THE ROLE OF GOVERNMENT RESEARCH IN ACHIEVING SAFE PEST MANAGEMENT

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If quality food and fibre production is to be maintained in economic quantities, pest management systems are needed, be they through the use of chemicals or other means, such as biological control. To achieve safe pest management a scientific input is required and from government that scientific input comes as close as possible to having no axe to grind over pesticides and their use. Our effort is very much focussed on developing pest management systems which maximise production but are cost efficient. The aim is to produce products with nil or very low pesticide residues for reasons of both public health and market access.

Where then, are government researchers currently putting their effort? Are they simply developing and refining spray regimes or are they embracing what can generally be called the organic alternatives? In fact the question largely depends on the nature of the problem in hand. The pursuit of single bottled solutions to complex problems has become recognised as unrealistic and almost certainly unsustainable. Often the returns on crops do not justify regular application of expensive agro-chemicals. There can be major problems of pests developing resistance to chemical controls. The agrochemical industry itself is vitally concerned about resistance of pests to their products as it renders them, and possibly related materials, valueless. There is also the very important issue of pesticide residues. Concern about these has grown, and, whether justifiable or not, consumer resistance must be taken account of both locally and internationally.

Government pest management research is orientated towards that which will improve market access and reduce production costs. The tendency has been towards ecological solutions to problems, partly because only state-funded work can be sustained in this area. Nevertheless, pesticides are still part of these solutions. A central aim is to maximise their effectiveness and search for less toxic, more specific variants. Associated with this is the aim of reducing pesticide application rates and frequencies to a bare minimum; often, old spray schedules have been shown to have involved application dates when no sprays were needed. Proper selection of the correct material is another area where significant improvement has been achieved. It is important to note that all of this gain is dependent on a thorough understanding of a pest's life-cycle. The key to reducing pesticide use is to apply it at the most vulnerable stage of the life-history. Ecological knowledge on which this is based is very expensive and sometimes difficult to obtain but undeniably provides the insights needed for ecologically sound decision-making. This has been very much the area of government funded research effort for the last 15 or so years, although it has recently taken a knock.

A large part of government-funded research seeks to maximise the value of all pest management inputs by rational and careful integration. Often the aim is to integrate the effects of predators, parasites and pathogens with plants that are bred or developed for resistance against pests. In conjunction with this, strategies may be adopted that are specifically designed to avoid pests. As a final component, carefully chosen pesticides that preserve the beneficial predators and parasites but eliminate the pest may be used. All of these processes taken together constitute what is generally known as integrated pest management. This approach has been described as half-way to organics, although often integrated pest management can be completely organic with pesticides being used only when things get out of balance. Such work in New Zealand has been particularly successful in orchards and in some pasture applications where there has been a vast reduction in amounts of sprays used in recent years. This integrated pest management in many ways epitomises the role of government research. Although each component of

this research may seem straight forward and obvious, work such as plant breeding for insect resistance is complex and often involves a range of disciplines such as biotechnology, plant pathology, plant physiology as well as specialist plant agronomy.

As a group, government researchers have been trained to be cautious in adopting new information or approaches until ample reproducible evidence of a fact has been shown. There is absolutely no room in science for anecdotal evidence as a basis for fact; everything has to be tested. This sort of 'fuddy-duddy' approach is probably a source of irritation to enthusiasts of alternative approaches. Nevertheless it ensures that science groups remain stringent about the safety and efficacy of new pesticidal compounds. This is why companies are required to spend around $10M simply to prove the safety of a new product. Science is based on original thinking and as such its workers are not doing their job if they ignore new ideas and opinions or presume that they have a monopoly on them. An example of this has been the realisation and acceptance that acupuncture does in fact work and is therefore worthy of serious research interest. People's empirical observations (for example folk-remedies) are often the basis of extremely important discoveries. It would be a great mistake if researchers were so arrogant as not to listen. Government science must be allowed to sift through this sort of information. The only problem is that, for some people, this may not be being done quickly enough.

As far as future trends in government funded pest management research are concerned, market forces will probably have the greatest influence. For example, it is not the cost of pest control, which is rarely a major component of overall production costs for many horticultural crops, but the demand for organically produced food which has now made research into this area profitable. Accordingly the subject is being given renewed attention with basic long-term ecological research that has been done to date paying off most usefully. One interesting difficulty in testing organic production theories is that often a research site is surrounded by productive land that has a good level of pest suppression. This sort of 'organic island' may be benefitting from someone-else's pest mangement and this can therefore give a rather optimistic view of what can be done. Unravelling these sorts of questions is another example of our work.

There is nothing constant about the battles that are fought against pests and diseases. The criteria are changing all the time. Land use patterns change, crops change, new pesticides and resistance to old ones appear and disappear. In New Zealand we are faced with the possibility of accidental importation of exotic pest species without their natural enemies; the arrival of fruit fly for example could completely change the nature of research and pesticide use. On the horizon no doubt are pesticides developed from naturally occurring pathogens and plants which will probably be genetically altered to confer pest-resistance.

Everyone must continue to demand that pesticides are toxicologically and environmentally safe when used *exactly* as directed. It is also important that the whole community remains vigilant for subtle but long-term effects of such materials on public and environmental health. Problems can manifest themselves in remote and unexpected ways as ecological systems get out of balance. For instance, in Sarawak North Borneo there was once a great deal of spraying of villages against malarial mosquitoes, usually with insecticide of relatively low mammalian toxicity. A short time after the commencement of this programme there was an explosion in the rat population. It seems that the cats had caught and eaten many of the moribund insects that had been affected by the insecticide. Eventually after eating an enormous number of these insects they were overcome by the residues and died — hence the rats.

Probably of more concern than anything else is the danger associated with the misuse of pesticides. Apathy and ignorance pose very major risks to human and environmental health. Drift is a typical example of what can go wrong as witnessed by innumerable court cases. More subtle, and I think probably more dangerous because its effects may be insidious, is the use of the wrong material on local market food crops or disregard for withholding periods. Recommendations are arrived at as a result of great research expense and effort; it is lunatic to think that these are not adhered to. It is a

clear role of government science agencies to stringently monitor pesticide use, ensuring that it is applied precisely as directed.

Although government research has reduced pesticide use considerably in some areas in recent years, pesticides remain a useful pest management tool. Their use is only likely to be eliminated from the production areas of specialist organic growers. Thus it is in everyone's interest to continue to be vigilant with regard to pesticides, although in most cases it is probably pesticide misuse rather than the materials themselves that deserve most scrutiny.