Utilisation of invaders for secondary industries: a preliminary assessment

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Abstract

Invasive alien plants are invading some 125 million hectares in South Africa and Lesotho. More than R800 million has been invested in the clearing of invading alien plants in South Africa since October 1995. These clearing operations have had huge environmental, social and economic benefits but the benefits of the *Working for Water Programme (WfW)* have not yet been maximised. The initial treatment of a dense stand of invading alien plants could cost anything between R1,500 and R12,000 (on average R3,500) per hectare depending on the species and terrain factors involved. Investors have therefore had to ensure that maximum benefit is being derived from their investments. The environmental benefits of clearing operations include positive impacts on water resources, environmental stability and ecosystem function. The economic benefits include employment opportunities, value adding multipliers and economic empowerment of historically disadvantaged communities. By utilising biomass from clearing operations both the environmental and economic benefits of the programme are being enhanced. The environmental benefits include impacts on flood behaviour after clearing, dead biomass on fire intensity and its effects on soils and plant regeneration after fires, as well as the cost of fire management. The macro economic benefits of the secondary industry programme would include enhanced employment opportunities, increased government income through taxes, value-added multipliers, economic empowerment and training. Secondary industry projects in the *Working for Water Programme* have three primary objectives:

1. Maximising the positive economic impacts of the programme
2. Minimising dead plant biomass after clearing and
3. Minimising the net cost of clearing through the exploitation of biomass.

Introduction

Invasive alien plants are rapidly invading some 125 million hectares in South Africa and Lesotho (Versveld, Le Maitre and Chapman 1998). If this was condensed to a closed canopy stand, it would cover more than 1.7 million hectares. The South African government, together with statutory institutions, large corporate companies, private landowners and international donors have invested more than R800 million in the clearing of invading alien plants since October 1995 through the *Working for Water (WfW)* Programme.

The key objectives of the *Working for Water* Programme are:

1. To enhance water security, improve ecosystems functioning, reduce the impacts of fires and floods and conserve biological diversity.
2. To restore the productive potential of land and promote the sustainable use of natural resources.
3. To optimise social benefits, enhance quality of life of

marginalised groups, promote the Poverty Alleviation programme, democratic governance and public participation.
4. To enhance economic empowerment and develop downstream industries.
5. To maximise the benefits of local and international partnerships.
6. To implement educational, training and capacity-building programmes and promote equity, efficiency and sustainability in resource use.

These clearing operations have had significant environmental, social and economic spin-offs. However, the benefits of *WfW* have not yet been maximised. Initial treatment of a dense stand of invading alien plants can cost between R1500 and R12 000 per hectare, depending on the species and terrain. Investors therefore have to ensure that the maximum benefit is derived from their investments. Environmental benefits of clearing operations include positive impacts on water resources, catchment and environmental stability and ecosystem functions. Economic benefits include employment opportunities, value-added multipliers and economic empowerment of historically disadvantaged communities.

By extracting and utilising biomass from clearing operations (round wood, etc.) both the environmental and economic benefits of the programme can be further enhanced. Positive environmental benefits of biomass extraction could include impacts on flood behaviour after clearing operations, impacts of reduced biomass on fire intensity, effects on soils and plant regeneration after fires, and costs of fire management. Macro-economic benefits could include enhanced employment opportunities, increased government income through taxes and sale of wood, value-added multipliers, economic empowerment and training.

A secondary industries programme has been initiated by WfW around the country to develop additional benefits of extracting biomass. This programme has two primary objectives:

- maximising the positive economic impacts of the programme and,
- optimising the dead plant biomass after clearing.

Versveld, Le Maitre and Chapman (1998) estimated that R600 million is required annually to control the invading alien plant problem in South Africa over the next 20 years. Currently, only some R220 million is being spent per annum. To enhance the possibility of gaining control of the problem, the rate of invasion and the net cost of clearing need to be reduced. This can be addressed in a number of ways such as by introducing biological control agents for the most aggressive species and by reducing the net cost of clearing through improving the efficiency and effectiveness of clearing operations. This in turn can be addressed in two ways: first, by increasing productivity and second, by utilising the cleared biomass through secondary industries which can in turn contribute towards the clearing programme. This paper addresses the latter.

Potential positive impacts of secondary industries are not limited to recovering the total cost of clearing. Other significant impacts include: creating additional jobs that can stimulate economic growth with important benefits such as creating downstream employment, extra value added, government revenue and economic empowerment or redistribution of wealth. This paper attempts a preliminary estimation of potential magnitudes of these benefits. This in turn will enable decision-makers to take informed decisions about the implementation of invading alien plant clearing programmes, the value that can be added through secondary industries and ultimately the economic viability of the clearing programmes.

Economic impacts of WfW

Environmental economic impacts

Key environmental benefits that can be influenced by the extraction of biomass from clearing operations are as follows:

Water

Water quality and quantity has a major influence on the efficacy of environmental functioning. The impact of invading alien plants (IAP) on water quantity has been researched to some extent. Most of the work has been done on surface runoff, with very little attention being given to the impact on groundwater (Scott and Smith, 1997; Prinsloo and Scott, 1999; van Wilgen *et al.*, 1999). In addition, little research has been undertaken into the impact of IAP on water quality. In areas with significant levels of infestation, for example parts of the banks of the Breede River, extracting biomass for secondary industry projects can add to the already significant water benefits of the *WfW* programme. In addition, dry biomass left behind after clearing poses a potential threat to infrastructure during floods. The biomass therefore needs to be removed from the river bank, irrespective whether it is to be utilised or not.

Ecosystem services and functioning

a. Ecosystem resilience and stability

The occurrence of high levels of sediment runoff after fires is well known and a number of serious erosion incidents have been attributed to this in the past (Scott and van Wyk, 1992). Two examples were recorded in the Hawequas State Forest in the Limietberg mountains and Devils Peak on Table Mountain (Versfeld, 1995). Damage to property and the cost of cleaning up after erosion or mudslide incidents as well as the risk of such an incident taking place, should be included in an economic analysis of invading alien plant clearing programmes. It has been shown that fire intensity increases as a result of dead fuel 'stacked' just above the soil surface. If a fire takes place during hot, dry periods, as happened during January 2000 on the Cape Peninsula in the Table Mountain range, the negative impacts of invading alien plants are significantly increased. By removing biomass the risk of fire damage after clearing is considerably reduced.

b. Biodiversity and sustainable harvesting

Extensive evidence exists illustrating the effect of plant invasions on indigenous plant diversity (Richardson, 1989; Richardson and Brown, 1986; Macdonald and Richardson, 1986). A common suggestion is that there may be many new life-saving or life-enhancing drugs yet to be discovered from native plant species. Loomis (1995) suggests that the value of saving a human life in developed countries is worth \$2–\$10 million, based on a narrow perspective of one person's likely net lifetime contribution to the economy.

While such an estimate would obviously be lower in developing nations, the potential value of such medicines can be considered vast in any context. It is beyond the scope of this paper to speculate on the probability that some of these potential drugs may be present in South African species although, given the richness of biomes in this country, some such contribution seems ultimately certain. In the present context, it shall simply be assumed that by omitting such possible economic contributions from a diverse plant kingdom these estimates err on the conservative side.

