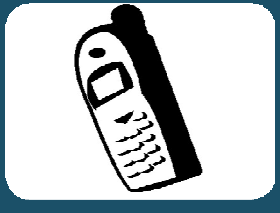
TRADE & INDUSTRIAL POLICY STRATEGIES

asset RESEARCH

POLICY BRIEF

Supporting livelihoods through the protection of natural capital: A case study of the Agulhas Plain



INTRODUCTION

Ecosystems are a form of natural capital. Invasions by introduced alien plant species alter ecosystems, often reducing supplies of valuable ecosystem goods and services and imposing substantial costs on South Africa's economy. Reversing these losses by removing alien plants imposes further costs because clearing and control operations are expensive. However, the high costs can be offset by the benefits of creating employment opportunities through such operations and the livelihood benefits that can be derived from the cleared land.

Using the Agulhas Plain as an example, this policy brief compares two different post-clearing land-use options that can be used to support livelihoods in the area, namely: restoring natural capital to allow wildflower harvesting, or using the land for bioenergy production. The different costs and benefits associated with each option are illustrated, together with guidelines about how to deal with selecting post-clearing land-use options.

The nature and value of livelihood benefits that can be derived from cleared land vary between different areas and call for a careful understanding of the ecosystem goods and services that are provided. Ecosystem goods can be defined as tangible products that ecosystems provide, whereas ecosystem services are benefits that result from ecosystem functioning (Turpie, 2004).

Ecosystem goods and services can have direct or indirect value. Direct value is derived if the good or service is captured in a market, i.e. traded between people or organisations. Indirect value is inferred from goods and services that are not traded and to which it is more difficult to attach a monetary value, such as placing a value on the air that we breathe. When comparing different land-use options, it is necessary to weigh the associated costs and benefits against each other.

The public and private sectors are both showing increasing interest in bioenergy as a way of reducing South Africa's greenhouse gas emissions and contributing towards a sustainable energy supply. It has often been suggested that the potential threat to food security could be reduced by using marginal land, including land invaded by alien trees, for bioenergy production. In contrast, strong arguments can also be made for the protection of South Africa's biodiversity and ecosystem services through restoring natural vegetation in many invaded areas. Although many areas are arguably marginal for agriculture, they provide critical ecosystem services, a characteristic that should not be overlooked.

ASPECTS TO CONSIDER

- All direct and indirect costs and benefits associated with different land-use options must be identified and compared. If the cost or benefit is not included in an explicit market, or if a monetary value for the attribute does not exist, it must be included in a qualitative manner.
- It is necessary to understand how the demand and supply of ecosystem services varies within an area as well to account for downstream (off-site) benefits.
- Different scenarios of how ecosystem services can be expected to change over time must be envisaged, and livelihood options selected accordingly.
- Infrastructure constraints and loss of economies of scale when dealing with fragmented land-use must also be considered.

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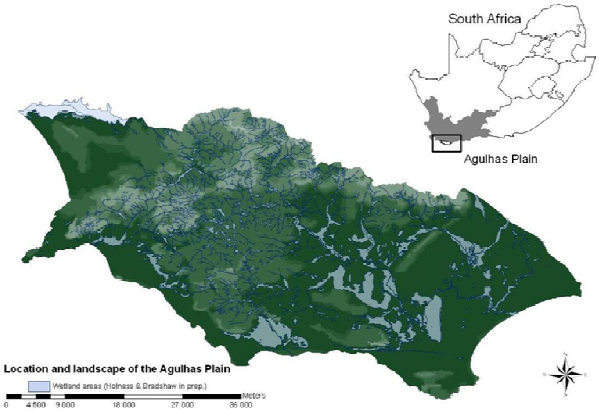

Figure 1: Location of the Agulhas Plain
Source: Nowell (2011)

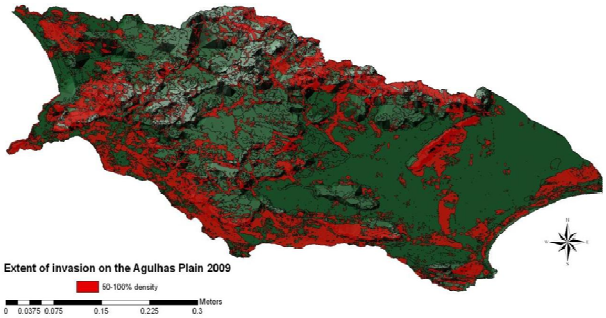

Figure 2: Extent of invasion on the Agulhas Plain
Source: Nowell (2011)

THE AGULHAS PLAIN

The Agulhas Plain is a low-lying coastal region at the southern-most point of the African continent (See Figure 1). It falls within the world renowned Cape Floristic Region, known for its diverse flora and the variety of the landscapes and tourist attractions. There are more than 1 500 species of plants within the 2 160 square kilometres of the Agulhas Plain. About 100 of these are found nowhere else and about 110 species are listed as threatened. There are more than 230 bird species and bird watching on the wetlands is one of the prime attractions. The combination of rocky and sandy coastlines supports a diverse marine and intertidal life and provides nesting sites for rare coastal birds like the African black oystercatcher.

