
INGSA WORKSHOP MATERIALS

CARBONERIA:

Competing technology-based economic proposals with multiple stakeholders

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A PIECE OF BIO-CHAR



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CARBONERIA:

Competing technology-based economic proposals with multiple stakeholders

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Carboneria is a country of 6 million people in Sub-Saharan Africa with a relatively stable but still-maturing democratic federal system of government which has managed three largely peaceful changes in government since independence, although prior to that there had been a military coup. It is an emerging economy, though it is largely still agriculturally dominated, with a per capita GDP of \$6720 (USD) in the last year. The major source of external income is eco-tourism especially to the forested north of the country and coffee and cocoa exports from plantations in the west of the country. One European agri-food company operates 4 cocoa and coffee plantation sites in western Carboneria, but the majority of agriculture in that region is subsistence and small-scale market farming. There is also a small amount of natural gas produced but it is largely used domestically.

The population is urbanising, however, with internal migration to the regional centres and especially the federal capital city rising rapidly. The urban population in particular has undergone considerable nutritional transition with 25% now considered obese by the WHO definition, and women affected disproportionately. Currently, for reasons outlined below, the federal government is considering the promotion of bio-char use for carbon sequestration in its overall approach to enhance agricultural productivity and to highlight its commitment to climate change.

Background and context

Carboneria has invested in education as a key part of its national development strategy with an established national university system including one major university campus in the capital and five smaller regional universities in each of the state capitals. It also has established a National Science and Technology Academy and there are two medical schools including one with a well-established reputation for nutrition research.

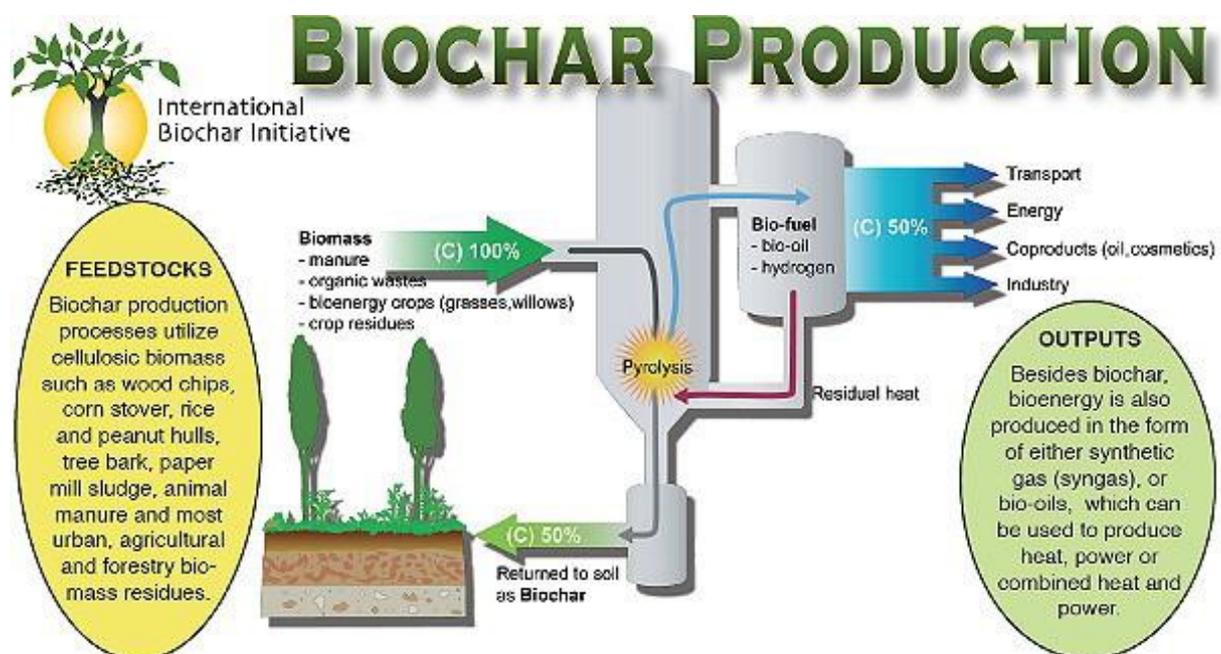
Many of the country's most respected academics have had overseas experience and have returned to Carboneria. These are mainly agricultural and environmental scientists. Their influence and the reputation of the Prime Minister internationally have strengthened the country's reputation as a global leader among developing countries seeking to address climate change. Indeed one of the IPCC working parties had been co-chaired by one of Carboneria's most distinguished scientists. Carboneria took a leading position at COP21 in Paris amongst peer countries in establishing its Intended Nationally Determined Contributions (INDCs) to climate change mitigation.