The value of other potential income streams such as wild flower farming, rooibos tea, thatching, ornamental plants, and the sustainable use of indigenous woods has not been included in the above argument. A culture of sustainable harvesting can be established through the initial clearing of IAP and rehabilitating the land. Productive use of natural resources such as grazing, flower picking and thatch for roofing can then be made. This leads to an increase in the productive potential of land. The St. Francis project will be discussed later to illustrate this impact.

Development potential

As mentioned previously, IAP negatively impact on streamflow. The water used by invading plants can be put to better use by agriculture, domestic use and industry. Van Wilgen *et al.*, (1997) have shown that releasing water for development through the clearing of IAP could have a significant economic impact. In addition, clearing in the Theewaterskloof catchment has been shown to deliver additional water at only 13.6% of the cost of delivery from the new Skuifraam scheme. Furthermore, adding value to the clearing process through harvesting biomass could further reduce the net cost of delivery.

Consumptive use and services

Natural grazing of cattle and game is the best known consumptive use of natural resources that is influenced by IAP. The way in which a natural system functions often drives invasions. The impact of fire on plant invasions is the best-studied ecosystem function in South Africa. In the Eastern Cape fires are used to rejuvenate grazing. However, following a fire, Australian Acacias (mostly Black Wattle) spread from neighbouring plantations and woodlots, reducing the grazing potential of the area. A similar process occurs with the harvesting of thatch and wild flowers on the lowlands and mountain catchments in the Fynbos.

The invasion of indigenous forests could also have a negative economic impact. Wood for furniture making from many of the indigenous South African forest species is highly sought after. If harvested in a sustainable manner, utilising small volumes of wood from indigenous forests is economically viable. Replacing these species with fast growing invaders with low value potential reduces the productive potential of wood being harvested.

Non consumptive use and services

Natural areas are generally regarded as significant attractions for tourists to South Africa. The Cape Floristic Kingdom has 12 000 plant species (8500 in the Fynbos and 3500 in the arid zone) (Cowling, Holmes, and Rebelo, 1992). South Africa is currently applying for World Heritage Site status for the Cape Floristic Kingdom. This will have a major influence on eco-tourism in the region. However, plant invasions and irresponsible development are seen as the biggest threat to biodiversity in the Western Cape Province.

On a smaller scale but with as significant an impact, the invasion of the valley bushveld in the Eastern Cape Province by *Opuntia* spp. (prickly pear) poses a major threat to the eco-tourism potential in the province. A number of game species cannot be reintroduced into areas with prickly pear. Given the fact that the economic potential of land stocked with game is significantly higher than areas stocked with cattle (van Aarde, *pers comm.* 1999), and since game is a significant attraction to the Eastern Cape, the productive potential of the land is being substantially diminished.

Education

Given South Africa's natural diversity, the environment can serve as an invaluable outdoor classroom for primary, secondary and tertiary levels. If a large proportion of land in South Africa is transformed from areas with high natural diversity to monospecific stands (as in the case of plant invasions), the education potential of the land will be significantly reduced, with the greatest impact being felt at the tertiary level. The natural diversity in the Cape Floristic Kingdom has provided a unique laboratory and classroom for numerous South African academics to be amongst the best experts in the field of Mediterranean ecosystems.

Macro processes

The impact of IAP on flood control has not received much attention to date. Clearing IAPs from the major river systems has had a significant impact on flood control. This can be illustrated by the experience in the Gauteng Province. Major flood damage was caused when the Vaal River burst its banks in 1996 as a result of a large amount of water being released from the Hartebeespoort dam. Damage ran into millions of Rands. *WfW* started clearing below the dam during 1996, and had cleared a substantial area by the time of the next flood in early 1997. During this flood the same volume of water was released from the dam. The recorded level of the water along the river was seven metres lower than the previous flood and damage to property was minimal (DWAF *WfW* 1997). It is important to note that the costs of initial clearing in riverine areas are extremely high as a result of biomass having to be removed from the river bank. By utilising the biomass and adding value, the net cost of extraction can be reduced.

Milton and Siegfried (1981) illustrated the substantial increase in biomass following invasions of Fynbos by Australian Acacias. Richardson and van Wilgen (1986) subsequently showed the dramatic impact of felled Hakea on fire intensity and the potential for poor veld recovery after a fire. This suggests that a build-up of biomass as recorded by Milton and Siegfried (1981) could lead to an increase in the cost of fire control and protection.

Macroeconomic impacts

During the 1996/97 financial year the *Fynbos Working for Water Projects (FWWP)* in the Western Cape employed an average of 2961 people as clearing workers, team supervisors, managers, development and training and administration officers. The total amount spent on salaries and wages for the year was R25 762 million with an average income per person per year of R8700 (R725 per month). It can be assumed that this money was invested directly into disadvantaged rural communities as fewer than ten employees were from historically advantaged groups. If it is assumed that the average size of a family from a disadvantaged community is five, and that only one person per family was employed in the project, the benefit of the project reached nearly 15 000 people. The average amount available per capita was R1740 per annum (R145.00 per month) (Marais, 1998). This can be seen as the direct financial benefit to the participants in the project. Other benefits included the procurement of protective clothing, tools, equipment and transport used in the project, which led to an increase in demand for such items. These were supplied by outside agencies that in turn had a secondary impact on the number of jobs generated in the economy. Furthermore, a total of R8.27 million was spent on transport for the financial year, at least 50% of which went to private transport suppliers.

The effects of the FWWP project have been evaluated within the context of the provincial economy of the Western Cape Province. The model used for this assessment was the Western Cape Agricultural Social Accounting Matrix (WCAGRSAM) developed by Eckert *et al.*, (1997) for the provincial Department of Agriculture at Elsenburg. Interested readers are referred to the original source for details of structure and methods used in developing this model.

To evaluate the project, it was assumed that project expenses came from general tax revenues. Thus an amount equal to total project costs for 1996/97 in the Western Cape was deducted from general government revenue and reallocated specifically to the FWWP programme. A reduction in government expenditure on all programmes except FWWP thus appears as negative macro-economic effects throughout the economy. A production function was then developed for the FWWP programme, which depicts the distribution of all programme expenditures, most of which is for labour, largely among the poorest households. These expenditures were entered into the model and showed positive macro-economic impacts. In effect then, the modelling procedure kept the amount of money in the total economy constant but deducted an amount from general government revenue with its attendant expenditure patterns and allocated that amount to FWWP with its expenditure patterns. Impacts of this redistributive decision by government were surprisingly strong given the small relative size of the provincial budget.

In this model, each major sector of the economy can be evaluated in terms of its contribution to a number of indicators representing certain macro or aggregated aspects of the economy. Specific results for the *FWWP* are reported below.

Employment

This effect is measured in the number of person-years of employment created from R1 million of additional final demand. Seventy-three people received direct employment from the project for every R1 million spent. The number of secondary indirect and induced jobs created in industries related to the *FWWP* was 8.93 for every R1 million project demand. Based on a 1996/97 expenditure of R40 217 million, the number of additional secondary jobs created was 359. By implementing a secondary industries programme this figure can be further enhanced (Marais 1998).

Value-added multipliers

Value added in the WCAGRSAM is the sum of gross operating surplus (profits) and salaries and wages paid. The value-added multiplier represents the final results of a spending pulse such as the FWWP on total value added within the provincial economy. This figure is a so-called Type III multiplier and includes direct, indirect and induced effects of the spending pulse. The net effect of 1996/97 expenditures by the *FWWP* is a value-added multiplier of 0.018 or an added increase in the value added (GDP) of R18.00 for every R1000 spent by the project. The total net effect of the *FWWP* project for 1996/97 was, therefore, an increase of R0.724 million in provincial value added (Marais 1998).

