Carbon farming

the potential for spekboom restoration in the south eastern Cape

Subtropical Thicket Restoration Project (STRP)

Water Affairs

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EXPANDED PUBLIC WORKS PROGRAMME
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WORKING FOR WATER

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R3G
Restoration Research Group

The Subtropical Thicket Restoration Project (STRP)

The current spekboom restoration initiative is driven by the STRP which is a partnership among farmers, communities, government, ecologists, soil scientists, botanists, ecologists and economists. This project is concerned with the implementation, monitoring and evaluation of restoring degraded thicket using spekboom plantings. The STRP falls within the Working for Land Programme which in turn, is administered by the Natural Resource Management Programmes (NRMP) of the Department of Water Affairs (DWA) (formerly the Department of Water Affairs and Forestry - DWAF). The NRMP forms part of DWA's contribution to the South African government's Expanded Public Works Programme (EPWP) aimed at alleviating poverty by providing additional work opportunities coupled with skills training. The implementing agency, the Gamtoos Irrigation Board (GIB) based in Patensie, is currently overseeing large-scale planting in degraded sites in the Baviaanskloof Nature Reserve, Addo Elephant National Park (Darlington Dam) and the Fish River Reserve, and to date, over 1000 hectares have been replanted. The GIB is also responsible for the 300 "Thicket-wide" experimental plots set up across the 550 km east-west span of spekboom-rich thicket. Scientific monitoring and evaluation is provided by a team of scientists from Stellenbosch University, Nelson Mandela Metropolitan University and Rhodes University (see www.r3g.co.za).

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Aim of STRP

To determine the potential for farmers to earn future additional income via the carbon market, while at the same time improving the productivity of their veld.

Aim of this pamphlet :

To provide an overview of what the STRP is doing to facilitate the entry of spekboom farmers into the carbon economy.

To give some background to the world's carbon trade with its complex suite of requirements.

In summary, ***STRP aims to determine*** *:*

1) the best way of restoring degraded veld using spekboom

2) the feasibility of spekboom restoration earning income via the carbon economy

STRP is doing this by systematically:

1) *monitoring field trials across the natural range of spekboom;*
2) *evaluating large-scale plantings to determine costs and rates of carbon storage under recovering spekboom;*
3) *developing the complex paperwork needed to enter the carbon economy (i.e. PDDs - Project Design Documents);*
4) *testing the economy with pilot projects;*
5) *using the above, to create the institutional structures (e.g. cooperatives, trusts) needed by farmers to enter the carbon economy via spekboom restoration.*

At the outset, farmers need to know :

