kg/ha sc	2,000	1,500
Turkey	crop protection strategy	ca. 7 applic. contact- and systemic insecticides	predators commercial biosprays
	yield kg/ha sc	3,700 2,700	3,500 2,500
Egypt	crop protection strategy	Malathion Dimethoate Sumicidin	predators pheromones Beauveria
	yield kg/ha sc	2,800	2,600
Peru	crop protection strategy	ca. 5 applications of insecticides	Trichogramma Bacillus thuringiensis
	yield kg/ha sc	1,500	1,200

Generally: * lower costs for crop protection measures (60-70 %)
* price premium of 15-20 %

Source: IFOAM, 1996