The positive impact on value added can be attributed to two primary sources. First, generalised government spending contains a balance of remuneration of employees, capital goods and intermediate goods whereas the FWWP concentrates its spending on salaries and wages. Thus induced effects will be relatively larger under the spending pattern of the FWWP. Second, the reallocation of money from general spending to the FWWP essentially takes funds from the relatively affluent, tax-paying segments of the population and spends them as disposable income among the poor. Spending patterns of the poor have been shown to be more labour-intensive and less import-intensive than spending by the rich. Thus, more of the money stays within the province and more of it circulates among the poor, raising multipliers in both cases.

Contribution to government revenue

The net effect of the *FWWP* on government revenue is negative. This is a result of the difference in income levels between the people that are making the biggest contribution to tax revenue and the participants in the project. The participants are largely in the very low-income group and the bulk of their taxes are paid through indirect taxes (VAT). The level of their personal income results in a minimal direct or personal tax being paid. The higher income groups on the other hand pay a large proportion of their taxes in the form of direct taxes. People from previously advantaged communities pay 81.8% of all direct income taxes paid in the province but pay only 41.7% of the indirect taxes. The people from disadvantaged communities contribute 18.3% of direct income taxes and 58.2% of indirect taxes. In total, people from high-income groups contribute 67.9% of all government revenue while those from disadvantaged communities contribute 32.1%. (Eckert *et al.*, 1997)

The figures above illustrate why a drop in government revenue can be expected. However the negative impact is small and implementing secondary industry projects could provide fully offsetting revenues. Incomes derived from the sale of raw material at stump after clearing could offset this impact while the increased economic activity could reverse the trend through both direct and indirect taxes. The potential impact of secondary industries is discussed below.

Redistribution of income

Eckert *et al.*, (1997) used Gini coefficients to estimate the level of equality or inequality in the Western Cape Province as a whole. Redistributions through taxation and FWWP spending led to declines in personal disposable incomes for

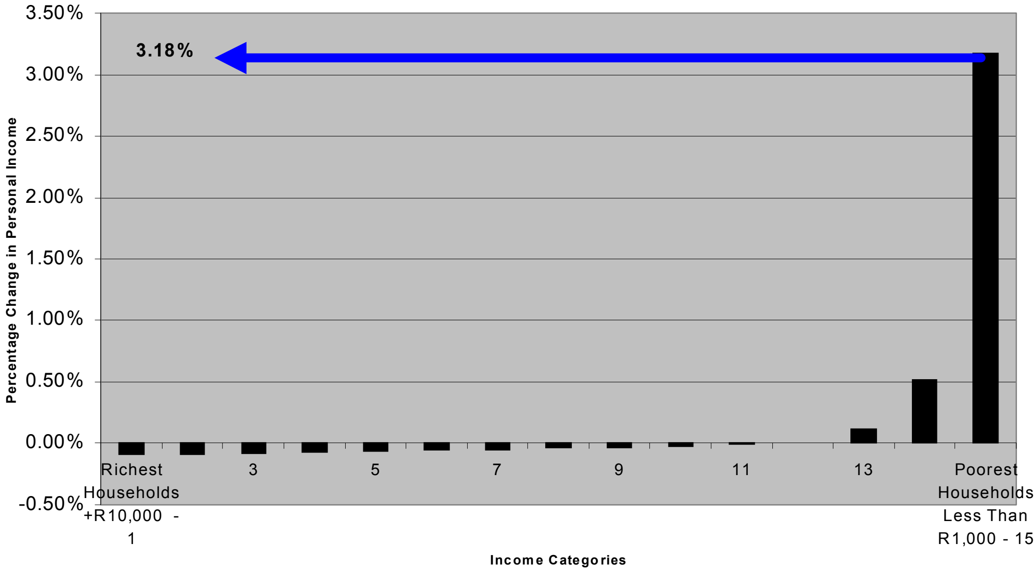

Fig. 1 Aggregate redistribution of household incomes as a result of FWWP 1996/97

upper and middle-income groups of a trivial 0.09%. On the other hand ,the poorest households employed by the project showed an increase of 3.18% in their household income. This redistribution has in fact had an unexpected visible effect on the Gini coefficient for the province as whole. The Gini coefficient was reduced to 0.507 from the 0.509 reported by Eckert *et al.*, (1997). If the small size of the project in relation to the size of the economy of the Western Cape is taken into account, this is indeed significant. Figure 1 illustrates the impact of the project on household categories across the income spectrum (Marais 1998).

Again, as in most of the other macroeconomic impacts of the *WfW* programme, the redistribution impact of the projects can be increased through the implementation of secondary industry programmes.

Both the environmental and macro economic effects of the programme as outlined above draw attention to the need for any decision maker within *WfW* to develop an understanding of alternative outcomes, economic benefits, probabilities, expected values and possible adjustments. This should inform his/her attitude towards risk (Loomis and Walsh, 1997). Resource managers need to know the factors they are facing and should be able to quantify the benefits of their management actions, which might not only be in economic terms. The development of secondary industries should form part of this decision making process.

Development of secondary industries

Not all IAP in South Africa can be used for secondary industries. Factors affecting the viability of a secondary industry project would include:

- The IAP species being cleared. Most harvestable species with invasive potential are currently being used in commercial forestry operations. One exception is the harvesting of *Prosopis spp*. in the Northern Cape province.
- The size of the individual plants in a stand has a major impact on their harvestability.
- Less dense stands have lower harvesting potential.
- Ease of accessibility plays a major role in the cost of harvesting and would therefore have an impact on the viability of a secondary industry.
- Transporting raw material or primary products long distances decreases the viability of the project.
- All secondary industry products have to be market-driven.
- The project needs to have a champion in order to succeed.
- The availability of an appropriate development agent contributes towards the success of a project.

The products and services that are being considered in the project can be classified in three major categories: high volume–low value-added products, low volume–high value-added products, and improving the productive potential of land. Products that have been tested during the early phases of the project are:

- High volume–low value-added: charcoal, pulpwood, fire wood, poles, wood-cement bricks and panels, compost and garden mulch.
- Low volume–high value-added: crafts (walking sticks and ornaments), furniture wood and the final product, floor boards, garden screens, educational toys and smoke chips.
- Improving the productive potential of land: agricultural products (vegetable gardens, natural thatch harvesting) and eco and cultural tourism.

