

## THE ECONOMIC AND COMMERCIAL IMPACT OF INTEGRATED CROP MANAGEMENT

Leonard Copping reports on a recent 2-day meeting organised by the Crop Protection Group of SCI, in collaboration with the Volcani Centre, Israel, and the Fresh Produce Consortium

### ICM – facts and perceptions

Professor Sir Colin Berry opened proceedings with a talk about perceived danger from pesticide residues in food, emphasising the need to undertake meaningful experiments in order to identify a real benefit or a real hazard – the risks are so small, he claimed that meaningful experiments can never be undertaken. The chemicals used in conventionally grown crops, Sir Colin pointed out, are much safer than those 'natural products' including organic fertiliser that are used in organic production. If ICM is to retain its current favoured status, it is important to make some measurements on environmental impact and non-target effects, as well as effects on man.

Gerry Griffin from the Public Relations Group, Burton Marsteller, talked about media manipulation and directing public opinion. Roundup Ready soybeans proved that the public could be persuaded by pressure groups, but not by big business. When deciding upon an issue and a strategy it is essential to determine what the opponents are trying to achieve and to fight this rather than protecting the product blindly.

### ICM – in practice

Martin Battersby of Zeneca Agrochemicals, speaking as a research manager in the agrochemical industry, told of the visions of the industry, with chemicals continuing to be fundamental to crop protection strategies for the foreseeable future and transgenic crops (with output traits) as the crops of the future. ICM is the use of all the weapons at our disposal, but only if and when needed – always with minimum inputs.

#### *ICM implementation in Israel*

Eli Shlevin at the Volcani Centre described how reductions in chemical inputs had been achieved in Israel by physical, cultural and biological means. Chemical control of whitefly in glasshouse grown tomatoes is not acceptable because the tomato crop is pollinated by bumble bees and biological control is too slow. The solution was to cover the glasshouses with 50-mesh plastic sheeting that was too small for the insects to pass through. *Alternaria* blight on tomatoes was reduced significantly through the selection of resistant varieties, improved cultural techniques and targeted fungicide applications.

#### *ICM implementation in the UK*

Alastair Leake described how, at the CWS farm, the LIFE

### SPONSORS OF THE CONFERENCE

#### **The Society of Chemical Industry (SCI)**

(<http://sci.mond.org>) is an international association of individual members whose aim is to further the application of chemistry and related sciences for the public benefit. It seeks to provide an interface between industrial, academic and other interests.

#### **The Volcani Center**

(<http://www.agri.gov.il>) in Bet-Dagan, near Tel-Aviv, Israel, is the major research center for the Agricultural Research Organisation (ARO) of the Israel Ministry of Agriculture. Among the 7 institutes on the Volcani Center campus is the Institute of Plant Protection.

#### **The Fresh Produce Consortium (FPC)**

(<http://www.freshproduce.org.uk>) represents UK retailers, wholesalers, importers, growers and packers in the fresh produce and floral industries.

project (Less Intensive Farming and Environment) was begun in 1989 with a view to producing quality yields with lower levels of chemical input. Clearly ICM was a good place to begin but after several years of trials, the comparisons with conventional farming and organic farming showed some interesting trends. Conventional farming gave higher yields than ICM methods but the inputs from ICM were significantly lower such that it was more profitable. In addition, ICM practices such as reduced or zero tillage indicated significant beneficial effects on wild life. In comparison, organic methods gave markedly reduced yields particularly as fallow years are important for production. Ploughing was again shown to have a deleterious effect on wildlife as well as causing a massive and uncontrollable loss of nitrogen into water courses.

Jerry Boxall told the audience all about LEAF (**Linking Environment And Farming**), which is a centre of excellence in the UK for ICM – their audit is a self-assessment management tool to help farmers assess their practices and performance against the standards of ICM.

Andrew Sharp of Marks and Spencer gave a retailers' viewpoint. M&S has established traceability back to source with minimum standards of Good Agricultural Practice in place for all its products and, on the back of this, has offered its customers so-called 'Assured Products'. John Foley from Waitrose talked about the European supermarket initiative EUREP, where producers of fresh food products are required to conform to basic good farming practice and thereby

guarantee the quality and the safety of the food the supermarkets sell.

