

## **Economic Assessment and Opportunities of Farming in the Buffer Zone of the Cocobolo Nature Reserve**

### *1. Introduction*

Slash and burn agriculture is a traditional but unsustainable form of agriculture which is still commonly practiced in the tropics by smallholders usually living in highly populated communities. Along with impacts caused by private enterprises (e.g. logging companies etc), the practice of slash and burn agriculture is one of the major causes of tropical forest deforestation. Indeed it is also the most common agricultural practice carried out by subsistence farmers around the Cocobolo Nature Reserve (CNR) in Panama, the area in which CREA is currently working. Cleared areas through slash and burn are often only productive for one year at a time, after which the soil becomes impoverished with few nutrients left to sustain crops. Farmers are then forced to move onto virgin or fallowed land in order to start the process over again. Slash and burn is a traditional way of farming for many poor people who are often not aware of alternative permanent ways of farming their land, which may be more sustainable. Lack of knowledge together with poverty has historically led to little experimentation or opportunities for change within this system.

In the area surrounding CNR, communities typically grow crops such as yucca, plantain, maize and rice. Slash and burn is also practiced by those farmers in the area who are growing the cash crop<sup>1</sup> *culantro*<sup>2</sup>, which can be sold at markets in and around Panama City. The practice of this type of “traditional/conventional” agriculture (i.e. slash and burn, monocropping, use of chemicals) carried out by smallholders in the tropics has inherent environmental, social and economic risks. Dependence on a single cash crop exposes farmers to market fluctuations with fixed production costs, which lead to further degradation of economic security. Furthermore, market crashes also expose cash crop farmers to food insecurity due to lack of investment in subsistence food production. In order for smallholders, to become more sustainable, from an environmental, social and economic perspective, there needs to be a shift in the way that they manage their land and their product choices. Through the “CREA Alternative” put forward in the IUCN EGP project proposal document (October 2008), CREA aims to address these problems by providing an alternative method of farming which is environmentally, socially as well as economically sustainable.

### *2. Aim of the This Document*

The overarching goal of the EGP project is to encourage the farmers to reduce the amount of land they slash and burn and work towards making their current land more productive in an organic and sustainable way. This will be carried out by encouraging agricultural diversification, the utilisation and integration of more sustainable land practices such as the use of organic fertilisers instead of chemical fertilisers, practicing soil conservation techniques and bed cultivation and having extended fallow times etc. Whilst the social and environmental positive impacts of switching to sustainable and organic farming are more obvious, the financial impacts are less so. The aim of this business plan therefore is:

⇒ *To analyse if, in the long run, products grown from a sustainable farming system are financially competitive and can provide greater economic sustainability when compared to conventionally grown cash crops, such as culantro.*

This will be done by constructing a baseline of overall production costs of a typical cash crop grown in the area (which in this case will be culantro) that will enable a comparison to be

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1 A crop that is purely sold for financial gains rather than for subsistence purposes.

2 Culantro is culturally an important herb throughout Central America, widely used in regional cuisines and even used by small rural and indigenous populations medicinally as a mild local anaesthetic.

made with the production costs of crops that are being grown in a sustainable way and which provide food security in case of a market changes (see section 3 below). From this comparison it will be possible to establish whether or not the profits made from alternative production regimes, can compete with the profits made from “traditional/conventional” farmed culantro.

This Economic Assessment will also conduct a SWOT analysis (taking into consideration financial variables as well as environmental and social variables), which will analyse the overall strengths, weaknesses, opportunities and threats of conventional farming versus organic farming (see section 4). By conducting this SWOT analysis and the comparison in production costs, it will be possible to establish if a switch over to a sustainable regime would be more beneficial for the farmers of the Cocobolo area than to continue to farm conventionally.

This document should be considered a work in progress. As new data from experimentation become available the models will become more refined. This analysis aims to set up a first pass at the current economic climate perceived by farmers and opportunities that may be exploitable.

### 3. *Analysis of Culantro as a Baseline and the Search for Sustainable Alternatives*

Culantro (*Eryngium foetidum* L., *Apiaceae*) production has been carried out in the CNR area for the last ten years and is one of the principle cash crops for farmers (other vegetables are infrequently sold at market, but these are almost irrelevant as a cash flow source).