Case studies

Southern Cape and Genadendal

During the early phases of the Southern Cape and Genadendal projects, two high volume–low value-added products were produced. Pulpwood, the more valuable of

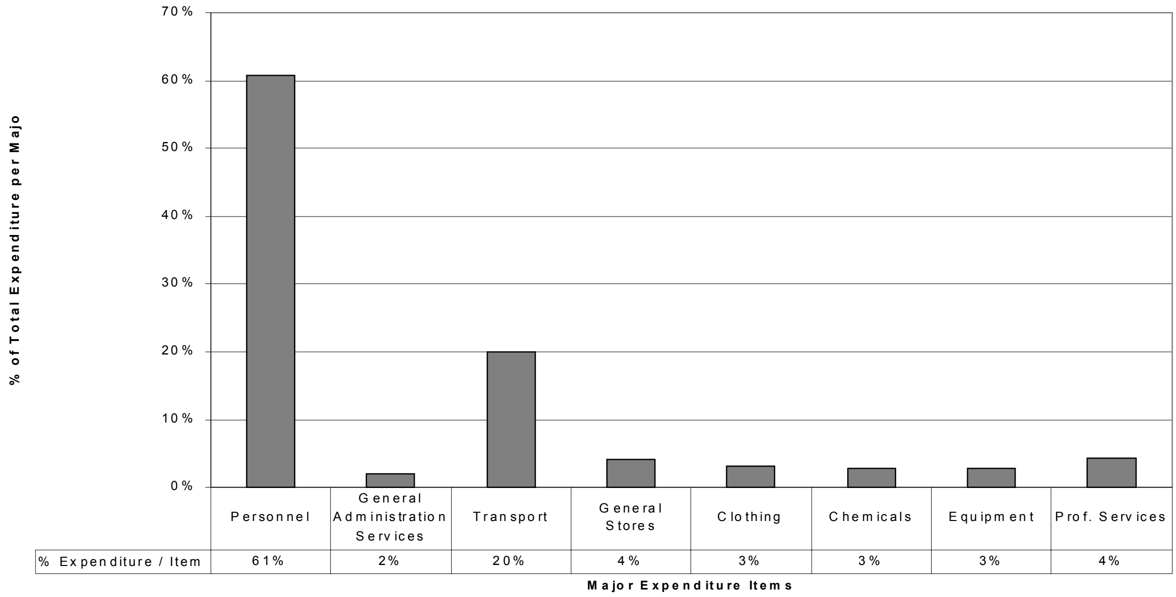

Fig. 2 Expenditure patterns for the Fynbos Working for Water projects, 1998/99

the two products, is shipped to pulp factories in KwaZulu Natal. Charcoal is produced from the wood that cannot be processed for pulp. *Acacia mearnsii* (black wattle) is utilised in the production process. Only Southern Cape data was available for analysis but the impact of the two projects would be similar. Four teams of thirteen people (52) are involved in the Southern Cape pilot effort. Eight people in each team clear IAP while five people extract the timber and produce raw products.

Anticipated expenditure was assumed to be slightly higher than a standard *WfW* project because of the additional need for equipment for the processing and transport of the raw product. Management costs were assumed to be 22.6% and the costs per productive person day were derived from the 1998/99 *FWWP* management data. Figure 2 shows the expenditure distribution for the *FWWP* for 1998/99. The median cost per productive person day in the FWWP for that year was R101.00, of which R89.83 was spent at project level. The cost per contractor day was taken as R78.13 (87% of project costs). These figures are averages from expenditures of R69.675 million spent on 40 projects in the Western Cape Province. As Figure 3 shows, the potential added impact of secondary industries on direct, indirect and induced demand generated by WfW is approximately 60.6% of the total cost of the clearing of IAP (R101.00 per productive person day). This estimate applies

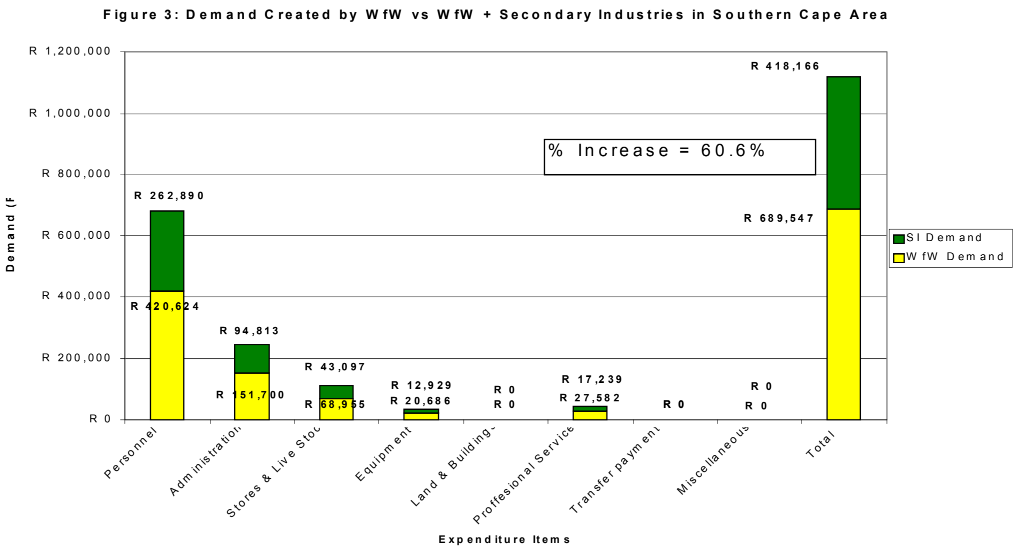

Fig. 3 Demand created by WfW *vs* WfW + secondary industries in Southern Cape area

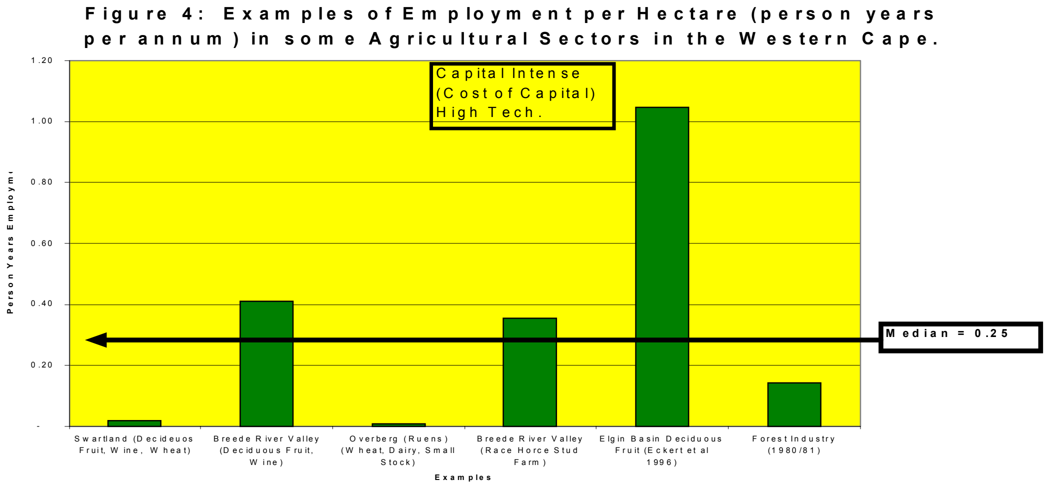

Fig. 4 Examples of employment per hectare (person years per annum) in some agricultural sectors in the Western Cape

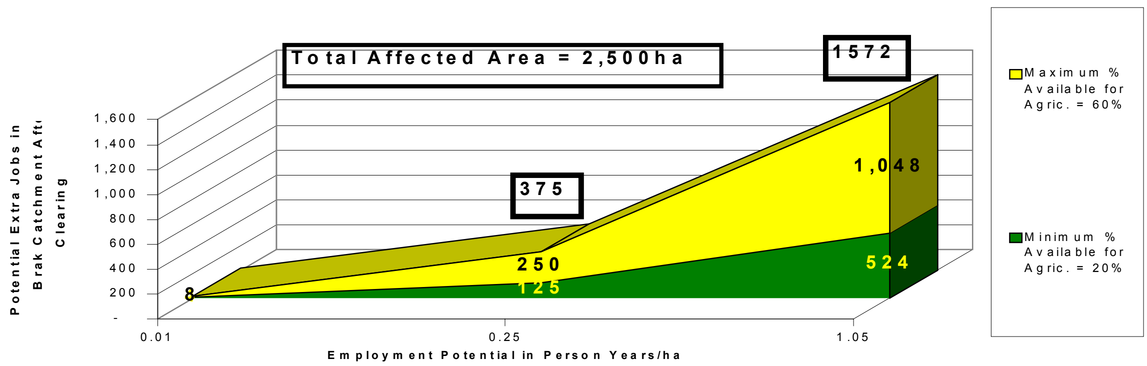

Fig. 5 Potential employment opportunities in affected areas of the Groot Brak catchment assuming that a maximum of 160% of the area is available for agriculture

to accessible areas with exploitable biomass in the Southern Cape.

