

# Exotic plants are the lifeblood of New Zealand: less regulation is needed to allow more new species into this country

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## Exotic plants provide our exports and day to day living

Exotic plants and animals are the basis of our wealth. In 2003–2004, 64% of New Zealand's exports (Table 1) came from primary land-based industries which are almost totally based on exotic plant species. Our farm animals graze on pastures dominated by ryegrass and white clover from Europe, forestry is dominated by the Monterey pine and Douglas fir from western USA and horticulture by kiwifruit from China and apples from central Asia. Horticultural exports consist of a diverse mixture of products with more than 60 species itemized in the export and domestic production statistics. All are exotic plants except for two native species, sphagnum moss and *Pittosporum* (HortResearch, 2004). The latter two contributed NZ\$8.6m to export earnings, but even allowing for some native plant exports within the generic plant category (\$15.3m), the amount earned by native species is a very small percentage of the \$2.2 billion earned by horticultural exports in 2003–2004.

In addition to national exports, locally grown products from exotic plants are part of our daily lives. Timber for our houses, the flowers we decorate them with, our newspapers, and the food we enjoy, such as breakfast cereals, bread, fruit, vegetables, beer and wine, all come from exotic plant species. New Zealand provides a wonderful plant-growing environment that has enabled New Zealanders to successfully grow and develop a wide range of plant species, turning the country from one devoid of staple food plants into an important

food producing nation. At the same time, the beauty and utility of our developed landscape is largely made up of exotic species. Lawns and sports fields, garden plants, hedges, shrubs and trees in public and private gardens in our cities, towns and rural areas are all dominated by exotic species, as are our botanical gardens and large plant collections such as at Pukeiti and Eastwood Hills, which attract visitors from around the world. Such places are important national resources for tourism revenue; for example, the Christchurch Botanic Gardens attracts over a million visitors annually and 60% of the tourists that visit the city (D. Given, personal communication). Exotic plants are an essential part of the fabric of our society and this has only been made possible by the free flow of plants into New Zealand in the past. This pool of plant material, together with a superior plant-growing environment for many exotic species, has provided New Zealand growers with opportunities to develop the commercial potential of new species.

**Table 1: Land-based primary industry export receipts 2003–2004**

	NZ\$ billions
Agriculture	13.05
Forestry	3.23
Horticulture	2.22
Subtotal	18.50
Total exports	28.70

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

## Innovation is important for the economy

New Zealand growers are well known internationally for innovation and development of new crops. In addition to kiwifruit other crops that have been developed into commercial successes are the South African flowers, *Zantedeschia* and *Sandersonia*, and the South American fruits, feijoa and tamarillo. Innovative research and development has been a key driver of the horticultural industry in the past and is likely to be a key determinant of future growth (Ministry of Agriculture and Forestry, 2004b). 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. To allow this development to continue there needs to be a constant flow of new plant material in the future. The government states that New Zealand requires innovation if it is to return to the top half of the OECD rankings by 2011 (New Zealand Government, 2002) and is committed to implementing policies that provide an open and competitive economy and a framework that allows innovative research and development to flourish. In spite of this commitment, the New Zealand business environment is still characterised by significant regulatory barriers and compliance costs which hinder innovative development (Ministry of Agriculture and Forestry, 2004b).

## Regulatory barriers to innovation

Legislation passed in the 1990s has placed barriers across the path of

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growers and plant breeders seeking new opportunities from new plant species, virtually stopping the introduction of new species. The 1993 Biosecurity Act focuses on the 'exclusion, eradication and effective management of pest and unwanted organisms' and the 1996 Hazardous Substances and New Organisms (HSNO) Act 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 (available at <http://www1.maf.govt.nz/cgi-bin/bioindex/bioindex.pl>), which is a list of plant species considered acceptable for growing in New Zealand. Plant species that are not listed on the Biosecurity Index are required to go through an environmental risk assessment before being placed on the Index. Currently, about 27 000 plant species are listed but it is well known that the Index is incomplete and some botanists estimate there are as many as 40 000 exotic plant species in New Zealand. This means 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. As a result, germplasm of these species cannot be imported until they are placed on the Plants Biosecurity Index. Thus, although MAF is the regulatory body, it does not know what plant species are in New Zealand.

### The HSNO Act

The stated purpose of the HSNO Act is '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). One principle

relevant to the Act is the need for people to maintain and enhance their capacity to provide for their own economic, social and cultural well-being as well as taking into account the economic and related benefits from new introduced organisms. Most people would agree with the purpose of the HSNO Act, but the definition of a new organism under the act as 'a species of any organism which was not present in New Zealand on the date of the commencement of this Act' places plant species alongside pathogenic microbes, insects such as fruit flies, and animals such as snakes (New Zealand Government, 1996). It is important to note that the HSNO Act focuses on the adverse effects of plants rather than on 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 with the biosecurity focus remaining only on plants with undesirable characteristics. This would return plants to their previous status of free entry into New Zealand provided they meet plant health standards and are not considered undesirable. After all, exotic plants are the cornerstone of the New Zealand economy, providing the structure and functionality of our developed landscape and resources for our future.

