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Costa Rica: The Deforestation and Soil Degradation of Paradise

“Since the end of the frontier in the 1960s, Costa Rica has faced increased land hunger and social dislocation. The frontier legacy includes wasteful practices and untenable perceptions.”

Quoted from: Augelli, John P. *Costa Rica's Frontier Legacy* Geographical Review 77.1 1987, p. 1.

I. Introduction

I chose Costa Rica to research because I have an affinity for this unique and environmentally conscious country. Costa Rica is the land of butterflies and forests where eco-tourism flourishes and fantasies of living in tune with the tropics prevail, at least for many Americans. Sadly, after conducting this research, I have discovered that Costa Rica's beauty and ecological balance are in grave danger from overdevelopment and deforestation. How did this happen? Is there hope for sustainability in this former oasis? During Spanish colonization, after the dissemination of the majority of indigenous tribes, Spain essentially abandoned Costa Rica for interests in other parts of the New World. Costa Rica's lack of pasture and precious metals not only kept the colonizers from overpopulating, it perpetuated an idealized tropical and political identity of this small Central American country.

Consequently, much of the farms are smallholder plots in the mountains where farmers cannot use tractors or large machinery. This country had rich soil and plenty of rainfall suitable for coffee and bananas. Now, the world is in a coffee crisis with a glut of the product, the largest export of Costa Rica, leaving this small country's 1 out of 4 agricultural workers underpaid and desperate (Wyels, 2003). Additionally, the soil is severely depleted (see Map A in Appendix) and Costa Rica has become dependent on food aid and cereal imports. To make matters worse, the impact of pesticides on the environment, due to the many pests in tropics, has resulted in a particular consciousness about toxins in food production with blame put on the Green Revolution. These problems, combined with a shift toward cattle and lumber away from bananas and coffee, deforestation has accelerated to the degree that only about 15% of the original forests of Costa Rica remain (Augelli, 1987; Wyels, 2003).

Today Costa Rica imports 70% of their food (Bureau of Western Hemisphere, 2006). Organic farming and related agricultural research are being implemented to improve the state of Costa Rica's food production. This research paper will focus on the unique agricultural history and conditions of Costa Rica and argue that organic farming and renewable resources appear to offer the only real options for sustainability and self-sufficiency in agricultural production. In order to become self-sufficient, the Costa Rican agricultural sector must focus on food production for local use and give local smallholder farmers economic and educational opportunities to prosper and support the growing landless and urban sectors.

Women are of particular focus of this research since there is a growing trend for “lone mothers” without any support becoming heads of households in rural and urban areas. These women face the most severe poverty and wage fairness discrimination, making their children the most at risk for malnutrition and hunger (Budowski and Bixby, 2003).

II. Agricultural History

The Costa Rican frontier “*frente de voltea*” kept alive the hope of the “family farm.” Although the Spanish did not colonize in numbers here as much as other colonies, the indigenous population was very small, and most settlers were of Spanish descent making the Costa Rican population unlike other Latin American regions. The family farm ideology that perpetuated in the agricultural history of Costa Rica contributed to the democratic and egalitarian development of this small, forested country (Augelli, 1987). Though Costa Rica’s 19,652 square miles represent just a small fraction of the world’s landmass, about 5% of the world’s biodiversity can be found there (Wyels, 2003). With over 200 mammal species, 214 reptiles, 130 fish, 168 amphibians, 600 birds and over 12,000 plant species, Costa Rica has been known for centuries as a tropical paradise. With variable terrain and tropical and subtropical climates Costa Rica boasts landscapes from coastal plains and rugged mountains situated between two bodies of water (see Map B in Appendix). Costa Rica is also a hotbed of volcanic activity with over 100 volcanic cones and several active volcanoes (Rainforest Alliance, 2006). This volcanic ash adds to the soil fertility as well, making this paradise a country that was once one of the richest in soil potential (Wyels, 2003).

Unlike the United States that developed from the coasts inland, Costa Rica developed from the interior forests outward (Augelli, 1987) although this country was almost 100 percent forests prior to colonization. Agriculture has been and continues to be very important for the Costa Rican economy. From frontier time to 1850 in Costa Rica pioneers cut and burned edges of virgin forests for land cultivation (Augelli, 1987). Until the introduction of coffee as an export crop in the 1820s the country was impoverished. During the 1800s coffee dominated export production. Although smallholder farmers were important in coffee production, they were left out of commerce, and credit, which has been and continues to be coveted by the elites (Streck, n.d.; Gudmundson, 1989). Coffee production today, squeezed by pressure of gourmet or elite coffee markets, is now dependent on fair trade in order to help the agricultural workers who pick the beans to live. However, very little coffee sold on the global market is fair trade (Wyels, 2003). Agriculture brings in the most income for this small country with eco-tourism playing a larger and larger role, but the fragility of tropical forests may prove to be too delicate for the far reaching canopy jumpers and “disturbers” of nature (Wyels, 2003).