Groot Brak River

One of the secondary industry projects in the Southern Cape is situated in the Groot Brak River catchment. Some 2500 hectares in the catchment are currently unirrigated due to a lack of water. Studies have illustrated that by clearing the IAP from the catchment, sufficient water would be released to irrigate these areas (DWAF, 1999). This project area thus illustrates the potential gains to be had when the WfW project can facilitate putting land to a higher valued use. A small sample of agricultural sectors in the Western Cape was selected to estimate the range of potential employment in the Groot Brak River catchment after clearing, under the assumption that one or another agricultural use is made possible by the newly recaptured water. Figure 4 shows the employment rates (person years per annum) for five stereotypical farms representing different agricultural sectors. The forestry and timber industry for Southern Africa (including Swaziland and Zimbabwe) was included as a separate land use option (van der Zel, 1983).

Figure 5 shows the cumulative potential for employment creation after clearing for the Groot Brak catchment. It must be noted that the higher employment options require a high capital investment as well to achieve maximum employment.

Northern Cape (Prieska)

Prosopis spp. dominate the invasions in the Northern Cape. They occur over more than 1 million hectares at a density of 12.84% (Versfeld *et al.* 1998). *Prosopis* spp. have significant potential for the development of a secondary industry programme in the region. The nature of the biomass facilitates the development of a model secondary industries programme. Both high volume–low value-added and low volume–high value-added products have already been produced. These include fire wood chunks (fist size wood chunks that can be used in Weber-type barbeques), compost and garden or agricultural mulch in the high volume category, while smoke chips for the smoking of meat and furniture timber is being produced in the low volume category. Importantly, off-cuts from the low volume products are being used to produce high volume products. The results of the analysis of the Northern Cape project accentuate the

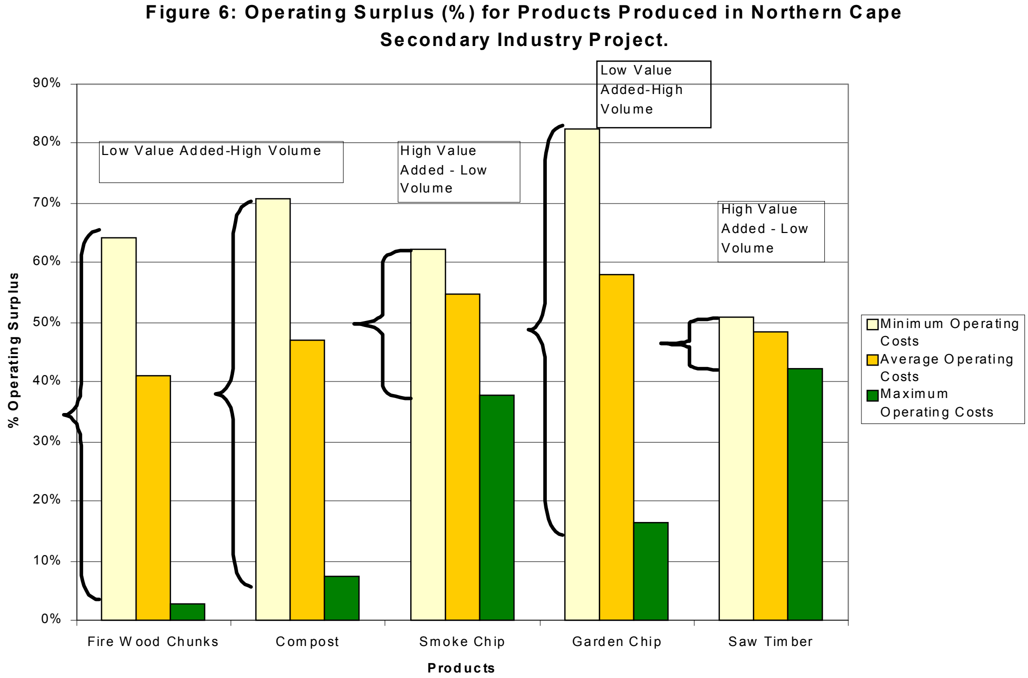

Fig. 6 Operating surplus (%) for products produced in Northern Cape Secondary Industry project

importance of multiple income streams in the development of secondary industries. It shows that operating costs have a more significant impact on the viability of low value products than high value products.

Figure 6 illustrates the impact of an increase in operating costs on operating surplus (viability) of the different income streams. The low value products show huge variances in operating surplus. The estimated minimum and maximum operating costs for wood chunks is 3% and 65%, compost 7% and 71% and garden chips 16% and 82%. On the other hand, saw timber shows the least variance of 42% and 51% while smoke chips shows a variance of between 38% and 62%. This indicates that a combination of high and low value products can help to ensure greater resilience in a business.

The increase in employment as a result of the production of the secondary industry products leads to an increase in wages paid out. However, variations in non-wage operating costs also affect the proportions of total costs than can be allocated to wages. The value of the wages that can be added to the operation through secondary industries under various operating cost scenarios is shown in Figure 7.

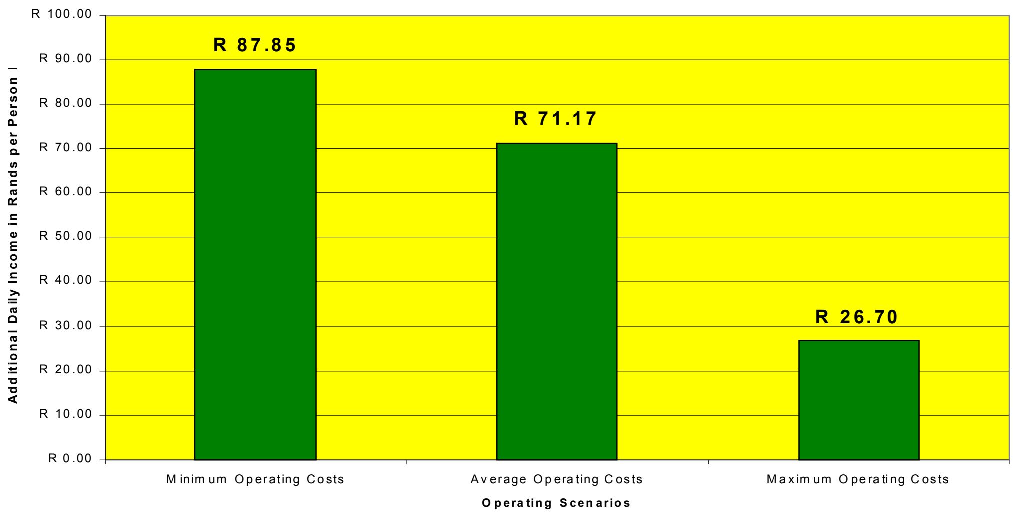

Fig. 7 Possible supplemental daily income to be obtained through secondary industries (over and above wages paid for clearing) in the Northern Cape project