The definition of a new organism raises a second point of contention about the difficulty of proving whether a plant species was in New Zealand when the act came into force. With the inadequacy of the Plants Biosecurity Index, there are a large number of plant species happily growing in New Zealand that do not exist in the eyes of the bureaucracy. This has created a high level of frustration amongst plants people as it is often difficult to prove when a plant species was imported into New Zealand as documentation was not always

required. Rather than attempt to prove to authorities that a plant species is legitimately in New Zealand and risk possible forfeiture of plants, many plant collectors have now chosen to keep their collection lists confidential (Brockerhoff et al., 2004).

### The Environmental Risk Management Authority (ERMA)

Environmental risk assessments for new plant species are undertaken by ERMA, which operates both a rapid and a full assessment process. The fee for a rapid assessment is \$500 and ERMA must 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 a valued species or cause deterioration of natural habitats (New Zealand Government, 1996). These definitions under section 35 of the HSNO Act make it very difficult to consider plants under the rapid assessment process as little is known about many new species, and whether or not they are capable of forming sustainable populations somewhere in New Zealand is a matter of conjecture. Since 1998 only two new species have been introduced under the rapid assessment regulations Australian grass trees (*Xanthorrhoea glauca* and *X. johnsonii*). Both were introduced for interior and semi-interior decoration and were seen to provide no environmental threat. An application to import 11 new species of *Agathis* was declined on the grounds of Māori cultural sensitivity as covered by the act even though there are nine exotic species of *Agathis* already in New Zealand (ERMA – <http://www.ermanz.govt.nz/search/registers.html>).

The full assessment procedure required 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. Unsurprisingly, no new plant species have been introduced since the requirement came into force. The high fee has in effect stopped new plant species coming into New Zealand and no new economic species have been introduced in the last seven years. This is an extraordinary state of affairs for a country reliant on exotic plant species for its economic survival. It is also a serious situation for our future economic development. 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 500–600 new plant species were brought into New Zealand annually, which would equate to 3500 to 4200 species over seven years. At a cost of \$30 000/species, this represents a cost of \$105–126m for the 7-year period or \$15–18m/year. Under this legislation, it is highly unlikely that kiwifruit would be allowed to enter New Zealand today because it is a vigorous growing vine. We would thus have foregone 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 as we do not know whether a particular species can be successfully grown until we try it. It is a trial and error process without any surety of success and consequently a high risk of failing and losing money. Secondly, the primary applicant to introduce 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 MAF's Biosecurity Index, its subsequent entry is free.

Examination of the HSNO Act shows that the implementation of the regulations by ERMA does not mirror the intentions of the act,

which requires regulators to take into account the economic, social and cultural wellbeing of people, 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 of new species by establishing a barrier to their introduction. Environmental risk has been overcome by eliminating the risk factor rather than managing it. Criticism of the HSNO Act regulations has also been voiced by MAF, who consider the regulations should facilitate wealth creation and innovation while managing risk. The processes must be changed so that users are not faced with insurmountable up-front costs and uncertainty (Ministry of Agriculture and Forestry, 2004b). There is also a suggestion that the HSNO regulations are encouraging the relocation of innovative plant research overseas (NZ Institute of Economic Research, 2003).

#### **Environmental risk – how real is it?**

The HSNO Act was brought in to manage any adverse environmental 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 there are 30 000–40 000 exotic plant species growing in New Zealand. Consequently, there are 12–15 times more exotic plant species in New Zealand than native ones. Of these exotics, 2108 or 5–7% of the total are listed as having naturalised (Wilton and Breitwieser, 2000) and 154 species are listed as being banned nationally or regionally as pest plants (New Zealand Pest Plant Manual, <http://www.protectnz.org.nz>). They represent 7% of the naturalised exotic species and 0.4–0.5% of the total introduced flora in New Zealand. Historically therefore, the vast majority of introduced species

(more than 99%) have not threatened the environment at all with the environmental threat coming from a very low percentage of introduced species. There is no reason to expect that this low level of environmental threat will change in the future and consequently there is little justification to assess all plants coming into New Zealand for environmentally harmful effects. Since the HSNO Act is specifically directed at adverse effects of new plants, it seems logical that the focus should be on identifying known unwanted plants. Government regulations in the second schedule of the HSNO Act already include a short list of prohibited plants as well as other prohibited species listed in the Plants Biosecurity Index. Development of a Biosecurity Index of undesirable plants instead of an index of acceptable plants would allow free entry of the majority of plants into New Zealand and enable us to dispense with the cumbersome bureaucracy of the present open-ended list of acceptable plants, which has created so much anger and frustration amongst plants people and put up barriers to innovation and development. The current focus of the plant importation regulations applies to less than 1% of past plant importations and change is needed to focus on the 99% of the exotic plants that are of benefit to our well-being and environment.

Importing nursery stock of plants on the Biosecurity Index involves an additional hurdle, that is, the requirement to meet an import health standard. Keeping out unwanted diseases and pests is a key requirement of the national biosecurity policy, but there are no import standards available for many minor crops and no importation is permissible without one. This is another frustration for plant importers that must be resolved.

