Agrichemical Use — 20 Years of Change©

J. Maber
Lincoln Ventures, Private Bag 3123, Hamilton

INTRODUCTION

At the I.P.P.S. Conference in 1981, I gave a presentation on new developments in pesticide application technology, focusing mainly on methods to produce spray droplets. Electrostatic spraying was relatively new then so this and other developments such as controlled droplet application (CDA) were included in the discussion. Twenty years on, what new developments in this area are there to report? What are the significant issues with respect to agrichemical use now?

Developments in droplet production for spray application technology in the last 20 years have been more in the refinement of traditional spray delivery systems with no radically new method for creating spray droplets. However, there have been other technology-based developments all aimed at improved application precision.

In addition to the technical developments the other most notable change is the move to respond to increased demand from customers or consumers for evidence of good practice. Suppliers of products that may have involved the use of agrichemicals are increasingly being asked to provide evidence that the agrichemical use is safe both from a personal health viewpoint, and from an environmental viewpoint.

This paper briefly reviews some of the most significant technical developments and as well describes the systems used in New Zealand that satisfy market demands for safe responsible and effective use of agrichemical.

AGRICHEMICAL APPLICATION SYSTEMS

The term agrichemical is used here instead of pesticides to reflect the fact that not all products used in biological production systems are designed to kill. The traditional methods to deliver agrichemicals have been by spray application but over the past 20 years the emphasis has moved from systems to control or adjust the droplet sizes produced to improvements in spray delivery systems. This is part of the general move towards precision agriculture, which includes the precise use of resources including agrichemicals.

Precision Application. Precision application of agrichemicals can be seen in three parts:

- In space
- In time
- In dose

Precision in Space. The availability of geographical information systems (GIS) offers the capability to apply agrichemicals only where they are needed. For example, farmers have known for years that a range of weeds occur only in patches. The development of GIS means that accurate maps of weed patches can be created, then used by spatially variable chemical application systems to apply agrichemicals only where needed and at the rate required.

Precision in Time. On-farm weather stations and computer forecast programs can be used to determine which days will present the best spraying conditions. These weather forecasts combined with crop disease information mean that for example apple blackspot (*Venturia ineaqualis*) risk, which is dependent on leaf wetness and humidity, can be predicted. As well, local weather information collected over time allows predictions to be made on the amount of "good weather" that should be available to apply agrichemicals. That information together with the amount of spraying to be done allows decisions on application equipment capacity to be made.

Precision in Agrichemical Dose. The amount of agrichemical applied to a target often takes no account of the actual size and shape of the target. This is particularly important with top-fruit crops such as apples where the size of the tree can vary enormously. For that reason systems such as the Tree-Row-Volume method are used to estimate the volume of the canopy to be sprayed and hence the volume of spray needed. Systems are now being developed which will enable these canopy volume measurements to be made automatically, and the information stored on a GIS database. That will allow adjustments to the spray volume to be made according to where the sprayer is.

The objective of the right dose in the right place at the right time applies to all aspects of agrichemical use. Increasingly the consumer is looking for assurance that the product they purchase is "safe" in that it has no chemical residue and that it has been produced in a way that does not harm the environment.

CUSTOMER DEMANDS

New Zealand exports food and fibre products to well over 100 countries. Importers in these countries increasingly are seeking assurance that the use of agrichemicals in the food and fibre production systems has not affected food safety, has not downgraded the environment, nor put producers or their workers at risk.

There are two ways to meet such demands—legislate or educate. Other countries around the world deal with this in different ways. Users of agrichemicals in Canada and the United Kingdom must have some form of certification which is required by legislation. New Zealand and Australia both use the self-regulatory path. In New Zealand there are four main pieces of legislation that underpin this self-regulatory approach. They are:

- The Resource Management Act 1991 (avoid, remedy, or mitigate adverse effects on the environment associated with the use of agrichemicals)
- The Hazardous Substances and New Organisms Act 1996 (risks to human health and the environment)
- The Agricultural Compounds and Veterinary Medicines Act 1997 (risks to trade in primary produce, animal welfare, and agricultural security)
- The Health and Safety in Employment Act 1992 (risks to human health)

Implications of These Acts. Without going into the detail of these various Acts, the relevant point is that the responsibility is placed on the agrichemical user to manage any risk. The essential parts of any system to manage risks include:

- Clear allocation of responsibilities
- Accurate information
- Proper documentation
- Adequate education and training of agrichemical users.

These features are an integral part of the New Zealand Agrichemical Education Trust's GROWSAFE® programme.

THE NEW ZEALAND AGRICHEMICAL EDUCATION TRUST (THE TRUST)

The Trust, formed in 1992 currently has a mission statement that reads: "To facilitate the approved and safe use of agrichemicals in NZ consistent with effective sustainable land management and environmental protection."

