

## Valuing ecosystems: is the fynbos worth conserving?

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One of the principal challenges to conservationists is convincing policy-makers and the broader community of the necessity to conserve natural systems. Increasingly stringent economic conditions make conservation appear a luxury item on national budgets. Part of the problem is that we have not adequately accounted for ecosystem services, on which we all rely, but which are often taken for granted — processes such as water production, air purification and soil genesis. During the past few decades, scientists from many different disciplines have recognized the need to incorporate these ecosystem services, and other, less tangible benefits accruing from natural areas, into national accounting systems. One of the leaders in this field is the University of Maryland's Robert Costanza, who, with Herman Daly, co-founded the 'transdiscipline' of ecological economics.<sup>1</sup> It recognizes that the environment is not just an external input into the economy, but rather that economic activity occurs within environmental constraints. Economies ultimately are dependent on ecosystems, and we need to alter our conventional thinking on economics (including the way we do national accounting) if we are to achieve the ultimate goal of sustainability.

Professor Costanza and five colleagues visited South Africa in July 1995 to conduct a two-week workshop on ecosystem valuation. The meeting, co-hosted by the University of Cape Town's (UCT) Institute for Plant Conservation and FitzPatrick Institute, considered as a case study the valuation of fynbos ecosystems. The workshop was attended by more than 40 delegates from a wide array of backgrounds, including four universities, two research institutions, two government departments, two conservation agencies, one regional authority, one NGO and one consulting agency.

The workshop had two main goals. The first was to train ecologists in the basic techniques of economic valuation, while exposing economists to ecological principles. The second goal was to produce a series of research papers which critically assessed the practical and theoretical issues surrounding ecosystem valuation as well as assessing the value of services derived by local and regional communities from fynbos systems. To achieve these ambitious objectives, a novel 'atelier' approach was used, which threw all the delegates together, breaking down the tra-

ditional hierarchical approach to teaching. Open space technology<sup>2</sup> was used to identify critical questions that needed addressing, and participants assigned themselves to one or more working groups which matched their interests and/or abilities. While this may sound like a recipe for unfettered chaos, the approach was remarkably successful, and by the end of the two weeks, seven working groups had papers drafted for a planned special issue of the journal *Ecological Economics*.

One working group considered the equity biases inherent in conventional valuation techniques, particularly when applied in an economy characterized by past and present social inequities. Such biases can be quite severe, particularly with survey approaches such as contingent valuation, which aim to elicit people's willingness to pay for environmental amenities. These biases probably are common throughout much of the developing world. The preliminary conclusions of this group were that this need not necessitate the discarding of conventional techniques, but that caution should be exercised when interpreting their results. A variety of approaches to assess the value of natural resources should be used to ensure equitable value estimates.

Two working groups considered factors affecting the level of knowledge about fynbos and its value among communities in the Western Cape. One group gave a slide presentation to Standard 8 pupils at four high schools that represented a range of socio-economic circumstances in Cape Town. Despite a great desire for knowledge, there was a clear correlation between socio-economic status and level of knowledge about fynbos ecosystems. Biodiversity conservation was perceived as the primary motivation for conserving fynbos only at the most affluent school; at the three other schools the main value of fynbos was identified as a source of employment and resources, such as rooibos tea, flowers and provision of water. At Khayelitsha's Joe Slovo High School, better responses were obtained when the presentation was given in Xhosa, despite the fact that English is the official medium of instruction at the school. The other working group conducted a contingent valuation of fynbos to estimate the willingness of UCT students to pay to limit the spread of alien plants in fynbos. Not surprisingly, willingness to pay increased with greater knowledge of fynbos, and stu-

dents whose home was in the Western Cape were more willing to pay than were students from outside the region.

Two working groups examined the use of cost-benefit analyses (CBA) in reaching development decisions. One team attempted a cost-benefit assessment of management options for the Kogelberg/Palmiet area, which is a key centre of endemism in the Cape Floral Kingdom. They concluded that all options required external subsidies in one form or another, and that using water sources outside the Kogelberg required the smallest subsidy. The other working group considered the more philosophical question of using multi-criteria decision analysis (MCDA) as an alternative decision-making tool to CBA. The main problem with conventional CBA is that it is difficult to assign a monetary value to many environmental assets that accurately reflects the present and future societal value. For example, how much is an endemic *Erica* worth? MCDA side-steps this problem by using a variety of more qualitative criteria. A desk-top study, using the MCDA approach, explored the various dam options for supplying water to Cape Town.

The two remaining working groups developed dynamic models that simulate both ecological and economic flows in fynbos systems. The first team estimated the returns from firewood extraction in alien-infested areas relative to the potential income from flower production. Once established, both activities are economically viable. However, the release of biological agents to control alien plants is altering this relationship, rendering firewood exploitation uneconomic in some areas. The good news is that biocontrol also reduces the cost of establishing a wildflower business on a previously invaded site. The model illustrates the viability of an alternative land-use (wildflower production) in the face of the threat posed by alien biocontrol programmes to income currently generated by firewood exploitation.