### **New plant species are needed to grow the economy**

The favourable New Zealand environment provides excellent conditions for growing a very wide range of economic species as shown by previous plant introductions. 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). Plant species not currently in New Zealand offer many new commercial opportunities.

Essentially, current government regulations have cut New Zealand off from using the world flora as a resource to develop new products to expand the economy. The need to change the regulations to allow better access to the world flora was the subject of the 2004 Banks Memorial Lecture published in this journal (Cave, 2004).

Modern transport systems mean world markets are available to New Zealand growers, but there is a need for rapid action to capture opportunities as market demands change. Fashion has an important influence on the ornamental trade and developing new products with new colours and form is a key requirement to gain a market edge. The demand for foods with functional health properties has increased the search for plants that provide beneficial compounds. This emphasis on what plants contain rather than the plant itself has promoted 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 so that they are available to improve other economic plants. These advances, as well as new plant species, will play a role in developing new foods, flowers,

medicines and industrial products and in addressing national issues such as bioenergy and climate change. The increasing importance of the constituents of plants emphasizes the need to look after the world biodiversity of plants for possible future use. This requires an active policy internationally to protect threatened and endangered species and allow New Zealand access to this resource.

### **Saving the world plant diversity for future use**

The intrinsic importance of plants globally was recognised at the 1992 Earth Summit in Rio de Janeiro with the signing of the Convention on Biological Diversity (<http://www.biodiv.org>) by most nations including New Zealand.

Two of the main goals of the convention are the conservation and sustainable use of biological diversity. The HSNO Act states the need to take into account our international obligations and the sustainability of valued introduced flora, but the New Zealand government's policy towards the convention has been to emphasize the conservation of the native flora and the negative effects of exotic species on natural habitats rather than to focus on the untold benefits of exotic species (Brockerhoff et al., 2004). This is in spite of the fact that exotic species provide the backbone of our economy and outnumber native species 13–15 times.

New Zealand could have an important role internationally as a global refuge for the conservation of many plant species threatened by exploitation, habitat destruction, and rampant diseases and pests. Already there are 267 globally threatened tree species growing in New Zealand (Brockerhoff et al., 2004). Botanical gardens and private plant collections have a valuable role in protecting biodiversity, but under the current plant importation regulations such

collections are virtually impossible to expand. It is also impossible to begin new collections with species not on the Biosecurity Index. For example, the 13 000 plant species introduced by the Dunedin Botanic Garden prior to the HSNO Act (T. Myers, personal communication) would theoretically cost \$390 million under the current ERMA fees of \$30 000/species. Saving the plant biodiversity of the world is highly relevant to New Zealand because of the importance of exotic species to the economy and our everyday lives. Consequently, government regulations need to take into account the need to build up our exotic biodiversity by providing easier access to the world flora while conserving and protecting our native flora.

### **Conclusion**

The biosecurity and HSNO regulations introduced in the 1990s have resulted in no new germplasm for evaluation, selection, breeding or conservation entering New Zealand over the past seven years. For a country dependent on exotic species for its wealth this should be viewed as a national disaster. Exotic plants are the backbone of the New Zealand economy and the lifeblood of the nation and we need 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. Current regulatory emphasis on the possible adverse environmental threat of all new exotic plants is totally misplaced compared to the benefits that new plants may bring. Most plants introduced into New Zealand have not caused any environmental harm and consequently the need to use the HSNO Act to protect the environment from new plants is draconian bureaucracy and puts up unneeded regulatory barriers to

plant introduction. Plants should be removed from the jurisdiction of the HSNO Act and its focus directed at excluding plants that are known to adversely affect the New Zealand environment. This could be achieved by developing a list of prohibited species and scrapping the present list of acceptable species, which would allow free entry of all new plant species into New Zealand provided they meet the required plant health standards and are not on a list of prohibited species. Exotic plants are our lifeblood.

### Acknowledgements

I would like to thank Tom Myers of the Dunedin Botanic Garden and David Given of the Christchurch Botanic Gardens for supplying information on plant introductions.

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If the present regulations existed 100 years ago, Chinese gooseberry plants would probably not have been allowed into the country and one of the giants of New Zealand horticulture, the kiwifruit industry, would simply not exist here. Image courtesy of HortResearch

Jim Douglas is one of the most widely experienced plant scientists in New Zealand with 40 years experience and an in-depth knowledge of both the agricultural and horticultural industries. In the late 1980s he was appointed national science leader for new crop development in MAFTechnology with teams working on herbs and medicinal crops, essential oils and edible fungi with research closely linked to export market identification and test market assessment. Jim moved into Crop & Food Research when it was formed in 1992 and continued new crop development on a wide variety of herb, medicinal and vegetable crops. He is author of more than 130 papers, a profusion of reports, and has sat on innumerable research committees. He is a joint member of NZ Institute of Agricultural Science and NZ Society of Horticultural Science, an ex council member of NZIAS, and Fellow of NZSHS.