The Agulhas Plain traditionally specialised in dairy and grain farming but the economy has recently begun to diversify. The area has also become an important wine producing area, specialising in white wines which do well in the cool conditions. There is an indigenous flower harvesting industry which provides employment for more than 25 000 people (Heydenrych, 1999). Tourism is increasing in importance, especially shark and whale viewing from boats and underwater.

The plains, particularly the wetlands, have been invaded by a variety of introduced plant species that often form dense stands. These include Australian Acacia species, pines, myrtle and eucalypts, which use more water than the natural fynbos vegetation. There are several different vegetation types on the Agulhas Plain which have been invaded to varying degrees, as detailed in Figure 3. About 23% of the Agulhas Plain is invaded by alien species when expressed as the equivalent area of dense stands (See Figure 2).*

**If 25% of an area of 100 ha has been invaded, the equivalent dense stand is 25 ha.*

POST-CLEARING LIVELIHOOD OPTIONS

The government's Working for Water programme was initiated in 1995 with the dual purpose of clearing invasive vegetation and facilitating poverty alleviation through creating employment. Milton et al. (2003) estimated that the programme employed 24 000 people in 2000. The extent of invasion on the Agulhas Plain suggests that the total employment benefits of alien clearing in the area could be more than one million person days. The table below shows the total person days per hectare for initial and follow-up clearing.

Density of invasion	**Acacia species**	**Eucalyptus species**
75-100% density	33.89	30.91
1-5% density	2.45	11.51

Source: Marais and Wannenburgh (2008)

The Working for Water programme has historically not paid much attention to *post-clearing land-use*. The post-clearing land-use options that are considered in this policy paper are: (1) restoring cleared areas using natural fynbos species; and (2) planting biomass crops for energy.

The land-use options yield divergent benefits. Restoring the invaded areas with natural fynbos species will allow for income generation from wildflower harvesting, and will create opportunities for employing the local community. Fynbos vegetation uses less water than alien tree species. Using remote sensing, Nowell (2011) estimated that 82 million kilolitres of water can be made available per year by clearing all the invaded areas on the Agulhas Plain, and restoring them to fynbos. Although the Agulhas Plain is on the coast and the water that would be released would hold limited marketable value, it will provide indirect benefits such

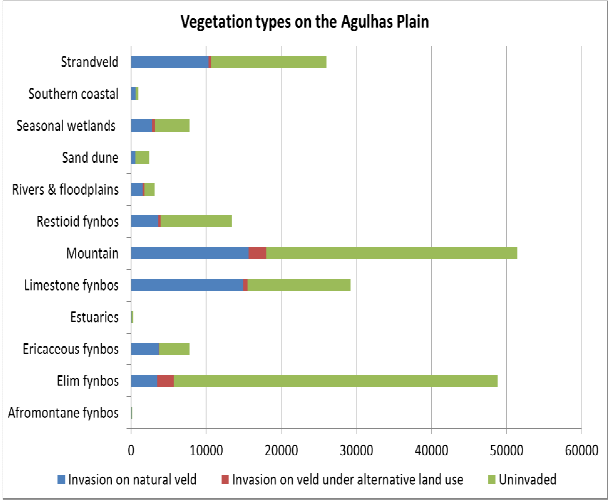

Figure 3: Hectares invaded on the Agulhas Plain per vegetation type and land-use. *Source: Nowell (2011)*

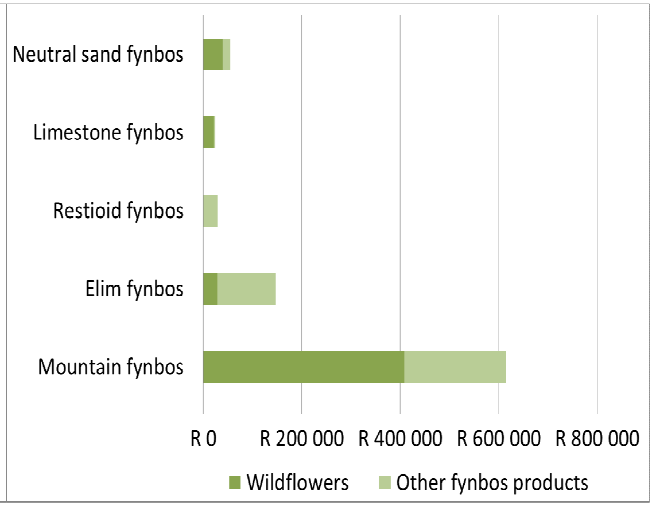

Figure 4: Potential net income per year from fynbos products. *Source: Fourie, De Wit, Van der Merwe (2011)*

as increased dilution of run-off and waste water from dairy farms, or improved estuary conditions and fish habitat by increasing flows through the estuary. Improved fish habitat would increase fish stocks and, potentially, the income of fishermen in the area. Recreational fishing would also benefit.