In particular, Carboneria has introduced what is seen as novel regulation of its public transport fleet (despite its limited budget an investment has been made in hybrid buses for inter-city travel) and incentive schemes for motorists and taxi drivers to maintain and/or convert to high efficiency engines using liquified gas locally produced rather than diesel in their vehicles. The government of Carboneria is also looking at policy options to support the scale up of sustainable farming techniques such as better fencing of grazing land, soil remediation and wetlands protection and better forest management practices. Overall, these policies have been hailed by urban voters, but rural communities

and especially farmers have experienced some difficulty in complying. There are local tensions between cattle herders and cropping farmers.

The dilemma

The carbon rich product known as 'bio-char' is produced by burning organic matter (e.g. farming or forestry by-product biomass) at a high temperature in an oxygen-controlled environment in a process that also produces pyrolysis (gasification). Indeed, it is similar to the process of making charcoal, which is then tilled into the soil. This technique has been used for generations by indigenous peoples in many regions of the world to enhance the agricultural productivity of soil. However, there is no credible research on the details of this practice (e.g. how long it may have taken to produce demonstrable enhanced soil properties or whether composted biomass was also added to achieve the desired effect. The impact of relative humidity in areas where this practice occurred is also an understudied factor).



BIOCHAR PRODUCTION

Since the early 2000s some scientists have suggested that, in addition to soil enrichment properties, the practice of burying bio-char can also be used as a key tool in climate change mitigation because it locks up (sequesters) carbon in soils. Consequently, there has been growing interest in using bio-char in large scale carbon sequestration projects, particularly as the global market for carbon offsets grows. The government sees this as a potential income earner.

Producing bio-char at the scale required to be meaningful in terms of greenhouse gas commitments or economic return on investment will require significant land use to create enough biomass available for pyrolysis. Much of the biomass will be obtained through the by-products of large-scale farming operations and forestry, but increasingly there is also interest in creating new plantations of fast-growing vegetation specifically for bio-char generation. The plantation solution is supported by a growing number of investors internationally who see enormous potential of bio-char in the carbon offsets market, though it has yet to be internationally recognised through the UN Framework on Climate Change.

Contrary to investor optimism, a major Australian-based NGO-funded research initiative active across Africa is very cautious about the potential for bio-char as a bio-engineering solution. There are at least 25 field trials of bio-char currently underway throughout Africa. Early results have led the scientists to acknowledge some beneficial properties of bio-char in soil enhancement, but also to state that considerably more needs to be known about the interactions between bio-char and local soils in various conditions and with various types of bio-mass, as well as its carbon draw-down and sequestration capacities in various conditions. There are no longitudinal data and the issues of scale still need to be addressed as well.

Nonetheless, a group of international investors including an American who had been a fellow student with the Carboneria Finance Minister at business school at Yale remains very encouraged by the results and want to get an early foothold in the bio-char carbon farming market. They have identified potential land for bio-char farming in the Carbonerian State of East Savaneria, which is in the rocky part of Carboneria that is largely viewed as economically unproductive because there are no commercial scale land-use operations. They deem this ideal for establishing a bio-char plantation based on growing a Eucalyptus variety that grows well in such soils and is suitable for pyrolysis and industrial scale production facility. Although the sites have no commercial farming operation, there is considerable subsistence crop farming by village cooperatives as well as some cattle and goat herding.

