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THE NECESSITY FOR NEW ZEALANDERS TO KEEP UP WITH THE LATEST PLANT SCIENCE TECHNOLOGY

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As a plant breeder I find the late 1980s an exciting time. Right now we are on the threshold of a major technological breakthrough which will be comparable in impact to the development of air transport, television, and computers.

As this breakthrough is very much in our area of activity it is essential that everyone involved in horticulture appreciates what is happening and understands the implications it has for New Zealand. I am referring to what is commonly termed "Biotechnology" or "Genetic Engineering".

The development of "improved" plants and animals has traditionally been severely restricted by a whole range of biological barriers. Even in cases where it has been possible to bypass a barrier the methods have usually taken a long time. Dr Legro's development of the red delphinium is a good example. This has taken the whole of his working lifetime.

In essence, biotechnology embraces a number of related disciplines that have reached a stage of development, and have come together, so that things which plant breeders have long wanted to do are now starting to become possible. A whole range of techniques are covered by the term "biotechnology" and central to all of these is tissue culture, a process now familiar to most of you. Some techniques are now considered "Low Tech" like embryo rescue, endosperm culture, and anther culture. Others are considered to be "High Tech" and involve unravelling and understanding the genetic code itself.

One of the big attractions of the "High Tech" end is the process of "transformation". Here it is possible to identify individual genes and to move them from one organism to another. As the genetic code is essentially common to plants, animals, and micro-organisms it is possible to put animal genes into plants and *vice versa*. It will also be possible to manufacture genes.

With traditional plant breeding, a great deal of time and effort have been required to achieve a favourable combination of genes. Such a combination can be thought of as a winning line in a lottery, but with far more numbers. When making a cross to introduce an additional desirable gene this sequence has inevitably been disrupted. Transformation offers the possibility of discretely introducing single genes or small rafts of genes without greatly disrupting the existing combination. Already people in many countries are working with genes which will confer resistance to specific pests, diseases, and herbicides, longevity to flowers, different flower and fruit colours, sweetness, and many other characteristics.

In a short article I cannot even attempt to expain the methods used. It must also be recognised that considerable background knowledge is required to be able to understand the details. However, this is no different than most of the other fields of technology we use each day. How many of us understand the electronics in our cars, televisions, or computers? The important thing is that as many horticulturists as possible understand the possibilities now opening up.

The New Zealand government, to its credit, has recognised the importance of this area by providing approximately $15 million for the development of biotechnology within DSIR over the next three years. Similar developments are being undertaken within the Ministry of Agriculture and Fisheries.

My greatest fear is lack of communication, or worse, inaccurate communication. I am not worried about communication between laboratory-based and field-based scientists. It is probably inevitable that the biotechnologist will be seen to be doing "difficult to understand" things and will, in consequence, be more highly regarded. It is also inevitable in the short term that fierce competition for funds will lead people to blur the line between what is currently possible and what they hope to achieve. However, I have no real fears that biotechnologists and plant breeders will not work together in harmony. I know that plant breeders look forward with considerable enthusiasm to the possibility of using new techniques. Equally, biotechnologists recognise that plant breeders and practical horticulturists will be necessary to ensure that their engineered plants are tested and survive in the real world.

I do fear lack of communication between the people developing the technology and the people involved in the various horticultural industries and the general public. Already garbled accounts are being published or broadcast which simply indicate lack of understanding. In addition some journalists have a penchant for portraying a "Frankenstein" image of genetic engineers.

Currently the level of communication with different sectors of the horticultural industry tends to reflect the degree of organisation

and the level of technical knowledge with these sectors. For example the kiwifruit and pipfruit industries are comparativley well organised and have established a track record in providing substantial funds for research and development. It is the ornamental industry, the one which most interests me personally, which gives me the greatest concern.

I have long felt that New Zealand had the potential to become the "Holland of the South Pacific". Overseas trips in recent years have only tended to confirm that we are letting this opportunity slip between our fingers. Short term exploitation of ornamentals developed over a long period by enthusiasts has taken place, but little or no investment in the development of new plants has been made by the ornamental sector. This is in marked contrast to countries like The Netherlands and Japan, where appreciable investment is made in developing new ornamentals. Currently our cut flower industry is dominated by plants imported from those countries. Similarly an increasing proportion of our bedding and pot plants come from Japan.

New Zealanders must face the fact that if we are to compete on the world market we must develop new products on an ongoing basis. With our geographical location, ethnic mix, and expectations of living standards, other countries are going to quickly obtain material developed here and produce it more cheaply. Unless we have something new to offer, interest in us as a supplier will quickly fade away. Ornamentals offer great scope as they are a fashion item and each product has a finite and predictable useful life.

Currently we have the scientists capable of generating a steady flow of new ornamentals and there is plenty of opportunity. For example we still await the true blue rose, blue dahlia, blue carnation, and yellow sweet pea, all of which could be developed to New Zealand's advantage. The current biotechnology plans are not surprisingly being targeted primarily at kiwifruit, apples, and agricultural plants such as clover.

It is important, if we are ever to do more than dabble with ornamentals in this country, that an appropriate infrastructure be developed. Research alone is not enough. Efficient production units with managers who have a good understanding of horticulture are essential. Quality products, produced to specification and delivered on time are as important as the new developments themselves. A knowledgeable retail sector that is prepared to promote and test locally developed material before it is offered overseas is desirable. Export sales people who understand ornamental plants, together with those who can devote sufficient time and knowledge to best exploit Plant Variety Rights and Patents in various countries are also an important ingredient.

In general the horticultural industry shows little interest in promoting horticulture as a desirable career at school level. Enroll-

ments in horticulture courses, as at other places in the world, are dropping at Lincoln and Massey Universities. Remuneration for experienced plantspeople compares unfavourably with other areas of activity. Retailers demand very high mark-ups, yet only employ staff with minimal horticultural knowledge. Producers show little understanding of what is involved in developing new plants and are often unwilling to build in a modest royalty to enable the plant breeder to do his work. None of this bodes well for the establishment of New Zealand as a centre of excellence for the development and supply of new ornamental plants.

The technology is advancing very quickly. If we do not seize the opportunity now it may be too late. Many other countries are involved in this area of study. Countries which a few years ago seemed unlikely competitors are taking positive steps to develop and exploit new technology. It is important that the ornamental industry acts as a coherent unit and that new technologies are not put into the "too difficult to understand" category. It is up to all of us to ensure that New Zealand is not left behind.

EXPORTING PLANTS FROM NEW ZEALAND

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I have had some direct experience over the last 5 or 6 years in both the preparation of material for export and the marketing of that product. I would like to relate some of those experiences to you now, tell you some of what is involved, and give you some opinions of the export scene as I see it.

My first comment relates to New Zealand's woody nursery production in relation to the rest of the world. I work for a large company and we grow a diverse range of woody plant material. Our domestic market is very small and our climatic advantages considerable. The countries into which we sell, mainly North America and Europe, conversly have large markets, producers grow a narrower range of material, and there are many different climatic zones within those areas. Many are efficient producers of large volumes. Growing a limited range they do not need large overheads to keep their production on the rails. My company is perhaps the largest of its type in the Southern Hemisphere, yet I have been on many nurseries in the United States far larger in area than ourselves, although not as intensive. I believe we are niche marketers in the export sector. We must be careful what we grow to export because, if it does not sell, there certainly is no market for that