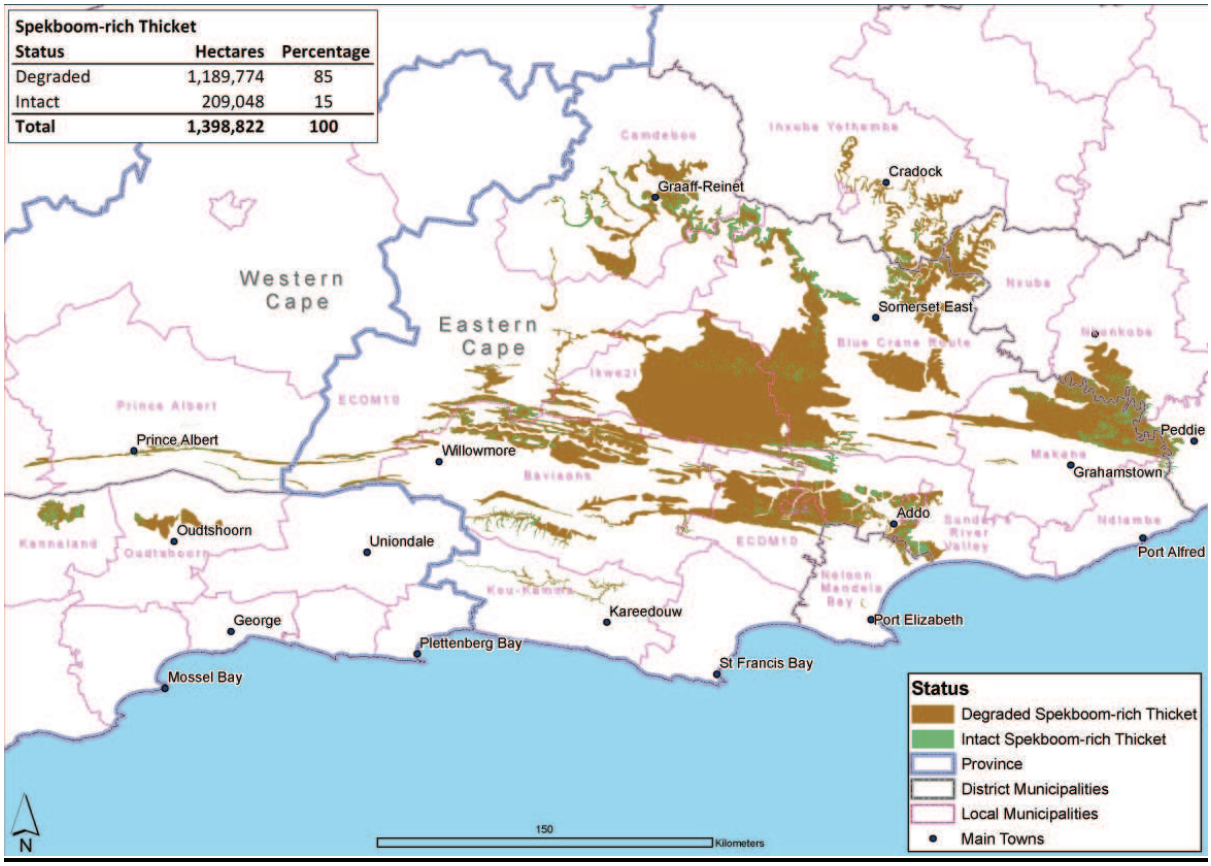
Timelines

There are no quick returns with spekboom farming.
Furthermore, landowners should be aware that there is no scope for earning money for degradation which occurs after a set date, fixed at 1989. Degradation must have occurred prior to this date for restoration to qualify for carbon credits.

Areas suitable for restoration using spekboom

Spekboom carbon farming is only suitable in areas where natural spekboom-rich thicket once occurred.- see Map 1. To determine this, new landowners may need expert advice on the vegetation and soil type of their properties.

There must be a nearby and abundant source of spekboom plants which can be harvested for cuttings. This is to reduce transport costs, and to ensure that the appropriate plant variety (or genotype) for the area is re-planted.



Map 1. Area of intact and degraded spekboom-rich thicket.
Based on STEP 2003. (Map: Andrew Skowno)

Carbon farming based on spekboom restoration

Carbon farming with spekboom is in its infancy, and at this stage, still has many unknowns. But what is known, and scientifically proven, is that spekboom-rich thicket, despite growing under arid conditions, is able to store - or sequester - remarkably large amounts of carbon, particularly in the underlying soil.

Furthermore, in sites recovering after being planted up with spekboom cuttings, there is a significant increase in carbon accumulation in the soil. **It is this ability to store or sequester considerable amounts of carbon which makes spekboom an excellent candidate for restoration and carbon farming.**

Based on studies of long-standing experimental sites, STRP's carbon scientists and economists have determined that there is a good possibility of sound returns on investment provided that restoration occurs over several thousand hectares of degraded land. This will require individual farmers to co-operate and pool resources and trade as a consortium of smaller suppliers. They may choose to work via a cooperative or through an "aggregator".

