More Money for Research

Sue Matthews reports

The Working for Water programme had already received numerous awards and accolades when it was given a wake-up call a few years ago by one of the country's top A-rated botanists.
"The botanist told me that Working for Water was operating in a scientific vacuum," said Christo Marais, who heads up the Scientific Services division. Speaking at the start of the programme's inaugural research symposium, held at Kirstenbosch in Cape Town during August, Dr Marais reported that Working for Water had reacted to this constructive criticism by allocating a portion of its budget to research, recognising the need to expand the knowledge base on which management decisions were made.

The core business of Working for Water has always been to control invasive alien plants, but it was thanks to its potential as a job-creation initiative that it was launched in 1995, with a R25 million allocation of RDP poverty-relief funding. Since then the programme has cleared alien invasives from about a million hectares of land at 303 sites, created employment for more than 20 000 workers, and today has a budget of over R400 million.

For the last two years the annual research allocation has been about R15 million - representing 2.5% of the programme's total budget – but this is to be increased to R23 million for the year ahead. It is also supplemented by funding from other sources, contributing an additional 20% to the total research budget. In fact, it is highly likely that Working for Water will soon enter into a partnership agreement with the Water Research Commission to support research of common interest.
"Both parties have approved the agreement in principle, and contractual details are currently being negotiated," explains Dr Gerhard Backeberg, a research manager at the WRC. "Essentially, the intention is that Working for Water will allocate a portion of its research funding to the WRC, which will manage some projects on its behalf."

Research funded by Working for Water is conducted in six broad

Dense stands of invasive alien plants are a fire hazard, stoking the flames to a raging inferno. Seeds of alien species seem better able to survive these very hot fires than indigenous species.

themes, each guided by a review panel made up of experts in the field. The themes focus on:

- **Hydrological research**, aimed at assessing the impact of clearing operations on the hydrological cycle and understanding the processes involved, so that predictive models can be developed
- **Ecological research**, which investigates the ecology of invasive alien plants and their impact on ecosystem functioning
- **Biological control research**, including the initial identification of new biocontrol agents, the quarantine period to assess their potential impact and safety, and the evaluation of their effectiveness after release through ongoing monitoring
- **Social development research**, which focuses on the socio-economic impact of Working for Water on its beneficiaries
- **Operational research**, designed to improve the efficiency and effectiveness of Working for Water's activities, particularly through the development of secondary industries, and
- **Resource and development economics research**, to enable Working for Water to make informed decisions that would maximise the social, environmental and economic benefits associated with its activities.

Each of these themes was the focus of a plenary session at the symposium, which reviewed findings from research projects conducted between 2001 and 2003. Since the negative impacts that invasive alien plants have on water supplies are cited as a major justification of the Working for Water programme, it was fitting that the symposium kicked off with the hydrology session.

How much hard evidence actually exists to back up the claims that controlling invasive alien plants will increase water yields though? The oft-quoted statistic is that invasive vegetation uses an estimated 3.3 million cubic metres of water annually - enough to supply 36 000 people with a subsistence water allowance of 25 litres of water per day for an entire year.

Some of the invasive alien vegetation cleared by Working for Water is used in its Secondary Industries programme to make value-added products such as garden furniture, décor items, toys and charcoal.

But this estimate is based on experiments conducted in the 1990s in commercial pine and eucalypt plantations, situated in high-rainfall catchments. Working for Water-funded hydrological research has therefore focussed in the last two years on studying impacts on water resources in naturally invaded areas.

EXPERIMENTS

In the Eastern Cape, Western Cape and KwaZulu-Natal, experiments are underway to assess streamflow responses to the clearing of black wattle (as well as gums at the Western Cape site) from catchment areas and riparian zones, while in the Northern Cape a project is investigating changes in groundwater resources after clearing of mesquite thickets. Evapotranspiration measurements are also being conducted in stands of black wattle in different habitats. Results to date, together with various modelling studies, have indicated that clearing in riparian zones can be expected to yield twice as much water as that in upland zones. Furthermore, since invasive alien plants reduce dam yields, clearing operations started without delay can postpone the need for new water supply schemes, and offer the best financial advantages.

