

## A South African perspective on plant introductions: motivations, problems and processes

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**Summary** This paper provides some South African examples of the motivations for introducing plants, conflicts of interest, and current thinking on how to deal with the problem. The key intervention is the new Biodiversity Act, which will bring sweeping changes to responsibility and accountability in terms of introducing new, and potentially invasive, species into the country. It will need to be balanced with campaigns aimed at raising awareness, and will need to be broadened to include neighbouring countries.

**Keywords** Working for Water programme, forestry, nurseries, legislation, conflicts of interest.

### INTRODUCTION

The introduction of plants to new areas (both deliberately and accidentally) is a global phenomenon, as is the observable fact that many of these introduced species become invasive, and cause significant economic and environmental damage. It is also true that many introduced species provide economic and other benefits. Sometimes the same species provides benefits and causes problems, leading to conflicts of interest. This paper provides some South African examples of the motivations for introducing plants, the conflicts of interest that can and do arise, and current thinking on how to deal with the problem.

### STATUS OF INVASIONS

Invasive alien plants are a significant problem in South Africa, affecting almost 10 million hectares (8.28%) of the country (Le Maitre *et al.* 2000). Estimates of the number of invasive alien plants vary from 161 (Henderson 1995) to 469 (Wells *et al.* 1986). Nel *et al.* (2004) list 117 major invaders (based on geographic range and abundance) and 84 emerging invaders (based on their potential to spread). The rate of arrival in South Africa of alien plants that have subsequently become invasive has increased during the historical period. From 1650–1750 the rate of arrival was 5.4 species per decade, from 1750–1820 it was 4.7 per decade, from 1820–1900 it was 25.9 per decade and from 1900–1985 it was 20.6 per decade – data derived from 469 species with known first arrival dates (Wells *et al.* 1986). This increase is not even an order of magnitude,

but the recent increase is probably underestimated as many alien species exhibit a long ‘lag period’ before they become noticeably invasive. Most invasive alien plant species in South Africa (72%) originate from Australia and South America (Richardson 1997).

### REASONS FOR INTRODUCTION

Alien plants have been introduced into South Africa deliberately for a host of reasons, and accidentally. The deliberate reasons for introduction are dominated by forestry, agro-forestry and horticulture, with few examples of agricultural crops becoming invasive.

Large areas of South Africa are invaded by trees that were introduced for plantation forestry, sand-dune reclamation or woodlot species (Le Maitre *et al.* 2000). These species were actively promoted by government forestry organisations. Alien plants also conspicuously dominate most public and private gardens throughout South Africa. An analysis of gardening manuals revealed that over 75% of species promoted for gardening were alien (Richardson *et al.* 2003). More recently, deliberate introductions of plants have occurred to support alien animals including, amongst others, food plants for butterfly collections, and a range of eucalypts to support a pair of koalas donated by the Australian government.

Accidental introductions are more difficult to assess, due to a lack of records. Many herbaceous alien plant species were introduced in consignments of horse fodder during the Anglo-Boer War (1899–1902).

### SOME EXAMPLES OF CURRENT RESPONSES

**The ‘Working for Water’ programme** South Africa’s Working for Water programme (van Wilgen *et al.* 2002) is a multi-departmental government initiative aimed at the control of invasive alien plants. As its name implies, it focuses on reducing the impacts of invasive plants on water resources through the creation of employment in poverty-affected areas. The programme has targeted existing infestations, using a combination of mechanical and chemical control, and biological control. It has an annual budget of R400 million (1 rand = 6.5 US \$). However, it does not address

the vital issue of the prevention of introduction of new invasive species. The lack of any effective means of preventing new introductions of potentially invasive species is now seen as a significant weakness in South Africa's overall approach to the problem of invasive species. It will be addressed, in part at least, by South Africa's new Biodiversity Act (see below).

**The new Biodiversity Act** South Africa's new Biodiversity Act, passed in 2004, tasks government with the publication of a national list of invasive species. Once this list has been published, it will be an offence to carry out any restricted activity using a listed invasive species without a permit. These restricted activities include importation, ownership, propagation, transport, and trade. In addition, permits will only be issued after a prescribed assessment of risks and potential impacts on biodiversity has been carried out. People in possession of a permit will have a 'duty of care', which includes taking steps to ensure that the species does not spread. All landowners will have to notify government of the occurrence of listed invasive species on their land, and take steps to control the species. Government may issue directives to permit holders or landowners to take steps against the invasive species concerned, and if they fail to do so, government may implement the steps themselves, and recover the costs from the permit holders or landowners. In addition, anyone can ask government to issue a directive, and if government fails to do so, that person may apply to court for a directive to be issued. This means that citizens are empowered to take action against offenders if government fails to do so (for example, if an owner of land free of invasive plants wishes to take action against a neighbour on whose land such plants occur).

The effectiveness of the new Act will depend largely on two things. One is the degree to which it will be enforced, and the second is the species that are listed in terms of the Act. Currently, the candidates for the list are being debated. Whether the list will be a restricted list (listing species of known high risk only), or a comprehensive list of all species where the risk is not understood, is an important consideration. If the latter approach is followed, the onus will be on importers to take all of the risk of a species becoming invasive onto themselves.