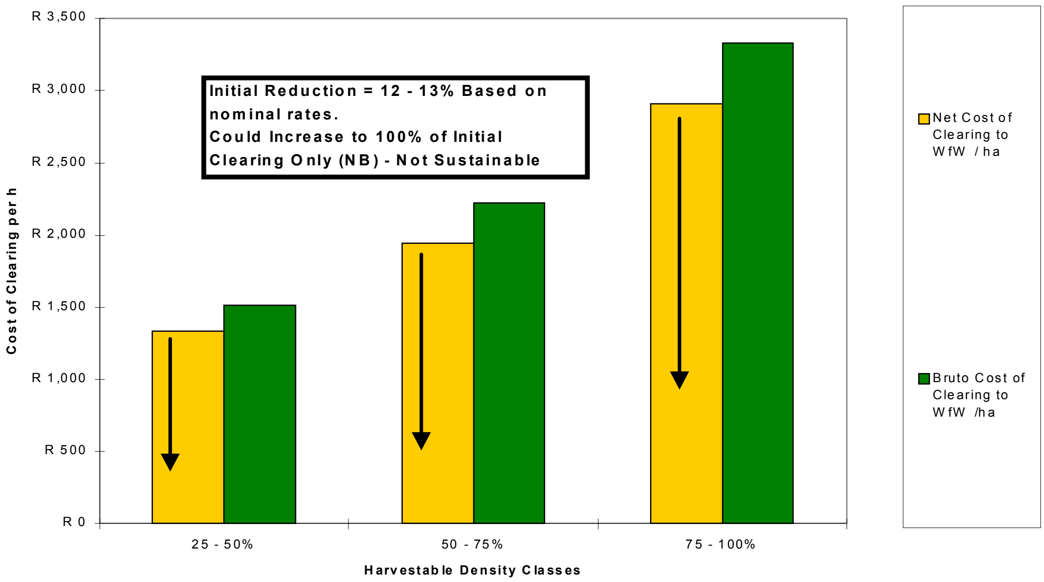

Fig. 8 Estimated impact of biomass harvesting on net cost of clearing in Northern Cape Secondary Industry project

It is important to note that Figures 6 and 7 are only applicable to primary production and do not include the production of furniture etc. Based on the cost of clearing recorded by the Northern Cape projects over the 1998/99 period, the estimated net cost of clearing can be reduced by 12-13% depending on the density of the invasive plant stand. This is however based on a nominal rate of only R12.00 per m^3 felled at stump. Once the industry has developed, the demand could well increase which could result in an increase in the value of the raw product. This will lead to a decrease in the net cost of clearing, as illustrated in Figure 8. It is important to remember that this is not a sustainable operation. Once the initial clearing has been completed, the harvesting potential of the operation reduces significantly or disappears entirely.

St. Francis Bay (Eastern Cape)

In the St. Francis Bay case study *Acacia cyclops* (Rooikrans) will be cleared from an area of approximately 207 hectares of coastal dunes near the town. This operation will not only increase the productive potential of the land but will also decrease the risk of fire damage to infrastructure in a town dominated by thatched roof houses. Two recent studies have also shown the negative impact of IAP on groundwater in coastal areas similar to St. Francis Bay (Visser, Norman and Stadler, 1998; Maclear and Kotze, 1999).

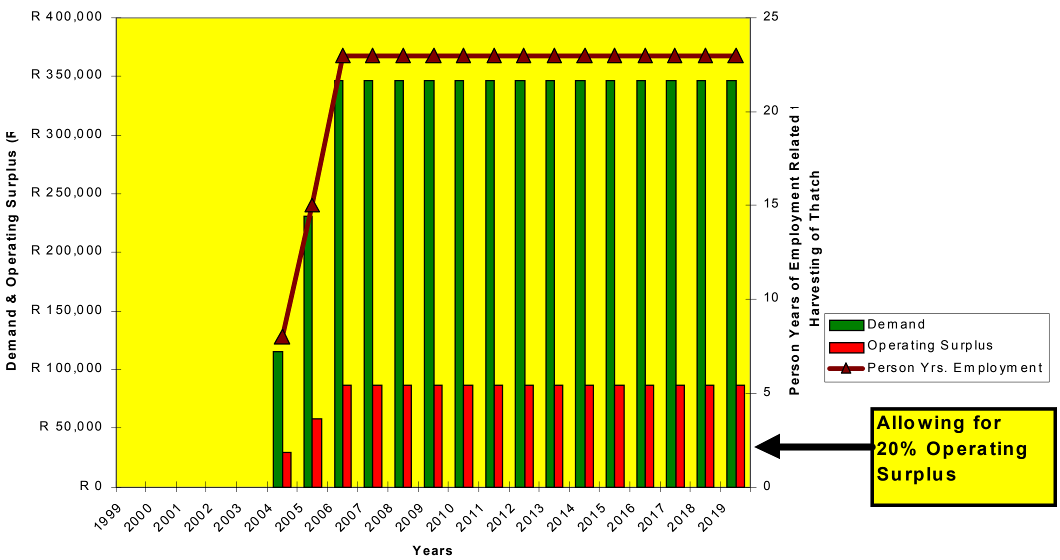

Fig. 9 Future potential of St. Farncis Project as a result of improved productive potential of land through the establishment and harvesting of Thamnocrotus insignis (Dekriet)

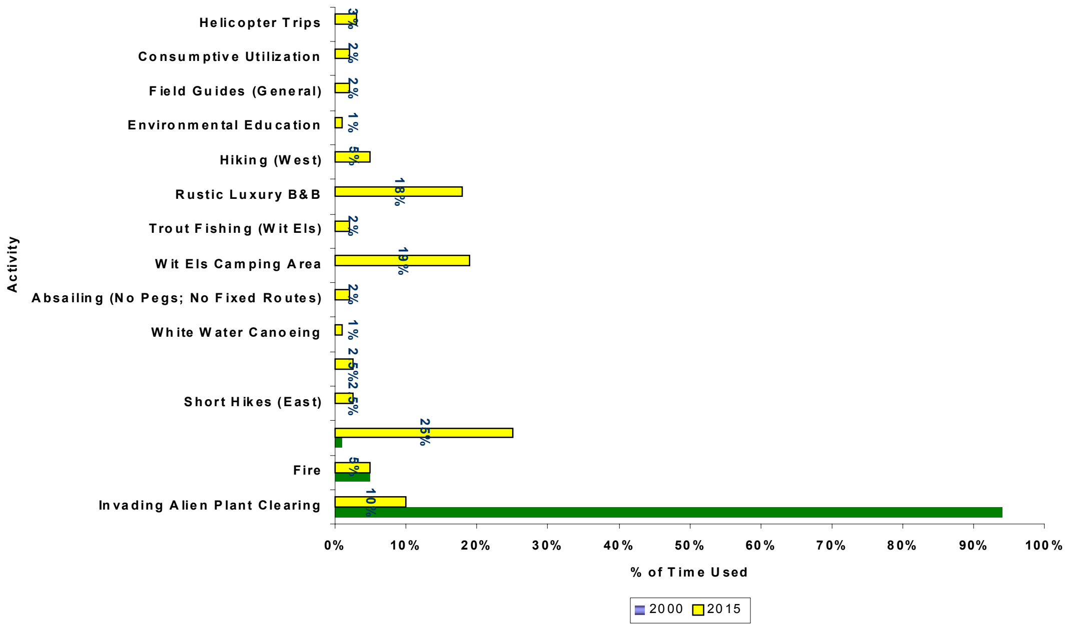

Fig. 10 Predicted time distribution for Ceres Environmental Technical Services & Tourism Micro Enterprise