Research findings could also be used to improve clearing methods used by Working for Water teams. Current practice is to stack invasive alien trees after felling and leave them on site, but some of the ecological research presented at the symposium brought this practice into question. A number of speakers warned that the stacks represent a concentrated fuel source, and burn with such intensity during fires that the heat destroys much of the seedbank in the soil, compromising post-fire regeneration.

SEEDLING GROWTH

One project - which investigated the recovery of vegetation after the January 2000 fires that burned 8 000 hectares of the Cape Peninsula – suggested that in some circumstances the cut wood should be removed altogether. A year after the fires, the research team surveyed seedling growth at 52 moni-

Insects used in biological control of alien invasive plant species.
Top: Neodiplogrammus quadrivittatus; *bottom left:* Algarobius prosopis; *bottom right:* Trichiologaster acaciaelongifoliae

toring sites set up in areas previously covered by indigenous fynbos, alien-invaded or alien-cleared vegetation, and found that alien species had recovered better than fynbos where the fire had been very hot. The data also indicated that important components of fynbos, such as restios and grasses, were eliminated by severe fires in cleared, stacked alien vegetation, and these effects were more marked on deep sand and granite-derived soils than on rocky sandstone slopes. For this reason, the researchers recommended that when alien woody plants, more than 3 m high, are cleared, the cut wood should be removed, and follow-up clearing should be carried out regularly to maintain a low fuel load. For her succinct presentation on this research project, Susan Botha was awarded the prize for best paper delivered at the symposium.

BIOLOGICAL CONTROL

Another group to receive well-deserved recognition at the symposium were the research scientists specialising in the field of biological control. The Weeds Division of the Plant Protection Research Institute was recently hailed at the National Science and Technology Forum's award ceremony – dubbed the "Science Oscars" - as the organisation that has made the most significant contribution to science, engineering and technology in South Africa over the last decade.

As the main funder of biocontrol research in South Africa, Working for Water shares in the glory of this award. The biocontrol theme gets the largest share (40%) of the programme's research-funding pie, and all indications are that this is money well spent.

Starting in 1913, when a cochineal insect was introduced to control the cactus *Opuntia vulgaris*, more than 90 biocontrol agents have been released in South Africa to control 47 invasive alien plant species. Over half of these have been completely (25%) or substantially (32%) successful, a quarter of them need more time before their effectiveness is judged, while 18% are considered failures, having achieved only negligible results.

Recently, Working for Water conducted a cost-benefit analysis of biocontrol on six weed species, taking into account the funds spent on biocontrol research, the extent to which the weeds would have spread without biocontrol, and the costs associated with such spread in terms of losses of water, land value and ecosystem services.
"The results showed that biocontrol offers enormous returns on investment," said the CSIR's Brian van Wilgen, who acts as science advisor to Working for Water.
"Biocontrol research is extremely cost-effective, and is deserving of increased investment."

EMERGING WEEDS

A list of priority projects and target weeds has now been decided on for future research effort. On the basis that early action has been shown to save time and money in the long run, the list includes five so-called emerging weeds – species still in the early stages of invasion. These are the pom pom weed (*Campuloclinium macrocephalum*), parthenium (*Parthenium hysterophorus*), yellow bells (*Tecoma stans*), American bramble (*Rubus cuneifolius*) and balloon vine (*Cardiospermum grandiflorum*).

Working for Water intends refining the cost-benefit analysis framework and using it as a guide for identifying other priorities for research. Such prioritisation is crucial, because as the programme's Biennial Research Report concludes:

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Fleshy galls on the long-leaved wattle Acacia longifolia *are evidence of biocontrol at work. The bud-galling wasp* Trichiologaster acaciae-longifoliae *lays its eggs in immature flower buds on the plant. After the eggs hatch, the larvae secrete chemicals that cause the buds to develop into round, fleshy galls. These not only prevent seed production in the affected buds, but also deprive other plant parts of nutrients and water.*

"The Working for Water programme's Research Management Unit faces a number of significant challenges with regard to its future activities. It operates within a poverty-relief programme, and as such it has to justify expenditure on research that would otherwise go directly into the pockets of needy people."

"The constant tension between the demand for immediate poverty relief in the short term, and the need to conduct research that will arguably enable the programme to deliver even larger and more effective benefits in the medium to longer term, has to be carefully managed."