#### *ICM implementation in the Netherlands*

Peter Smits from Wageningen spoke about opportunities for biologicals in crop protection. He recognised that farmers are used to rapid, broad-spectrum pest and disease control and this is something that biologicals will never be able to provide. There will always be high-value, niche markets available for biologicals, but they will never compete with chemical pesticides.

### ICM – case studies

#### *ICM in Africa*

John Pickett introduced the work by Rothamsted in collaboration with the International Centre of Insect Physiology and Ecology on using intercropping in subsistence farming to push insect pests out of the main crop (maize or sorghum) into a trap crop thereby reducing stem borer damage to the grain crop whilst providing forage for animals from the trap crop. A secondary finding was when the legume *Desmodium* was used as the intercrop, the parasitic weed *Striga* was also controlled. These techniques have shown significant yield increases with little increased cost to the farmer.

Rory Hillocks described the problems that subsistence farmers in Malawi have in growing coffee and maintaining high yields. Plantation coffee out-yields many fold the production by small holders indicating that higher yields are possible. The main problems are insect pests such as the white stem borer that was once controlled by dieldrin but now has no effective treatment that small holders can afford. In addition, diseases such as coffee berry disease and leaf rust reduce yields very significantly. It has been shown that better agronomic practice such as opening up the crops and reducing shading help to reduce insect and plant pathogen attack.

#### *ICM in Israel*

Susan Lurie spoke about experiences from Israel of preventing post-harvest loss by inducing resistance to attack by treatment with elevated carbon dioxide levels or with heat shock or by the use of natural compounds such as methyl jasmonate that have been implicated in systemic acquired resistance. These techniques have no effects on existing infections or infestations but these can be tackled with the application of chemicals Generally Recognised As Safe (GRAS) including low oxygen or high carbon dioxide levels, heat, ethanol, hydrogen peroxide or bicarbonate treatment. Biologicals were described as being an effective method of giving longer-term control of pests and particularly diseases often in combination with other treatments including low doses of chemical pesticides.

Eli Putievsky described the use of natural compounds from herbs as crop protection agents as well the introduction of ICM techniques into their cultivation to reduce the need for chemical inputs – this is important in Israeli-produced crops as they are rigorously checked for residues

when shipped into the European Union – more so than those grown within the EU. This theme was continued by Yitzhak Spiegel with reference to the control of soil-borne nematodes. A number of ‘natural’ compounds have been tested including waste material from the shells of crustaceans to increase the presence of chitin-degrading fungi in the soil which would be expected to digest the cell walls of soil insects and nematodes. He also described the determination of the interactions between nematodes and their hosts as a potential means of identifying new ways of controlling the infestation or deterring the nematodes from attacking the host.

### ICM – the wider picture

The enthusiasm of Sue-Chi Shen from Gustafson for seed treatments was infectious and her assurance that tomorrow’s high value seeds will be protected by chemical and biological seed treatments was sincere.

Steve Lisansky, as always, gave a very professional talk on the economics of ICM strategies and concluded that such techniques would only be adopted if there is a financial benefit for the farmer. Organic production compensates for reduced yield by increased price and consumer demand, but what of ICM? It has been shown that the adoption of these techniques reduces chemical input costs and, in some cases, actually increases yield. The US government is aggressively supportive of such strategies and many farmers have reported significant increases in income. Under these circumstances, ICM will succeed in developed countries but the intellectual challenge of its implementation and very high pest and disease pressures found in developing countries will make it much more difficult there.

Sir Robert May (Chief Scientific Advisor to the UK Government) in his closing remarks encouraged the adoption of ICM practices in the UK (and globally) and emphasised all the government-supported groups/ventures that were in place to support ICM. He insisted that GM crops were going to revolutionise crop production and would be adopted when the public saw a benefit for themselves rather than chemical companies or farmers.

### Take home message?

What was the take home message? It is clear that the definition of ICM is different to different people – from reduced inputs, to no chemical inputs and on to the use of what is available as and when necessary. It does not really matter as long as the objective is to farm profitably with minimal inputs and concern for the environment and all non-target organisms. This is a sound objective in the rich, developed world but in subsistence farming can this be achieved? Again the answer is yes, but it must be managed and the farmers need help and advice. However, the big take home message that I got from the conference was that deep ploughing is the real reason for nitrogen pollution and loss of wild life rather than modern farming methods.

The authors were invited to offer papers for publication in the SCI journal, *Pest Management Science*.