The investors have had preliminary talks with federal and state government officials. There has been some discussion about the impact on current land-users but officials point out that no individuals hold formal title to the land they have been husbanding for generations.

The role of scientific advice

The government and local leaders alike have also been approached by a number of strong NGOs, backed by several environmental groups internationally. But, these groups come with opposing views: About half of them want to discuss what they call the 'misconceptions surrounding bio-char production', warning that it is an unproven technology that will result in widespread displacement of local food crops and accelerated land-grabbing for low-grade biomass production because crop residues could never produce enough biomass to support a viable bio-char industry. They add that the soil enrichment properties of crop residues will also be lost if they are used for bio-char production. They raise the spectre of the bio-fuels controversy of the early 2000s, citing its *contribution* to global emissions rather than reduction. Yet other environmental groups fall on the other side of the issue; they are encouraging government officials and village leaders to take up bio-char processing as a viable economic development activity with beneficial environmental impacts despite the still uncertain potential of the market globally.

The foreign investment potential of the bio-char proposal for the same region is indeed highly attractive. A number of influential federal political leaders believe bio-char production would position the country as a leader in the growing climate mitigation market through carbon sequestration and credits trading. The proposed deal would require the state and national governments to jointly agree to lease the land to foreign developers as well as commit resources to site maintenance and infrastructure for an initial 20 year period with two 20 year rights of renewal. In return, the investors agree to a 65:25:15 split of the profits between the company, state and federal governments and to funding a local high school and agricultural technical institute in nearby villages once the company is profitable.

But most of the local village leaders see an alternative. They are being encouraged by a former nutritional scientist, turned entrepreneur, living in the capital to commercially cultivate a local shrub called flavonella as it has been found that a natural non-sugar sweetener can be extracted and commercially produced from this plant. Flavonella is endemic to East Savaneria. The sweetener, while not yet licensed by any food safety agency is being developed for likely use in diet drinks by a multinational food company (Global Health Food and Beverage Corporation GHFBC), which also has a senior scientist who is an expatriate from Carboneria working in their research headquarters. GHFBC thinks that it will be another five years before regulatory approval is achieved in a major global market for flavonella sweetener, but on the basis of their own internal data and clinical trials, it is well accepted as a replacement for sugar. The company is prepared to fund schools in the 5 villages at the centre of the proposed flavonella plantations in return for an exclusive option to purchase flavonella leaves in the event a food regulatory licence is granted for a major market in the next 7 years. An agreement has been drafted for the purchase price of flavonella leaves at that time. This agreement would guarantee significant income for the villages and the State, which is one of Carboneria's poorest.

With rumours about the new bio-char development increasing, traditional land-users have protested when potential investors visit the site and agitation is growing. There is considerable competing pressure by some local leaders and the multinational food company to start cultivating flavonella at scale.

Federal government officials are seeking advice on the merits of bio-char (including its potential to be accredited within the global Carbon Credits market) and the amount of land required for a sustainable bio-char economy to develop. But village leaders and many within the State government are not convinced about bio-char and much prefer the idea of growing flavonella, as they believe this would allow many of the state population's traditional land-use practices to continue. Thus, they want to compare the bio-char option to the continued use of the land by subsistence farmers with sustainably developing the area to cultivate flavonella. Yet for both options, the community benefit is dependent on the external market conditions materialising.

Both Federal and State governments are concerned about creating civic unrest after more than 20 years of stability. The Federal government needs to resolve the conflicting possibilities for land-use.

There is contention and strongly held views amongst different ministries.

The Science Advisor is, along with the Head of Treasury and other senior officials, expected to prepare advice for Cabinet on the path ahead. What considerations should the science advisor have in preparing their report?

PHOTO CREDITS

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