In order to construct a baseline, CREA has drawn on information from a previous study that was undertaken in collaboration with McGill University in 2008, which reviewed the social, environmental and financial impacts of culantro production in the project area. The study revealed approximate costs and income for culantro production based upon 9 farmers with varying production intensities and investments<sup>3</sup>. This information was combined with production costs and prices from CNR demonstration farm. A summary table has been developed (see table 1 below) which provides information on the average production costs<sup>4</sup> associated with growing one hectare<sup>5</sup> of this cash crop as well as the average income received from one hectare of culantro in one year.

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3 The data from this report was based on interviews with the farmers and so the information obtained is anecdotal rather than analytical. However it does allow approximate figures to be given.

4 Such costs would typically be the labour and time needed to prepare the land, the acquisition of the necessary seeds and tools, labour for general maintenance and harvesting, products used on the crop such as fertilisers, insecticides and pesticides, both organic and chemical, the time needed to have a harvestable crop, transport to market etc.

5 Usually culantro plots are less than 1/2 hectare, but for the purpose of comparison, estimates of production costs have been calculated for one hectare.

Table 1 – Production Costs of Culantro

	<b>Costs of culantro per ha per year</b>
<b>Total Production per year</b>	81000 lbs
<b>Transportation</b>	\$4050 (5 trips per month for 9 months a year x \$100 per trip)
<b>Fungicide</b>	\$36 (3kg @ \$12 per year)
<b>Herbicide</b>	\$90 (3 litres @ \$30 per year)
<b>Insecticide</b>	\$90 (2 litres @\$ 45 per year)
<b>Fertilisers</b>	\$1350 (27 x 100lb sacks @ x \$50/ sack per year)
<b>Labour*</b>	\$5346 891 man days/yr @ \$6 per day
<b>Sub Total - Costs</b>	<b>\$10962</b>
<b>Income per annum per ha @ \$0.35 per lb</b>	\$28350
<b>TOTAL</b>	<b>\$18738/ ha</b>

\*Owner labour is not counted as a cost.

In order to make a comparison with potential produce that can be sustainably grown through the CREA alternative, estimates have been provided of the production costs associated with growing one hectare of 3 selected crops (spinach, spring onion and sweet pepper) (table 2). These crops have been selected as they not only have a good market value but they are also eaten by the farmers. We estimated production costs based upon CREA's own experience at growing these crops in its demonstration farm located within the CNR. Environmental conditions and soil types are identical to those in the buffer zone of the reserve and hence growth rates and production amounts are used with confidence. Table 2 provides an estimate of the potential income that such products would have.

Table 2 – Production Costs and Profit Margins of Spring Onion, Sweet Pepper and Spinach (sustainably grown)

	<b>Costs of Spring Onion per 1/3 ha per annum</b>	<b>Costs of Sweet Pepper per 1/3 ha per annum</b>	<b>Costs of Spinach per 1/3 ha per annum</b>	<b>Total</b>
<i>Total production per year</i>	15000 lbs	12500 lbs	30000 lbs	30500 lbs
<i>Transportation</i>	\$750	\$625	\$1,500	\$2875
<i>Seeds (This cost would disappear once in production)</i>	\$48	\$21	\$33	\$102
<i>Labour<sup>^</sup></i>				
<i>Weeding</i>	\$1620	\$1620	\$1620	\$4860
<i>Harvesting</i>	\$600	\$500	\$1,800	\$2900
<i>Post production processing</i>	\$150	\$150	\$300	\$600
<b>Sub-Total Costs</b>	\$4038	\$4086	\$3273	\$11,397
<i>Potential Gross Income per annum per 1/3 ha (\$)*</i>	\$15,000	\$6250	\$6000	\$13,750
<b>NET INCOME PER 1/3 HECTARE</b>	\$10,962	\$2164	\$2727	\$15,853
<b>TOTAL per ha</b>	<b>\$15,853</b>			

<sup>^</sup> Like in Table 1, owner labour is not counted as a cost.

\*Note: Income is based upon conventional market prices.

#### 4. A SWOT Analysis of Conventionally Farmed Culantro v. Sustainably Produced Crops

This section compares strengths, weaknesses, opportunities and threats between conventionally farmed culantro and organically grown and sustainably produced spring onion, sweet pepper and spinach. This will be done by comparing the financial (such as the estimated production costs - see section 3 above), environmental and social aspects linked to both regimes.