**The nursery partnership** It is realised that legislation alone will not be sufficient to deal with invasive species, and attempts have also recently been made to raise awareness of the problem. The Working for Water programme initiated a partnership between the Department of Agriculture, the Department of Environment Affairs and Tourism, the South African

Nursery Association and the gardening public. The partnership has several aims:

- to ensure that nurseries do not stock or sell invasive alien plants;
- to dissuade customers from buying invasive alien plants;
- to develop a system of endorsement for nurseries that encourage the planting of indigenous and non-invasive alien plants; and
- to ensure that staff at nurseries are equipped to answer queries about invasive alien plants, and alternatives.

These aims are being addressed through awareness campaigns, training projects focused on nursery staff, and research to establish the awareness of and attitudes to invasive alien plants by nurseries and their customers. To date, it is the only example of such an initiative in the country.

**Conflicts of interest** Conflicts of interest often arise when invasive alien species also have potential use. This problem will remain for two reasons. First, there are already substantial interests in established species, and secondly, there will be ongoing pressure from many quarters to import new alien species for horticulture, forestry, agroforestry, agriculture, aquaculture and other uses. The case of black wattle (*Acacia mearnsii* De Wild.) provides a good example.

The black wattle tree was introduced into South Africa from Australia in the 19th century. It is an important commercial species, as well as an aggressive invader, giving rise to significant environmental impacts and conflicts of interest. An analysis of costs and benefits associated with this species (De Wit *et al.* 2001) suggested that a 'do nothing' scenario (with no attempts being made to control the spread of the species beyond the limits of plantations) is not sustainable, as the benefit/cost ratio was around 0.4. The most attractive control option would be to combine physical clearing and plant-attacking biological control with the continuation of the commercial growing activities. In case this is not practically feasible, the next best option is a combination of seed-attacking biological control, physical control and the development of secondary industries based on wood products from clearing programmes. There is, however, a 40% loss of benefits involved with this option when compared with the first best option.

A suitable biocontrol agent has recently been screened for use on black wattle and is ready for release. This agent, a gall-forming fly, will reduce seed output, but it may also reduce the vigour of the tree. This may necessitate a full environmental impact assessment, similar to the test case of Paterson's curse

(*Echium plantagineum* L.) in Australia (Nordblum *et al.* 2001), and it promises to be a watershed test case.

#### WAY FORWARD

The ability to address the prevention of introduction of new invasive weed species to South Africa is almost non-existent at present, and much remains to be done to develop and implement effective measures. While the new Biodiversity Act does create an opportunity to address some of these issues, much will depend on developing complementary measures to raise awareness. As a mainland country, South Africa also faces significant challenges in co-ordinating its approaches with neighbouring countries.

#### REFERENCES

- De Wit, M., Crookes, D. and van Wilgen, B.W. (2001). Conflicts of interest in environmental management: Estimating the costs and benefits of a tree invasion. *Biological Invasions* 3, 167-78.
- Henderson, L. (1995). 'Plant invaders of southern Africa'. (Plant Protection Research Institute, Pretoria).
- Le Maitre, D.C., Versfeld, D.B. and Chapman, R.A. (2000). The impact of invading alien plants on surface water resources in South Africa: A preliminary assessment. *Water SA* 26, 397-408.
- Nel, J.L., Richardson, D.M., Rouget, M., Mgidi, T., Mdzeke, N.P., Le Maitre, D.C., van Wilgen, B.W., Schonegevel, L., Henderson, L. and Naser, S. (2004). A proposed classification of invasive alien plant species in South Africa: towards prioritising species and areas for management action. *South African Journal of Science* 100, 53-64.
- Nordblum, T., Smyth, M., Swirepik, A., Sheppard, A. and Briese, D. (2001). Benefit-cost analysis for biological control of *Echium* weed species (Pater-son's curse/salvation Jane). In 'The co-operative research centre (CRC) for weed management systems: an impact assessment', Technical Series No. 6, pp. 35-43. (CRC for Weed Management Systems, Adelaide).
- Richardson, D.M. (1997). Alien plant invasions. In 'Vegetation of Southern Africa', eds R.M. Cowling, D.M. Richardson and S.M. Pierce, pp. 535-70. (Cambridge University Press, Cambridge).
- Richardson, D.M., Cambray, J.A., Chapman, R.A., Dean, W.R.J., Griffiths, C.L., Le Maitre, D.C., Newton, D.J. and Winstanley, T.J. (2003). Vectors and pathways of biological invasions in South Africa – past, present and future. In 'Invasive species: vectors and management strategies', eds G.M. Ruiz, and J.T. Carlton, pp 298-349. (Island Press, Washington).
- Van Wilgen, B.W., Marais, C., Magadlela, D., Jez-ile, N. and Stevens, D. (2002). Win-win-win: South Africa's working for water programme. In 'Mainstreaming biodiversity in development: case studies from South Africa', eds S.M. Pierce, R.M. Cowling, T. Sandwith and K. MacKinnon, pp. 5-20. (The World Bank, Washington DC.).
- Wells, M.J., Balsinhas, A.A., Joffe, H., Engelbrecht, J.A., Harding, G. and Stirton, C.H. (1986). 'A catalogue of problem plants in southern Africa' (Memoirs of the Botanical Survey of South Africa 53, Pretoria).