This mission is given effect through two initiatives—a Code of Practice and the GROWSAFE® Training and Certification programme and it is important to note that the Trust consists of user group representatives such as farmers/growers, foresters, contract applicators, both aerial and ground, and distributors. It is a non-governmental organisation. Details of activities and membership are available on the Trust website <www.growsafe.co.nz>, but what follows is an outline of how the Trust works.

Code of Practice—The GROWSAFE® Code. Legislation in New Zealand dealing with agrichemical use essentially is effects based. It does not provide details of what an agrichemical user shall or shall not do, but instead describes what outcomes must be met if agrichemicals are used. The responsibility to meet those outcomes falls on the user. At some point details are needed on what practices should be followed to ensure safe, responsible, and effective use of agrichemicals. That is the objective of the Code of Practice. The Trust is an accredited agency of Standards NZ and the Code is a NZ Standard - NZS8409:1999 Code of Practice for the Management of Agrichemicals. One result of the Code being a NZ Standard is that it must go through a public consultation process.

The Code is the agreed standard upon which agrichemical users are prepared to act in order to satisfy the safe responsible and effective use objective. The implication is that users are prepared. They may be ready, they may be willing, but are they able? That is the objective of the second key part of the Trust's work—the GROWSAFE® Training programme.

GROWSAFE® Training and Certification. The GROWSAFE® Code covers all aspects of agrichemical use including transport storage, application, and disposal and as well, sets out the training requirements for three main user groups—distributors, contractors including ground and aerial application, and applicators. Care is taken to clearly define each of these groups so that appropriate GROWSAFE® Certification is available. The Trust is not a training provider. Rather it issues GROWSAFE® Certification to those who have met the specified training requirements. The Code sets out the performance requirements in each activity (e.g., transport of agrichemicals) and is the primary resource for all the GROWSAFE® training programmes.

The Trust uses Accredited GROWSAFE® Trainers to run GROWSAFE® courses and to date over 20,000 people have attained a GROWSAFE® Certificate of some sort. Often these are attained as part of another qualification the candidate may be doing.

Some GROWSAFE® Certificates have a lifetime of 3 years (distributors and contractors) others 5 years (applicators) so there is an opportunity for a periodic update on best practice.

The primary incentive for all agrichemical users to hold the right GROWSAFE® Certificate comes through the resource consent process in the Resource Management Act, administered at the local government level. The consent to use agrichemicals will normally have conditions attached, one of which often is that the agrichemical user holds the appropriate GROWSAFE® Certificate.

The GROWSAFE® certificate is a personal qualification and there is the assumption that because the Certificate holder now knows what is required, they will adopt best practice. However to achieve safe responsible and effective agrichemical use, the user must also have the appropriate equipment and facilities. To satisfy this requirement the Trust also runs the GROWSAFE® Accreditation Programme. This involves ongoing formal auditing of the commercial operation using agrichemicals.

CONCLUSIONS

There will continue to be technical developments in the handling and use of agrichemicals, almost all to do with increased precision, which in turn leads to safer use both environmentally and from the human health viewpoint. There will also be change in response to customer demands. The Trust itself is currently undergoing a major review, the central reason being to determine whether or not they are meeting the needs of their customers.

Propagation of Several Plants Threatened with Extinction©

Tomohide Yamamoto
Minami-Kyushu University, Takanabe, Miyazaki 884-003 Japan

INTRODUCTION

In Japan, the numbers of plant species threatened with extinction have been increasing through various forms of environmental destruction. To protect the plant species from extinction, Environment Agency of Japan published a red data book in 1997. In this book, plants were classified into five categories; extinct, extinct in the wild, critically endangered, endangered, and vulnerable. The total number of vascular plants listed in these categories was 1428. The Environment Agency also showed that several factors were driving these plants to a crisis point or extinction. The largest factor is development in rural regions. The second is theft from the wild for private interests, and the third is change in vegetation. From the point of view of environmental protection and conservation of plant species, we have studied propagation of several plants threatened with extinction.

PROPAGATION OF THREATENED SPECIES

In vitro propagation of *Dionaea muscipula* Ellis and *Primula sieboldii* E. Morr. were presented at the IPPS Conference in Miyazaki Japan (1995) and at that in Odense Denmark (1998). In addition, propagation of *Pecteilis radiata* (syn. *Habenaria radiata*) from aseptic seeding was presented at the I.P.P.S. Conference in Chicago (2000). The present paper summarises in vitro propagation of *Drosera* species, *Osbeckia chinensis* L., and adaptation of *P. radiata* when restored to the original wild habitat.