##### a) Conventionally Farmed Culantro

###### I. Strengths

Culantro is a relatively quick and easy crop to cultivate in comparison to crops grown using sustainable farming techniques e.g. it can be grown in many different soil types (but does require nutrients to be available), it requires good drainage but no irrigation in the rainy season. It can be harvested twice a week and is less susceptible to getting damaged during transportation than some of the alternative crops, which can be more fragile. Indeed, the local farmers are well adapted to growing culantro and are knowledgeable in the farming

techniques required for its production. From a financial perspective, as is clearly visible from the table of production costs above, a hectare of culantro can generate more income than a hectare of organically produced crops, mainly because it grows more quickly and can be harvested on a more regular basis. Indeed some of the culantro-producing farmers have a contract with the Riba Smith super market chain in Panama City which provides them with a regular and reliable income if they provide the necessary quota (120 lbs per week) of culantro (in sacks) on a fortnightly basis. From an environmental standpoint, culantro production takes up much less land than a typical cereal crop or pasture used for cattle farming.

## *II. Weaknesses*

Whilst there may be some positive aspects to cultivating culantro, which have been discussed above, there are many negative aspects to its production, particularly when it is produced in a conventional manner (monocultures, use of chemicals, and lack of soil conservation techniques etc). Its major weaknesses are the environmental and social impacts it causes. Firstly, the land is usually cleared by means of slashing and burning the forest to completely clear an area where it can be grown. As culantro needs a lot of light, it is usually grown in open monocultures, rather than in shaded agroforestry systems, which are more sustainable. This results in there being less biodiversity and wildlife rich habitats and more of a depleted and fragmented landscape. Also, in order to have a successful crop (particularly crops that are grown in monocultures that can be more susceptible to disease), many of the farmers are prone to spraying the culantro with chemical fertilisers, pesticides and insecticides, products, which pollute the soil and water systems in the surrounding area. From a social perspective, the use of such chemicals can cause long term health issues. When taking climate change in consideration, culantro needs a lot of rain so it may be a crop that may not respond well to such foreseen changes in climate. Already in the Mamoni Valley, there has been noticeably less rain in the rainy season and there has been a drop in culantro production.

Not only are there numerous negative environmental and social impacts caused by growing monocultures like culantro, but the farmers dependent upon such cash crops for their financial livelihoods also face other challenges such as fluctuations in the market and the demand for the cash crop they are growing. As already mentioned in the introduction, such fluctuations in the market can have huge impacts on their income and further exacerbate poverty amongst those cash crop farmers. In these types of circumstances, the farmers are left with a crop that they are unable to eat thereby intensifying food security issues.

## *III. Opportunities*

With the know-how of culantro farming already in place, there would be opportunities to convert from the way culantro is currently being produced in the area to a regime which is more sustainable and organic. The employment of more sustainable farming methods would generate positive impacts such as increased soil fertility and extended future cultivation of the crop whilst producing the same amount for market sale. Furthermore if sustainable agricultural practices were adopted, further opportunities would also exist by way of bringing the culantro into the certified organic market, which would have a financial benefit of providing extra income for the farmers.

## *IV. Threats*

Culantro farming using traditional/conventional farming techniques and small sized land parcels will inevitably run into a problem of space. As land becomes exhausted farmers are likely to be forced to reduce crop rotation cycles and fallow periods, threatening the quality and quantity of culantro produced. Additionally culantro grown in this manner is reducing

future opportunities for realising income based upon natural resource payments (such as payments for maintaining ecosystem services etc), eco-tourism or other sustainable land uses. Finally, there is also a threat that a more industrial approach to culantro farming is undertaken elsewhere which causes prices to drop, against which small-scale production cannot compete.

## *b) Sustainably Farmed Crops*

### *I. Strengths*

Switching from conventional agriculture to sustainable agriculture can provide many positive impacts, environmentally, socially and economically. From an environmental perspective, sustainable farming harnesses organic farming techniques that encourage better integration of the land that is under production into the surrounding landscape. This integration provides a richer habitat for wildlife and so is more biologically diverse than monocultures, for example, which are used extensively in conventional farming. Indeed the discouragement of the use of chemicals for pesticides, insecticides and fertilisers etc allows the soil and water systems to be more pollutant free. In relation to climate change, organic farming offers the potential to decrease emission of GHGs, improve energy efficiency and increase carbon sequestering within the agriculture sector. Also, as a potential climate change adaptation strategy, organic agriculture already addresses the key consequences of climate change, namely increased water stress, drought, flooding and extreme temperatures, by increasing water filtration and retention capacity as well as organic nutrient content of organic fields

From a social stand point, sustainable farming not only helps to lower health risks through the non-use of chemical products, but it also helps to improve food security due to higher crop diversity which satisfies subsistence dietary requirements throughout the year. Economically, sustainable farming strategies such as agricultural diversification, can assist with alleviating poverty as the use of mixed cropping, for example, does not over expose farmers to fluctuations in the market – if the market crashes, they still have other crops they can fall back on to either sell or for subsistence purposes.