What we don't yet know about spekboom restoration

Although the experimental sites have shown that restoration is feasible, several key questions remain unanswered, e.g. under what conditions is restoration feasible?; how do different soils and climates conditions influence survival of cuttings and rates of carbon capture?; and what is the best technique of planting spekboom cuttings?

In order to answer these questions, STRP has established the massive experiment covering the full extent of thicket. Across the 550 km east-west span of spekboom-rich thicket, some 300 experimental plots have been set up in degraded sites. Each plot is fenced to exclude livestock and is a quarter hectare in size. In each plot, thirteen different treatments have been applied using a range of different sized cuttings. This trial, referred to as the 'Thicket-wide plots' experiment, is arguably the largest ecological restoration experiment in the world. While the results of survivorship and growth rates will only be available in several years' time, the results to date are most promising. Spekboom cuttings in the larger size classes have shown remarkable survival despite one of the region's worst droughts in living memory.

Entering the carbon economy

Carbon farming is a new and developing activity and already underway elsewhere in the world (for example, see Box 1). However, a number of issues need to be resolved for spekboom restoration to qualify as carbon farming. STRP is committed to facilitating the farmer's entry into the carbon market.

For any entry into the carbon market, and to qualify for trading, a Project Design Document (PDD) has to be developed. This is where the assistance of an organisation, such as the STRP, or a specialist company, is crucial. This complex document includes, amongst other information, evidence that recovery and carbon storage cannot occur on its own i.e. without human intervention and proof that the carbon farming project will result in long-term carbon storage (determined from soil and vegetation measures in 10X10 m plots on the relevant properties).

A further requirement is the pooling of restored land of a number of landowners into a package large enough for trading on a carbon Exchange (a requirement of carbon Exchanges because transaction costs in trading carbon credits are very high). For more information on the carbon trade,see Boxes 1 & 3.

STRP's research and development spans all stages, from best practice in the field (see Box 2), to the development of the complex paperwork involved in the necessary Project Design Documents (PDD). The aim is for STRP to link landowners with a PDD in order to save them excessive costs. In addition, in order to trade the carbon from the PDD, an institutional structure needs to be created, such as a cooperative or a trust. This is a complex process as the structure must appeal to farmers, government and large corporates willing to invest in the PDD project. Only once the institutional structure is created, and appropriate contracts are developed, can farmers join the PDD project contractually.

A number of costs will arise associated with many of the steps below, such as selection of suitable sites (according to soil and vegetation type, possibly requiring specialist advice), incorporation of farmers' land into a PDD and ensuring appropriate integration (requiring scientific consultants), auditing by approved carbon auditing firms and monitoring of carbon stocks (requiring scientific consultants).

Restoration is costly, and in all likelihood, landowners will need initial financial investment in order to start. It is possible, given the enormous benefits of restoring land and creating employment, that government will assist. Another possibility is that socially responsible corporates or even individuals or non-governmental agencies will provide start-up financial assistance for restoration which captures carbon.

It is the aim of the STRP to assist in developing models for the necessary structures..

Steps in carbon farming
(once the necessary structures are in place)

1. Landowners would need to verify the suitability of the degraded site for spekboom restoration, i.e. ensure that it was formerly spekboom-rich thicket prior to degradation by over-stocking. Refer to Map 1 and if necessary, seek expert assistance.

2. The landowner would have to approach a cooperative, trust or reputable organisation (i.e. "aggregator" see Box 1) in order to enter the carbon economy. Only once an in vehicle is created, and appropriate contracts are developed, can farmers join the PDD project contractually. This is where the STRP will assist.

3. The landowner would be obliged to make a legal commitment to the cooperative or "aggregator", committing to manage the recovering veld in such a way that it reaches and retains a healthy cover of spekboom, in this way maintaining the stored carbon in the underlying soil.

4. The landowner would arrange for the degraded veld to be planted up with locally available spekboom cuttings according to certain specifications (these would depend on the individual contract).

