

Regulatory Barriers to Introducing New Plants Need to Be Minimized to Grow the New Zealand Economy[©]

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EXOTIC PLANTS ARE OUR WEALTH

Exotic plants and animals have made New Zealand a wealthy country. In 2003–04, 64% of New Zealand's exports came from primary land-based industries (Table 1). These industries are almost totally built on exotic plant species. Pastoral agriculture is dominantly based on ryegrass and white clover from Europe, forestry on the Monterey pine (*Pinus radiata*) and Douglas fir (*Pseudotsuga menziesii*) from Western U.S.A., and horticulture dominated by kiwifruit (*Actinidia*) from China and apples from central Asia. Horticultural exports are made up of a much more diverse mixture of species than agriculture or forestry and over 20 fruit, 15 vegetable, and 10 ornamental species are separately itemized in the export statistics (HortResearch, 2004). All the species listed in the horticultural export statistics are exotic plants from around the world except for two native species, sphagnum moss (*Sphagnum cristatum*) and *Pittosporum* (HortResearch, 2004). Together these two products contributed \$8.6 million, which is a very small percentage of the \$2.2 billion horticultural exports in 2003–04. Some native species would also be included in the export statistics under the collective plants and foliage items but these groups are also very small (\$15.3 million) compared to the total export return.

Table 1: Land-based primary industry export receipts 2003–04.

	NZ \$ billions
Agriculture	13.05
Forestry	3.23
Horticulture	2.22
Subtotal	18.5
Total exports	28.7

(Source: Ministry of Agriculture and Forestry, 2004a.)

New Zealand growers are internationally recognised for being innovative and developing new crops. In addition to kiwifruit, commercial development has created international markets for South African *Zantedeschia* and *Sandersonia* as cut flowers and for South American feijoas [*Acca sellowiana* (syn. *Feijoa sellowiana*)] and tamarillos (*Cyphomandra betacea*) as export fruit. The ornamental industry in particular is continually searching for new colour and form in flowers, foliage, and plants to gain a market edge as fashions and demand change. These developments were made possible by the free flow of plant species into New Zealand that occurred in the past. Future developments will require a constant flow of new plant material so that new species can be evaluated and appropriate colours and forms selected and bred for international markets. Research and development and innovation

have been key drivers of the horticultural industry in the past and are likely to be key determinants of future growth (Ministry of Agriculture and Forestry, 2004b). Innovation has not only played a key role in the development of horticulture but is also seen by government as a general requirement to return New Zealand to the top half of the Organisation of Economic and Cooperation Development (OECD) rankings by 2011. To do this, government is committed to implementing policies that provide a framework to enable an innovative society to flourish (New Zealand Government, 2002).

BARRIERS TO INNOVATION

Counter to the government policy of providing suitable business conditions to enable innovative development, the regulatory legislation of the 1990s has placed significant barriers in the path of growers and plant breeders seeking new opportunities from new plant species by virtually stopping new plant species introduction. The two pieces of legislation are the 1993 Biosecurity Act, which focused on the “exclusion, eradication, and effective management of pest and unwanted organisms”, and the 1996 Hazardous Substances and New Organisms (HSNO) Act, which focuses on the “management of hazardous substances and new organisms” (New Zealand Government, 1996, 1998). Under these Acts the Ministry of Agriculture and Forestry (MAF) administers plant health standards to keep out unwanted pests and diseases on imported plant material, and a Plants Biosecurity Index (Ministry of Agriculture and Forestry, 2005), which is a list of plant species they consider acceptable to grow in New Zealand. Species not listed on the Biosecurity Index are required to go through an environmental risk assessment before being placed on the Biosecurity Index. Currently about 27,000 plant species are listed on the Biosecurity Index, but it is well known that the Index is incomplete and some botanists estimate that there are as many as 40,000 exotic plant species in New Zealand. This means that there may be up to 50% more exotic species in New Zealand than listed by MAF and yet these plants are not officially recognised as being in New Zealand. The result of this is that germplasm of these species cannot be imported until they are placed on the Plants Biosecurity Index. Although MAF is the regulatory body it does not know what plant species are in New Zealand.

The purpose of the HSNO Act is stated as “to protect the environment and health and safety of people and communities by preventing and managing the adverse effects of hazardous substances and new organisms” (New Zealand Government, 1996). Most people would agree with this sentiment, but it is the definition of a new organism, which puts a sting in the tail. The definition is: “a species of any organism which was not present in New Zealand on the date of the commencement of this Act” (New Zealand Government, 1996). This places plant species in the same category as pathogenic microbes, insects such as fruit flies, and animals such as snakes. It is important to note that the HSNO Act is focused on the adverse effects of plants rather than the much more important beneficial attributes of most plants. From this perspective it is a justifiable argument that plants should be completely removed from the HSNO Act and the biosecurity focus concentrated only on plants with undesirable characteristics. This would return plants to their previous status of free entry into New Zealand provided they met plant health standards and were not considered undesirable. After all, exotic plants provide the developed landscape of New Zealand and are the cornerstone of the New Zealand economy and way of life.