The second modelling group produced perhaps the most valuable product from the workshop: the formulation of a general dynamic model that integrates ecological and economic processes in fynbos ecosys-

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tems. This exercise drew in part on the findings of the other working groups, and provides an assessment of the value of fynbos services under varying management scenarios. It clearly shows that the mountains of the Western Cape are far more valuable under fynbos than if they were vegetated with alien trees. The difference in water production alone was sufficient to favour spending significant amounts of money to maintain fynbos in mountain catchments. The model is fully

interactive and should prove to be a valuable tool in convincing decision-makers of the necessity to invest in tackling the alien plant problem now; delays in acting have serious cost implications. It is encouraging to learn that funds from the Reconstruction and Development Programme have been released to combat the problem of alien tree and shrub encroachment in fynbos mountain catchments.<sup>3</sup>

The concept of the workshop arose from a meeting between Bob Costanza and Richard

Cowling at a gathering of Pew Scholars. Financial and logistical support was received from the Foundation for Research Development, National Botanical Institute, the Pew Charitable Trusts and the UCT Visiting Scholars' Fund.

1. Costanza R. (1989). What is ecological economics? *Ecol. Econ.* 1, 1-7.
2. Rao S.S. (1994). Welcome to open space. *Training* (April), 52-55.
3. Gosling M. (1995). War declared on alien plants: R13 m Cape jobs boost. *Cape Times* (Cape Town), 15 September, p. 1.

## INTERVIEW

### Lessons in good breeding

Two UN agencies recently invited *Annabel Fossey* to participate in an intensive training course to learn about the latest plant breeding methods. Professor Fossey, who is in the Department of Genetics at Pretoria University and the first South African to be so honoured, talks about the experience and what it could mean for the practice of this aspect of biotechnology in southern Africa.

#### What was the purpose of the training course?

It was intended to upgrade our knowledge of the latest plant breeding methods and to show us how to introduce or extend this technology in our respective countries. The focus was on the growing of plants altered by radiation or chemical means. This approach is appropriate for a developing country and much less expensive than, for example, mastering the molecular biology of transgenic organisms.

The mutations are usually induced in seed material by gamma radiation, of which there are many sources in Africa. The method once had a bad name because in the early days it was very hit and miss and either killed or deformed the organism. Today we can achieve the desired characteristics in plants using sufficiently large samples and carefully controlled dosages, and well-designed selection procedures.

#### How were your colleagues on the course selected?

I was one of 23 fellows chosen from the developing world, who came from South America, southern Africa, the Far East and eastern Europe. We were selected by representatives from the International Atomic Energy Agency and the Food and Agriculture Organization in Vienna from a shortlist (of two in the case of South Africa) nominated by national selection committees and came mostly from universities, government and other research institutes. Now that doors overseas have begun to open for us in South Africa, this was the first time that these UN agencies could offer this kind of assistance. It was also the first time that there were almost as many women as men on such a course.

#### What did you think of the way the course was organized?

I was particularly struck by the attitudes of the people who instructed us. They were all incredibly positive and believed in what they were doing. Their mandate is to upgrade plant breeding in developing countries — and that's just what they do! They are wonderful communicators, and tackle any problem presented to them head on, and only wanted the best results. All the senior staff at the two UN agencies are among the world's top scientists, and generally work on contract for 3 or 5 years. You cannot believe the quality of the interfacing we got. Apart from the teaching, the research never stops! This is because there are also 60 or 70 fellows around on short-term contracts, who go there to improve their skills and conduct the research. All our instructors had a very good research background and were selected for their teaching skills. They were allowed to teach only their special subjects; if necessary, the UN will fly in other specialists to cover particular parts of the course. Money is no object.

The effect on my colleagues was such that, after six weeks of the most intensive study and practical experience, the group was totally different from what it had been at the start. For me personally, I now have a holistic knowledge of the latest breeding principles — apart from the contacts I made.

#### What can this mean in practice?

My mandate is to share my acquired knowledge and experience for the benefit of the country, in a responsible, unselfish way. The UN is prepared to give fellows money to get on their feet after returning home. For example, I can apply for

funding for a personal contract, worth \$15 000 for three years, or for a so-called country project, preferably related in some way to food production that will be important under South African conditions. Country projects can generate huge funds. Other immediate benefits are the possibility of obtaining short-term fellowships for my postgraduate students, paid for by the UN, and getting foreign experts to come here, also at the expense of the UN, to improve the skills of local scientists.

There was also serious talk of my establishing a centre for international training courses for Africa. United Nations personnel would do the training, at no cost to us. Our labs would be upgraded for the purpose if necessary.

#### What will you do now?

After some discussion, a group of us designed a plant biotechnology programme that would be truly interdepartmental. (After all, the university claims a biotechnology programme, for which it gets funding, but has no products at all to offer.) The faculty has become interested in that. I am also hoping to set up a small commercial unit that could be run part-time by postgraduates, so they could generate funds by selling plant products and acquire business experience.

I have other ideas, too. The UN are prepared to help me in our advanced plant breeding course. I could not ask more from them. I am planning a project with the Agricultural Research Council people at Roodeplaat, and am hoping to get a personal contract with the UN. Roodeplaat is also interested in a national programme, which would have invaluable educational spinoffs for our students. A southern African programme is also being investigated. My ultimate goal is to establish an advanced plant biotechnology programme at a university.

Recently, I have received a fax from the UN agencies, asking me to be considered for the position of coordinator of an inter-regional African breeding programme. I am now awaiting the results of their selection process. □