5. At the start of restoration, the site's existing carbon stores would have to be verified. (If the landowner is considering going the route of the Community, Climate and Biodiversity Standard (CCBS) (see Box 3), a vegetation survey and measurement of soil carbon content would be needed.)

6. The restoration would have to be monitored regularly and the amount of sequestered carbon measured. This would entail an independent carbon auditor visiting the farm to monitor soil carbon levels, and to confirm that the spekboom is restoring and in a healthy condition.

7. With time, carbon credits would start to be issued. The cooperative or "aggregator" would arrange trade of the credits on the carbon Exchange and make payments to the landowners.

Questions from farmers

Can a landowner earn carbon credits from intact thicket?

International organisations are supporting this kind of initiative, termed "avoided deforestation credits". At this stage, it is not yet feasible as it is technically very difficult to qualify for credits for intact vegetation, and would normally only apply to vast tracts (tens of thousands of hectares) of tropical woodland or forest. However, this may become an option in the future.

Can livestock be allowed to graze in veld which has been planted with spekboom for carbon credits?

Browsing effects by wild game and livestock could seriously retard rates of restoration; therefore, landowners and managers would have to exclude livestock from restored sites for an extended period. The actual period is still in question, with estimates ranging from 5 to 10 years. Thereafter, the livestock would need to be managed judiciously, and in such a way that the spekboom plants continue to increase in size (vertically and horizontally).

How much can be earned from spekboom carbon farming?

It is much too early for any accurate predictions about income from spekboom carbon farming. Thus far, measures of carbon sequestration at a site near Steytlerville indicate promising rates of more than 5 tonnes of CO_2 per hectare per year, which equates to 5 carbon credits. However, income from the carbon credits will need to cover transaction costs, as well as planting and maintenance costs. Consequently the net return depends on these costs. Furthermore, the carbon credit generation can vary greatly depending on thicket type, growth rates of different spekboom varieties, effect of herbivory etc, which is the reason for the 300 experimental plots established across the extent of the spekboom-rich thicket. Only once the STRP has these figures to test the market, can a platform be created fromwhich the market can grow.

Box 1. An example of how carbon farming is being done in the USA

The basis of carbon farming is that carbon dioxide, that would otherwise remain in the air, is securely captured – or *sequestered*, for example by planting trees or perennial grasses. The most important part of any carbon sequestration project is long-term sustainability. This requires a long-term commitment by the landowner to continue managing the land in order to guarantee that the carbon is stored on a permanent basis. By sequestering substantial amounts of carbon, landowners can be granted carbon credits which are then sold for cash payments on a carbon Exchange. There are a number of Exchanges worldwide which serve as trading platforms for carbon credits, e.g. Chicago Climate Exchange, European Climate Exchange, Nord Pool, PowerNext, Multi Commodity Exchange and National Commodity and Derivatives, CantorCO2e and Preserval Marketplace.

Owing to the high transaction costs in buying and selling, Exchanges demand that carbon credits generated, for example by carbon farmers, are bundled into substantial packages. In the USA, this is achieved by large numbers of landowners co-operating and working through an aggregator. Each landowner enters into a contract with an aggregator who then has the rights to the sequestered carbon in exchange for payment. The aggregator can sell the credits on the Exchange and the landowners are paid according to the system established by the individual aggregator. In effect, the landowners are contractually bound to the aggregator and not the Exchange. Aggregators charge a small fee for their efforts, and the Exchange charges an enrolment and trading fee. In the USA, prices vary but overall carbon credits have grown in value since opening in 2003. Note that one metric ton of sequestered carbon dioxide earns one carbon credit.