THE ENVIRONMENTAL RISK MANAGEMENT AUTHORITY (ERMA)

Under the HSNO Act any plant species that is not on the MAF Biosecurity Index needs an environmental risk assessment undertaken before it can be introduced into New Zealand. This is undertaken by ERMA who have a rapid and full assessment process. An application for rapid assessment costs \$500.00 and ERMA has to be satisfied that the organism is not unwanted and that it is highly improbable that the organism after release could form self-sustaining populations anywhere in New Zealand (taking into account the ease of eradication) or could displace or reduce valued species or cause deterioration of natural habitats (New Zealand Government, 1996) These definitions in the Act make it very difficult to consider plants under the rapid assessment process because little is known about the capability of many new species to form sustainable populations somewhere in New Zealand and what is known is a matter of conjecture. Since 1998 only two new species of Australian grass trees (*Xanthorrhoea glauca* and *X. johnsonii*) have been introduced under the rapid assessment regulations. Both were introduced for interior and semi-interior decoration and were seen to provide no environmental threat. Application to import 11 new species of *Agathis* was declined on the grounds of Maori cultural sensitivity, as covered by the Act, even though there are nine exotic species of *Agathis* already in New Zealand.

The full assessment procedure to enable a new species to be grown anywhere in New Zealand has an application fee of \$30,000 and entails a full environmental risk assessment. Not surprisingly, no new plant species have been introduced. In effect, the high fee has stopped new plant species coming into New Zealand and no new economic species have been introduced in the last 7 years. This is an extraordinary state of affairs for a country reliant on exotic plant species for its economic survival. It is also a very serious situation for our future economic development as an analysis by Halloy (1999) concluded that up to 20 new species needed to be developed each decade to maintain economic growth. Prior to the HSNO Act an estimated 500 to 600 new plant species were brought into New Zealand annually. In 7 years this equates to 3,500 to 4,200 species and at a cost of \$30,000 per species this represents a cost of \$105 to \$126 million or \$15 to \$18 million per year. As an example of the draconian nature of this legislation, today it is highly likely that kiwifruit would not have been allowed entry into New Zealand and we would not have had the opportunity to develop a billion-dollar industry (Douglas, 2005a). It is not surprising that no new plants have been brought into New Zealand under the full assessment programme because for many species it is not known whether they can be successfully grown until they have been tried. It is a trial-and-error process without any surety of success. Consequently, the risk of failure and losing money are high. Secondly, the primary applicant to bring a new plant species into New Zealand has to meet all the environmental risk assessment costs but once the plant is approved and placed on the MAF Plants Biosecurity Index it is subsequently allowed free entry. In essence, the implementation of the HSNO Act regulations by ERMA does not mirror the intentions of the Act, which requires the regulators to take into account the "enhancement of the capacity of people and communities to provide for their own economic, social, and cultural well-being" the economic benefits of any new organisms, and the sustainability of introduced flora (New Zealand Government, 1996). Essentially ERMA has prevented any adverse environmental effects by virtually stopping the introduction of new plant species. Environmental

risk has been overcome by eliminating the risk factor rather than managing it, without taking into account any economic, social, or cultural considerations of new plant introduction.

ENVIRONMENTAL RISK — HOW REAL IS IT?

In relation to plants, the HSNO Act was brought in to manage any adverse effects of new introductions. It is therefore relevant to look at past plant introductions as an indicator of what to expect in the future. From past plant introductions it is estimated that there are 30,000 to 40,000 exotic plant species growing in New Zealand. Consequently there are 12 to 15 times more exotic plant species in New Zealand than native ones. Of these exotics, 2108 or 5% to 7% of the total exotic plant species are listed as having naturalised (Wilton and Breitwieser, 2000). Of these 154 species are recognised as pest plants and are banned nationally or regionally (New Zealand Pest Plant Manual 2005). This represents 7% of the naturalised exotic species and 0.4% to 0.5% of the total exotic flora in New Zealand. It can be concluded from these numbers that any environmental threat comes from a very low percentage of exotic species and that the majority of introduced species (99%+) pose no threat to the environment at all. From this summary there seems little justification to assess all plants coming into New Zealand for environmentally harmful effects when history shows the vast majority poses no threat at all. Government regulations in the second schedule of the HSNO Act already include a short list of prohibited plants as well as other prohibited species that are listed in the Plants Biosecurity Index. Regulating unwanted plant species seems a much more sensible approach to minimize environmental risk rather than examining the environmental risk of all new plants coming into New Zealand when most are of no environmental threat. Developing a Biosecurity Index of undesirable plants instead of acceptable plants would allow the free entry of the majority of plants into New Zealand and dispense with the cumbersome bureaucracy of the open-ended Acceptable Plant Index, which has created the barrier to innovation and development.