### *II. Weaknesses*

Whilst sustainable farming can have many strengths, there are also some major barriers to converting to sustainable agriculture for the rural poor sector, such as:

- Lower income than cash crops farmed conventionally;
- The need for greater knowledge of agro-ecological systems;
- Large initial investment in labour for making terraces, planting live fences and erosion barriers and making organic fertilizers;
- Untested and unproven makes it hard for farmers to risk transition.

The initial transition to sustainable production can be costly, especially with a high initial investment in labour to prepare plots – a price that in some cases many farmers are not willing to pay. Clearly such a large investment would require a large return as an incentive. In Panama however the organic sector is small, government subsidies non-existent and consumer education very limited. Currently Panama only provides perverse subsidies for unsustainable land use mostly in the form of preferential loans for cattle ranching operations.

### *III. Opportunities*

Although the organic market in Panama is still insignificant, it is growing annually. Organic production cooperatives exist in most provinces with demand coming from high end

restaurants and supermarkets. Currently, organic vegetables attract prices that are 25-70% higher than conventionally produced vegetables. Furthermore, certification companies such as BioLatina are now operational in Panama, although certification prices remain an obstacle to most poor farmers. An alternative opportunity exists in the form of farmers' markets, where farmers are able to sell directly to customers. In this form certification is not entirely necessary to demand a higher than conventional price. In Panama, farmers' markets are not frequently encountered and most poor communities would not have the capacity to organise such activities without outside aid. An alternative strategy is a vegetable box scheme where customers can buy a box of mixed vegetables grown sustainably and brought directly to them from the farm. Models for this form of trade are abundant in Europe and the US. With the large expatriate community within Panama City and the well travelled elite and growing middle classes within Panama, it is expected that there will be a demand for such a scheme. It is expected that at first CREA's brand name may be sufficient to provide confidence in the origin of the vegetables, however mid to long term a more conventional form of certification will likely be needed. The potential selling power of organic produce, therefore, provides the farmers with a strong economic incentive to convert their land to sustainable agriculture.

#### *IV. Threats*

The threats that exist with sustainable farming are that crops grown organically 1) do not grow well in the vicinity of CNR and 2) have little market value. These threats can be combated by undertaking viability experiments at CREA's demonstration farm within CNR together with CREA field technicians and by only planting crops that are known to attract high market prices. Another major threat that the farmers face for selling organic produce (as well as culantro) is the cost and logistics of transportation from their isolated community to any market in and around Panama City. As part of the EGP project, CREA will likely assist with transporting organic produce to markets in Panama City, however it is not clear what the exit strategy would be once CREA has finished the project. CREA, therefore, needs to work towards developing self-sufficiency amongst the farmers.

#### *5. Conclusions & Recommendations*

The SWOT analysis of conventional farming versus sustainable farming, clearly suggests that a transition to sustainable farming would be the best mid to long term option. In the short term however, there are strong financial and social barriers to the acceptance and use of this technology. Sustainable farming would not only have positive effects on the community in terms of income, employment and health but would also benefit CNR. Currently CNR is threatened by slash and burn, use of chemicals and erosion within its buffer zone that cause strong edge effects. Under the sustainable agriculture model these threats would be mitigated and the farms better integrated into the surrounding landscape (through the practice of agro-ecology). As a result of this preliminary analysis the following actions are recommended for CREA:

1. Develop a one-on-one market for uncertified organic vegetables within Panama City;
2. Aid in the logistics and transportation for the delivery and pricing of vegetables;
3. Develop an exit strategy that focuses on transport, markets and cost management;
4. Investigate adequacy and ease of organic certification for farmers;
5. Promote inter farmer cooperation so that risks can be hedged;
6. Develop an experimental garden where new crops and mixtures can be investigated before being passed on to the farmers;
7. Build capacity amongst farmers to understand agro-ecological systems.

This assessment is the first phase of an ongoing activity that aims to understand the nuances of sustainable agriculture not only as an environmental tool but also a community development one. Information gained through this project will be important to guide and develop a scalable model for future projects.