As an example, if landowners in the USA wish to trade on the Chicago Climate Exchange (CCX), they need to fulfil a set of requirements: complete an application form requiring certain calculations predicting levels of carbon sequestration, and submit their documents to an aggregator or an institutioal vehicle such as a trust. The status of the land and land practices may be reviewed at any time. The land must be managed according to the contractual agreement. The landowner must submit a yearly report of one page indicating conformance with the contract, listing the hectares restored and their locality. The aggregator/institutioal vehicle would usually assist with this paperwork and verification. The CCX reserves 20% of a landowner's initial credits as insurance against a crisis such as a flood. In the absence of such an event, this reserve is paid out to the landowner in full at the end of the contract period.

Box 2. Planting methods developed by the Gamtoos Irrigation Board (GIB)
Based on farmers' experience, the Department of Agriculture and studies by the STRP over the last seven years, certain basic practical steps have been established. (Further refinement of planting methods will emerge from the results of the 300 thicket-wide experimental sites.)

The spekboom cuttings must be 25-30 millimetres in diameter at the base and about 800 to 1000 millimetres in length. Once harvested, the stems must be stored in the shade for two days before planting. The cuttings must be planted 150-200 mm deep in the ground, at a density of about 1.5 to 2 metre intervals. If the ground is hard and stony, koevoets and picks are often a necessity, but the recent testing of a mechanical auger or drill (similar to a chainsaw) has improved planting time dramatically. Using this, a team of 12 members, can plant up about 26 hectares over a 20 day contract. It should be noted that these efficiencies are achieved on conditions and wages set by the Expanded Public Works Programme.

Box 3. Carbon credits and the carbon market
A carbon credit is a unit of trade, used in the carbon market, supported by a certificate that guarantees that one metric tonne of carbon dioxide has either been captured from the atmosphere or been prevented from entering the atmosphere.

A carbon credit derives its value from two sources. Firstly, as with any commodity, value is reliant on demand versus supply. This is dependent on government regulation, public opinion on the risk of global warming and the steps required to mitigate the risk, and the number of projects generating carbon credits. Secondly, its value is reliant on the strength of the guarantee that one tonne of carbon dioxide has been removed from or prevented from escaping into the atmosphere, and this in turn, is reliant on the checks and balances within a particular carbon credit trading system.

The carbon market aims to decrease emissions of greenhouse gases (GHG) such as carbon dioxide, which scientific evidence shows with a very high probability to be contributing to global warming and climate change. Broadly based on the earlier, highly successful programme to reduce acid rain, the carbon market developed from the Kyoto Protocol which emerged under the United Nations Framework Convention on Climate Change (UNFCCC).

The Kyoto Protocol set targets for GHG emissions by developed countries. Individual governments set annual size limits on emissions by its major industries or emitters. If an industry exceeds its target or cap, it must make up for this surplus by trading, for example, with another industry which has successfully reduced its emissions to a level below its target. This system of "cap and trade" is the basis of the ***compliance market***. Carbon credits can also be traded between countries, while those countries unable to reduce their emissions and stay within their targets can invest in developing countries through the Clean Development Mechanism (CDM). In this way they can "offset" their emissions, e.g. support a carbon sequestration project in a developing country and buy the carbon credits thus created. The CDM trade is strictly regulated according to rigorous standards, verification and certification.
To prove that the project will result in real, permanent, verifiable reductions in elements such as carbon, there must be proof in the form of a Project Design Document (PDD) and activity reports validated by an approved third party. All of these processes are extremely expensive.

In contrast to the legally-enforced compliance market, the ***voluntary market*** is driven mainly by public concern about climate change and corporate social responsibility. The Voluntary Carbon Standard (VCS) follows the format of CDM but does not require authorization by the host country which greatly reduces transaction costs. Another is the Community, Climate and Biodiversity Standard (CCBS) which ensures benefits to communities and the consideration of biodiversity over and above the carbon stored and can be linked with the CDM and VCS standards and verified accordingly.

To avoid the exorbitant costs associated with the compliance market, spekboom carbon farming is best suited to the voluntary market. In particular, it is well suited to the CCBS owing to community benefits of high employment opportunities and the rehabilitation of degraded veld.