The aim in this project is to clear the IAP and establish stands of an indigenous thatching grass species, *Thamnochortus insignis* (Dek Riet). The productive potential of the land after successful conversion to thatching grass was estimated using the following assumptions (Allardice, *pers comm.,* 2000; Ball, 1995; Middelmann, *pers comm.* 2000):

1. One plant per 2 m^2 = 5000 plants per hectare;
2. Two bunches per plant = 10 000 bunches per hectare;
3. An average harvesting cycle of six years taking into account a minimum age of seven years (since last fire) before first harvest;
4. Value per bunch to producer = R1.38 (including VAT).

A harvest can therefore yield approximately R13 800 per hectare. Taking the average six-year harvesting cycle into account, an area of 31.4 hectares can be harvested per year at full potential. Figure 9 illustrates the employment potential and estimated annual turnover from the 202 hectares in question, allowing for a 20% operating surplus. The land has the potential to generate 23 person-years of employment with a potential turnover of approximately R350 000 per annum. This represents an employment rate of 0.1 person-year per hectare, which compares favourably with other agricultural sectors in the Western Cape (see Figure 4).

Ceres (environmental technical services) project

The aim of the Ceres project is to empower participants to

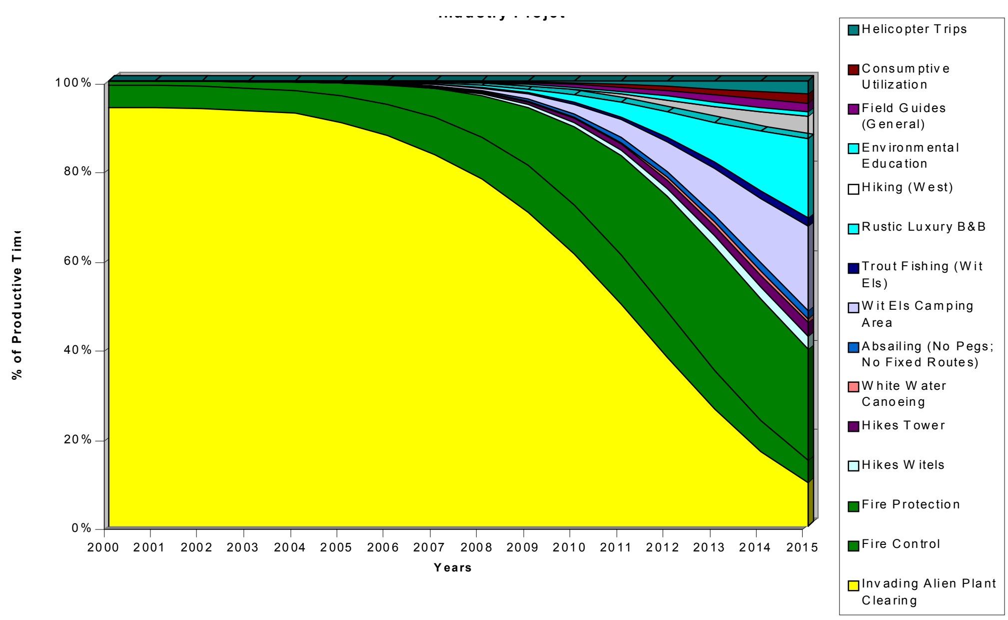

Fig. 11 Envisaged change in time distribution of Ceres Mountaineering Team Secondary Industry Project

undertake other activities to generate income over and above the clearing of IAP. Negotiations are currently under way between the provincial nature conservation agency (Cape Nature Conservation), the Ceres local authority and a team (emerging contractor) within *WfW* to establish the team as concession holders. Once this has been agreed upon, the team will have the right to utilise the Ceres Mountain Fynbos Reserve (a local authority) for non-consumptive use and very limited consumptive use. Apart from the income generated from the reserve, the team will render other environmental technical services.

Figure 10 illustrates the current and expected future time distribution for the Ceres team. The transformation of the team is planned as a gradual process over a 15-year period, with the emphasis placed on developing different capacities of individuals in the team. Figure 11 illustrates the anticipated trends over time in the allocation of time between different activities.

Conclusions

The extent of the resource and potential for secondary industries

Versfeld *et al.* (1998) reported that some 124.8 million hectares of South Africa are invaded to a lesser or greater extent. The estimated total area of invasive alien species at present (if they were all condensed to 100% invasive stands) is estimated at 1.736 million hectares. The top ten invader genera/species in the country are:

1. *Acacia cyclops* (Rooikrans) – example: St. Frances Bay
2. *Prosopis spp.* (Mesquite) – example: Northern Cape
3. *Acacia mearnsii* (Black Wattle) – example: Southern Cape
4. *Acacia saligna* (Port Jackson)
5. *Solanum mauritianum* (Bugweed)
6. *Pinus spp.* (Pines)
7. *Opuntia spp.* (Prickly Pear)
8. *Melia azedarach* (Saringa)
9. *Lantana camara* (Lantana)
10. *Hakea spp.* (Hakea)

The potential for secondary industries was based on the extent of invasion of the above species and assumptions regarding the possible harvestable percentages of each. Figure 12 shows estimated areas that could potentially be harvested.

The estimated potential annual demand (contribution to the economy) generated through the development of secondary industries for the harvestable species was based on the predicted potential turnover of on-going case studies. Estimates were calculated assuming a 10-year period to complete all initial clearing of harvestable stands. Figure 13 shows that the demand created can be between R23.5 million and R70 million per annum for the 10-year period.

It is important to note that the estimated demand as projected in Figure 13 is only the expected demand generated through the primary processing of the raw product. If it is assumed that one job is created downstream from the primary production to the retailer for every job in primary processing, the best case scenario could generate as many as 10 000 for the ten year period. Figure 14 shows the potential number of jobs based on a low, medium and high scenario.