The importation of nursery stock of plants that are on the Plants Biosecurity Index faces an additional hurdle — the requirement to meet an import health standard. Keeping out unwanted diseases and pests is a key requirement of the national biosecurity policy but currently import standards are not available for many minor crops and no importation is permissible without one. This is a second frustration for plant importers and developers and one that needs resolution.

NEW PLANT SPECIES ARE NEEDED TO GROW THE ECONOMY

The warm to temperate New Zealand environment provides ideal conditions in which to grow a very wide range of economic species. Nevertheless the number of exotic plants in New Zealand represents less than 10% of the estimated world's flowering plant flora of 422,000 (Govaerts, 2001) and many new opportunities are apparent from plant species not currently in New Zealand. Essentially, the current regulation of Government has cut New Zealand off from using this world flora as a resource to develop new products that may expand the economy. Modern transport systems mean world markets are available to New Zealand growers but there is a need for rapid action to capture the opportunities as market demands change. Fashion has an important influence on the ornamental trade, and developing new products with novel colours and forms is a key requirement to gain a market edge.

Demand for new plant products has become more sophisticated with increased emphasis on plants as resources for specific plant compounds. This is the concept of plants as factories' where new plant compounds are sought as starting blocks for new industrial products or bioactive compounds are extracted for use in foods, cosmetics, and natural medicines (Douglas, 2005b). Beneficial plant characteristics are now being identified at the molecular level and with modern plant breeding methods they can be used to enhance the economic potential of unrelated species. New plant species and their targeted development for specific end uses will be needed for new market opportunities, environmental adaptation to climate change, and resource issues such as bioenergy production. The increasing importance of identifying and understanding the constituents of plants emphasizes the need to safeguard the world biodiversity of plants for possible future use. This requires an active global policy to protect threatened and endangered species. New Zealand has a role to play in providing a safe haven for species that will grow here. Currently we cannot offer this haven for plant species not listed on the Biosecurity Index. This need and all the opportunities and benefits that new species bring require a constant flow of new plant material into New Zealand and for this to happen there need to be minimal barriers to new plant introductions.

CONCLUSION

The biosecurity and HSNO regulations introduced in the 1990s have stopped the entry of new germplasm for evaluation, selection, or breeding within New Zealand for the last 7 years. For a country dependent on exotic species for its wealth this amounts to a national disaster. Exotic plants are the backbone of the New Zealand economy and there is a requirement for a continual flow of new plants entering New Zealand to develop new products for new market opportunities. Unless the regulations are changed the lack of new plant material coming into New Zealand is likely to have serious long-term consequences for the economy. The regulatory emphasis on the adverse environmental threat of new exotic plants is totally misplaced compared to the benefits that new plant material can bring. Plant import regulations should focus on keeping unwanted plants out of New Zealand and allow the free entry of all other plants provided they meet disease and pest health standards.

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Unforeseen Consequences[©]

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INTRODUCTION

Every person on earth has an individual view of the world. This is influenced by the culture in which we are raised, by our education, and by individual experiences as we pass through life. Misunderstandings often arise when discussing a topic if we do not check out the other person's perceptions, or we do not clearly explain our own. I trained as a plant pathologist and converted myself into a plant breeder of both fruiting and ornamental plants. As a consequence, I have a heightened awareness of the need to balance potential benefits from importing plants against the risks.

I also believe in collective custodianship, rather than the notion that naturally occurring plants or animals can be "owned" by anyone. By this, I mean that we live in a global village and have a shared responsibility to preserve biodiversity worldwide. We do not just have responsibility for the plants and animals that happened to have evolved within New Zealand.

IMPORTANCE OF GERMLASM

Economically New Zealand's rural industries are almost totally based on exotic germplasm, whether this be pine trees (*Pinus radiata*), roses, or cows. As a consequence, New Zealand has frequently acted as an unwitting Noah's Ark. Cultivars of several genera that have been lost elsewhere in the world have survived in gardens here in New Zealand. A good example is *Cosmos atrosanguineus*, the chocolate-scented cosmos. This plant is a native of Mexico, but has died out in its country of origin. Fifty years ago this plant was normally raised from seed. With the advent of tissue culture propagation a single clone was disseminated worldwide, displacing other strains. Individual plants of many members of the Asteraceae are self-incompatible and without other plants that are genetically distinct they are unable to set seed. This is the case with the clone currently available commercially. All vegetatively propagated cultivars become less thrifty over time and the plant was potentially in danger of being lost to cultivation as well as in the wild. Fortunately Russell Poulter of Dunedin was able to locate some remnant plants of *Cosmos atrosanguineus* that predated the tissue-cultured strain and the possibility to reestablish and further develop the plant now exists.