Finally, restoring the natural vegetation would assist in sustaining the valuable biodiversity of the area. By allowing sustainable wildflower harvesting from the restored areas, a direct use value is attached to the fynbos. This not only encourages the local communities to protect it, but also allows them to generate income from harvesting products from the restored veld. Products provided by fynbos vegetation include wildflowers, honey bush used for brewing tea, and thatching reed. Strandveld fynbos provides non-landowners with an opportunity to derive income from drying and selling sourfigs, but they are often harvested illegally from privately owned land.

If all invaded areas on the Agulhas Plain were restored to their natural state, additional net income of R870 000 could potentially be derived from wildflowers and other fynbos products (excluding sourfig harvesting. (See Figure 4). An experimental study has shown that active restoration through mulching and sowing native fynbos species can significantly increase the income that can be derived from restored areas (Gaertner et al, 2012). Restoration of mountain fynbos provides the largest share of benefits from wildflower harvesting, suggesting that restoration of these areas should be prioritised. In addition, wetland restoration would enhance bird habitats and draw more bird watchers to the area. Bird watchers are typically wealthy and stay for more than one day in the area, providing an additional source of income to local communities.

In contrast to fynbos restoration, planting biomass for energy would yield benefits such as energy production, carbon offsets, and job creation. Bioenergy production could take the form of planting crops for biofuels, planting trees for gasification, or using the invasive trees for wood chip and bio-char production. By providing a financial incentive for alien plant removal, woodchip production from invasive biomass could add value. If the project can (a) demonstrate carbon saving through a reduced use of fossil fuel for energy, and (b) adhere to sustainable development criteria as stipulated by the economic, social and environmental standards of the Clean Development Mechanism (CDM), it can enter the carbon market and in doing so create additional livelihood opportunities. The CDM allows emission reduction projects in developing countries, such as South Africa, to earn certified emission reduction credits (equivalent to one tonne of carbon dioxide) that can be used by industrialised countries to meet their emission reduction criteria as set out by the Kyoto Protocol (United Nations Framework Convention on Climate Change*).*

A number of risks need to be considered when planting biomass for energy in an area with high biodiversity value. When planting crops for biofuel, the question arises as to how energy crops can remain restricted to marginal land. A rational landowner would select the land-use activity that provides the highest return. There is thus a risk for productive land to be directed towards energy crop production if bioenergy proves more profitable than food production. There is an additional risk to biodiversity if landowners opt for bioenergy production on land currently covered by natural fynbos.

Eucalyptus invasion on the Agulhas Plain (left). Preparing flowers for packaging (right).

The threat to biodiversity and food security that is associated with introducing crop species for bioenergy can be minimised if project areas are selected discerningly. Aspects to consider include the cost of restoring an invaded or transformed site to its natural state, the conservation value of the natural biodiversity (in this case fynbos and the associated ecosystem), and the opportunity cost of the ecosystem goods and services that will be foregone if bioenergy crops are planted. Policymakers, for instance must establish the alternative use of water in the absence of bioenergy crops. In addition, resources will have to be set aside to ensure that invasions beyond the demarcated crop lands are kept in check.

Climate change is expected to reduce water supply on the Agulhas Plain and to encourage the spread of invasive vegetation, placing additional pressure on the natural fynbos. The impending threat of climate change paradoxically suggests that it will become increasingly important to reduce greenhouse gas emissions through using renewable sources such as bioenergy. By carefully selecting areas for biomass production, bioenergy benefits can be realised at minimal cost to biodiversity. Some income could even be used to finance fynbos restoration in other areas.

CONCLUSION

A number of lessons can be drawn from the Agulhas Plain. First, it is important to note that ecosystem services vary across an area and these variations need to be taken into account when land-use decisions are made. By planting bioenergy crops on areas where water has few other benefits, the opportunity cost of the water that is lost can be minimised. Second, when comparing ecosystem services across an area, it is important to also consider the services that may be excluded from the market but which still provide benefits. One example is the increased dilution of waste water. In cases where these benefits are difficult to value they should be accounted for qualitatively in the decision-making process.

Finally, policymakers must be aware that the land-use option selected has future implications. As the supply of certain ecosystem services become scarcer, their value may increase. Decision-makers should compare livelihood options with foresight and under varying scenarios of how the supply of ecosystem services can be expected to change. The impact of climate change on water supply is one of the key aspects that decision-makers across South Africa must consider.

Using the Agulhas Plain as an example, this policy paper has illustrated the potential livelihood benefits that can be derived from alien clearing and from post-clearing land-use activities. This includes the livelihood benefits from alien clearing, the importance of the supply of ecosystem goods and services when selecting post-clearing land-use options, and how site specific characteristics should guide decision-making.

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ABOUT THIS POLICY BRIEF

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