Recommendations

The preliminary results of the analysis of some secondary industries projects have shown that the development of secondary industries could significantly contribute towards the development of better management practices for the management and control of invading alien plant species in South Africa. One of the major shortcomings of this analysis, however, is the lack of good quality data on a national level. The study highlighted the need for a proper inventory of all IAP available for harvesting. This will enable *WfW* to do

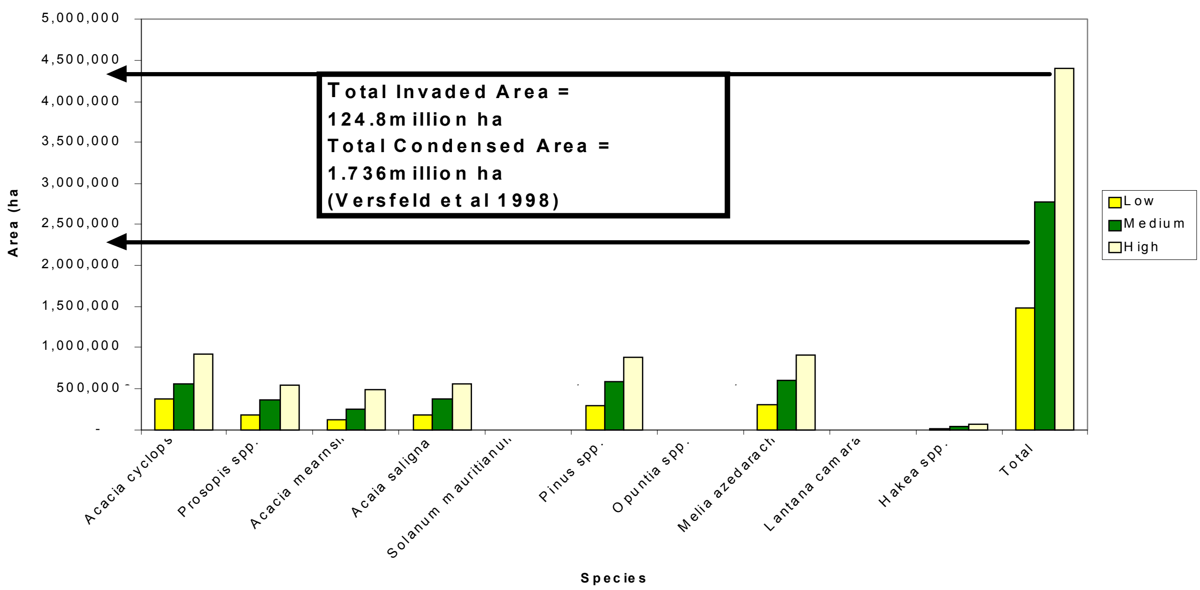

Fig. 12 Estimated extent of invading alien plants available for the development of secondary industries

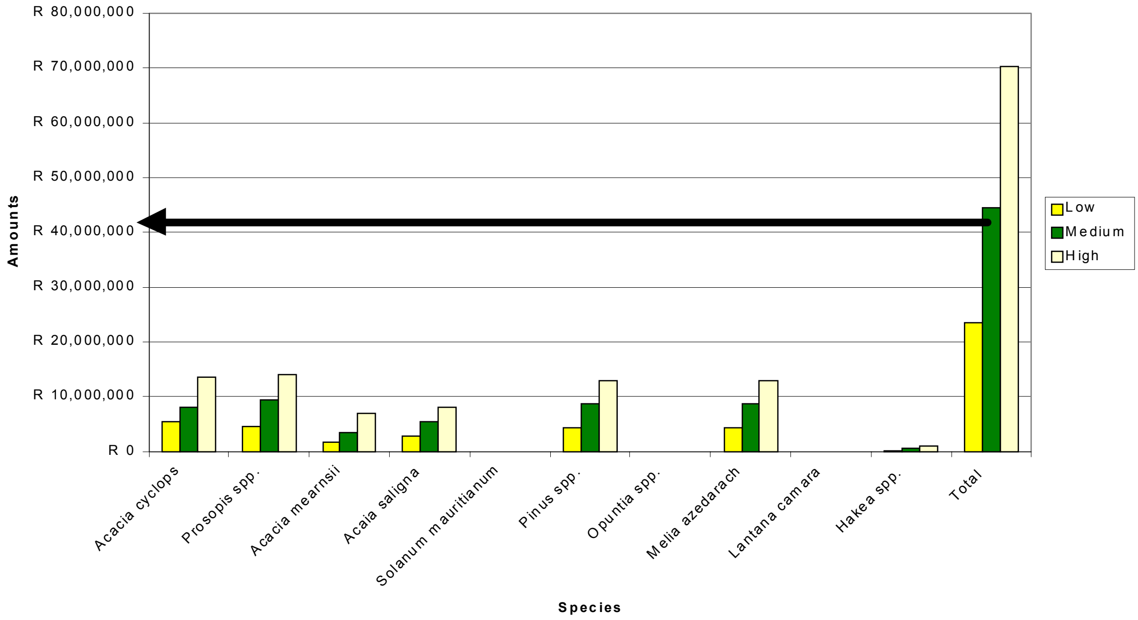

Fig. 13 Projected annual demand created through the primary production of secondary industries (value-added) for 10-year initial clearing period

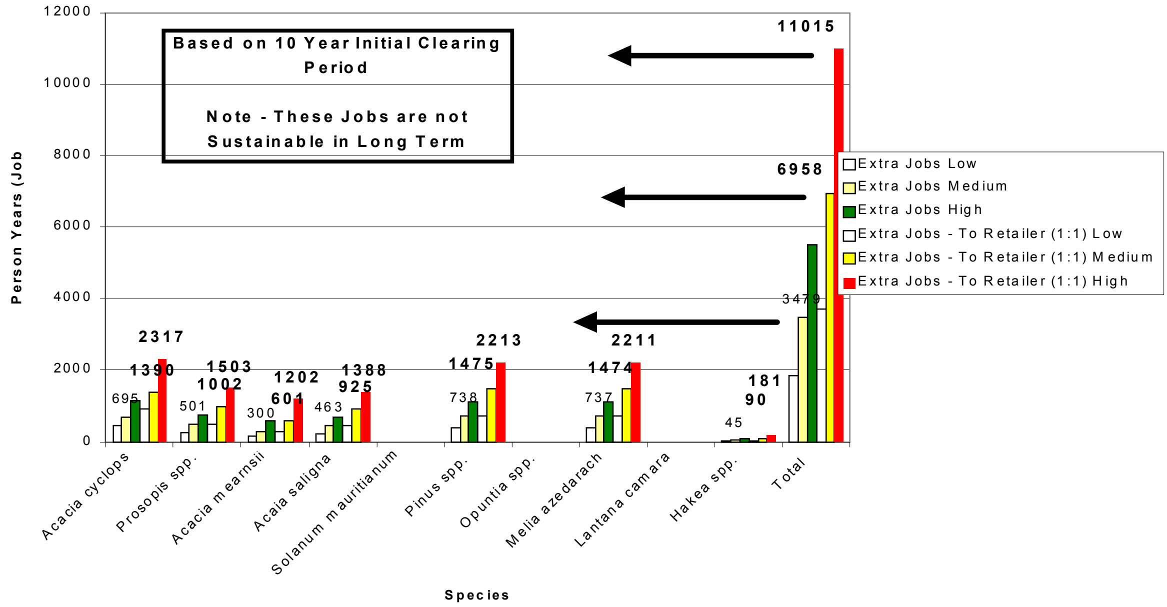

Fig. 14 Estimated number of additional jobs linked to the development of secondary industries

more accurate planning and to improve prioritisation of clearing operations. It will also enable *WfW* to get more accurate estimates of the true economic potential of the programme.

A critical issue, given the extent of the available resource, is the question of sustainable development. It is of the utmost importance that secondary industries do not encourage the perception of IAP as a sustainable resource. If sustainable forest resource utilisation is seen as a potential income stream for emerging contractors, alternative non-invasive species must be identified for the development of woodlots. Woodlots should preferably be developed in combination with other benefits streams such as eco-tourism.

This leads to the last recommendation. Participants in WfW should, as far as possible, be multi-skilled to ensure participation in more than just the clearing of invading alien plants. Secondary industries in its current form should therefore have a limited life span, with the future focus on sustainable development, sound environmental management and economic empowerment.

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