Spekboom and Carbon

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Spekboom Restoration, Monitoring, Evaluation and Development Project

The degradation of thicket veld

The thicket vegetation of the south Eastern Cape is highly sensitive to overgrazing by livestock, especially by mohair-producing angoras. Heavy browsing by goats can convert dense shrubland into a desert-like system within ten years. Thicket exists in various forms, from low noorsveld to tall thicket with tree euphorbias and aloes. In the case of thicket rich in spekboom shrubs (igwanishe or Portulacaria afra), approx. 46% of the original 16 000 square km has undergone severe degradation, and 34% has been subjected to moderate disturbance by overgrazing.

The challenge of restoration

Removal of livestock and resting the veld does not lead to natural recovery of the vegetation because of changes in the exposed soil, such as temperature extremes and reduced waterholding capacity. The active restoration of thousands of hectares of formerly healthy thicket, rich in spekboom plants, appears at first sight to be unfeasible. But there is now compelling scientific evidence that restoration using spekboom can be funded by the international carbon market. Such restoration would generate carbon credits and create jobs in economically depressed rural areas.

The use of spekboom

Over the years, several land managers have used cuttings of spekboom to restore plant cover in degraded thicket. The plant's ability to sprout from replanted cuttings without irrigation or nursery time, makes it a very good candidate for large scale restoration of degraded land. Furthermore, there is sound scientific evidence that spekboom is a “super plant” when it comes to its extraordinary carbon storing capabilities.

Data gathered over the last seven years show that carbon storage in intact spekboom thicket in the arid south Eastern Capeexceeds 20 kg carbon per square meter of vegetation, which is equivalent to that of moist subtropical forests.

Data on the remarkable rates of carbon storage under re-planted spekboom were collected on the farm Krompoort, between Uitenhage and Steytlerville. Over the last 30 years, the farmer, Mr Henry Graham Slater, has systematically restored a degraded hillslope using spekboom cuttings. Now the oldest spekboom plants stand more than 2m tall covering 90% of the planted site - an impressive growth from cuttings planted in bare ground under a rainfall of only 250-350 mm per year. The plantings enabled estimates of potential rates of carbon sequestration, with the oldest stand indicating an average rate of 0.42 kg of carbon per square meter per year. This rate of carbon sequestration is comparable to many temperate and subtropical forests, and is extraordinarily high for an arid environment.

Spekboom plants can withstand grazing by elephant and black rhino which feed from above the shrub, forming a "skirt" of branches which are able to root and proliferate on contact with the ground, while broken branches are able to reestablish, much like planted cuttings. But goats feed from underneath the plant, so that overgrazing soon destroys the umbrella-shaped canopy.

History of the Subtropical Thicket Restoration Project (STRP)

The project had its origins in Easter 1999 when Professor Richard Cowling of the Nelson Mandela Metropolitan University (NMMU) successfully negotiated with the Global Environment Facility (GEF) -

an organization concerned with the fate of the world's biodiversity and formed after the first Earth Summit in Rio de Janiero in 1992) to fund the Conservation Farming Project. This was aimed at a number of biomes (grasslands, forest, karoo and thicket). Administered by the South African National Biodiversity Institute (SANBI), the Project began in 2000 with a sub-project in the subtropical thicket region.

There was a strong emphasis on ecosystem services, and in particular, a study of the impact of farming practices on soil carbon and quality by Ant Mills. His results showed that extraordinarily high soil carbon stocks are found in thicket relative to other vegetation types. In 2002, it became clear from the work of Richard Cowling's PhD student, Richard Lechmere-Oertle, that litter production in thicket near Steytlerville was also high - equivalent to that of certain forest ecosystems. Cowling and Lechmere-Oertle then approached Mills as the carbon specialist in the Conservation Farming Project to discuss the implications and processes behind the anomalous soil carbon stocks and litter production in dry spekboomveld systems. When Andrew Skowno, a co-worker on the Conservation Farming Project, together with Mills and others provided estimates of biomass of spekboomveld, the extraordinary size of total carbon stocks in thicket became apparent.

The findings showed that spekboomveld stores huge amounts of carbon - as much as some subtropical rainforests - and the bulk of this is contributed by spekboom. Their joint findings led to much discussion and collaboration between Ant Mills based at the University of Stellenbosch/SANBI, and Richard Cowling, Richard Lechmere-Oertle, Ayanda Sigwela and Graham Kerley based at NMMU, resulting in a joint scientific paper submitted in mid 2003 and published in 2005. In June 2003, Cowling approached Tony Palmer of the Agricultural Research Council and Christo Marais of Department of Water Affairs to kickstart a project using spekboom plantings for carbon sequestration. (The original plan was to drive the project via the Subtropical Thicket Ecosystem Planning (STEP) Project with Andrew Knight playing a role, as STEP had identified restoration as an essential activity.)

Cowling and Mills realized that there was a vital element missing if they were to build a case for carrying out large-scale veld restoration to be funded by carbon credits. The key measurement needed was a measure of the rate of carbon sequestration. In July 2003, Cowling approached both Bool Smuts of the Baviaanskloof Project Management Unit and David Daitz, the CEO of Cape Nature to provide funding to determine rates of carbon sequestration.

It was fortunate that there existed a few stands of spekboom planted some decades ago which would allow these measurements to be made. A situation was provided on Graham Slater's farm where he had planted stands of spekboom at different periods extending back 27 years. Funding by both organizations was granted and work started in mid October. The final report was submitted in Jan 2004 and published in 2006 by Mills and Cowling.

This research provided the case for the launching of the STRP in 2004 which was ultimately adopted (not by ARC) but by DWAF Working for Woodlands in conjunction with the Baviaanskloof Project Management Unit. At this stage Mike Powell came on board to manage the pilot work on spekboom plantings in the Baviaanskloof over the next three years. The actual field work was done by teams of previously disadvantaged individuals funded by the government's Expanded Public Works Program, administered by DWAF/Working for Woodlands under the management of the implementing agency, Gamtoos Irrigation Board.