Where does all the money from agricultural production go? In 2001, for example, coffee and bananas together accounted for 31% of exports with values of \$163.4 million and 501.1 million, respectively (Nations Encyclopedia, 2006). Over the years agriculture production has changed drastically, but remains a major part of the economy. Ninety percent of Costa Rica's exports are from agriculture (Bureau of Western Hemisphere Affairs, 2006). What kinds of responsibilities do the large banana corporations or world coffee distributors have toward small farmers in rural areas?

In the past land was easily accessed by the poor, yet as settlement increased less land became available. Now, for the first time in many years, the poor do not have the opportunity for land ownership. Large landowners are using Costa Rica's land resources to export agricultural crops and not to feed the people (Augelli, 1987; Wyels, 2003).

Bananas have become a major crop, grown on large plantations by foreign companies such as Dole and Chiquita. The banana industry has been producing more than one million tons of bananas annually since 1970. The principal marketer of Costa Rica’s bananas is the Standard Fruit Company (Rainforest Alliance, 2006). Banana cultivation is expensive and known to be hard on soil. Major corporations have a reputation for exploiting the economy and laborers. Bananas also bring in problems with pests and diseases. The most serious consequence is soil degradation and now Costa Rica has severe soil degradation throughout its agricultural areas (see Map A on soil degradation). In recent years there has been a shift toward cattle and lumber exports. This brings in other problems of deforestation and clear cutting.

What was once a country that was almost 100 percent covered in virgin forests, is now a country of land degradation and soil depletion with only about 15% of those forests left (Wyels, 2003). If it were not for the foresight of the government to make 25% of the land protected national forests and parks and to focus on eco-tourism, the country would be in even greater peril.

Costa Rica is also the world's largest exporter of butterflies. Exporting butterflies is a way to help Costa Rica while not harming the environment. Butterflies are indigenous to Costa Rica, and butterfly farms aren't destroying the land like banana or beef production (Bronaugh, 1993). Although Costa Rica is popularly perceived as a tropical paradise, there are many ecological concerns and environmental issues that no longer support this belief. Wildlife conservation is one aspect that has not been covered by this paper that is of great importance in this rich tropical forest called Costa Rica. In this paper, the focus is farming and smallholder farmer families and their food production.

III. Subsistence Farming

Costa Rica's subsistence farmers are smallholder families who mostly live in Central Valley, which is the most farmed region in the country. There are also some spread around the Atlantic Coastal Zone. (See Map B for more details on the topography of Costa Rica.) A typical family farm consists of 4-5 people with children who are in school. Despite Costa Rica's high literacy rate, most of the family farmers don't have an education past primary school. When the children get out of primary school they stay at home and learn to help with the farm or household duties. A family's diet consists of corn, beans, rice, tortillas, and bread for the most part (Ruben and Ruiters, 2002). The crops that are generally grown on smallholder farms are corn, beans, plantain, and rice. In Central Valley the farmers also grow cabbages, tomatoes, peppers, carrots, broccoli, and cauliflower. In the coastal areas they grow cassava, taro, pineapple, pejabaye, and citrus. Other domestic crops include cattle, chickens, grains, legumes, root crops, and exotic fruits and vegetables (Streck, n.d.).

The family farms bring in little cash and the farmers have limited access to resources. Much of their income is brought in from agriculture, but since this is not enough, farmers turn to livestock, and some farmers seek other employment to help bring in more money, some even leaving their families for the faraway plantations or urban sectors. Small holder farmers don't have as much opportunity for education and resources and are not seen as equal to people in power who make the decisions about how to market or sell cash crops. Smallholder farmers do not receive fair treatment and are not able to do as well as large landholders and the dominant elite (Gudmundson, 1989; Budowski and Bixby, 2003).

Women are very affected by this attitude because of the more traditional views of small Costa Rican farm communities. There has been some outreach to women in recent years, but the majority is still discriminated against in the workplace and marketing communities. A lot of men in small holder farms are leaving the women to sustain the family alone while the men find wage labor opportunities and some of these men do not stay in the family unit at all. There is a growing trend in Costa Rica for women to have children out-of-wedlock and receive little or no child support. These women headed households make up a large portion of the poverty stricken because of unequal treatment in the workplace (Budowski and Bixby, 2003; Ruben and Ruiters, 2002). Some of the wage labor that the men seek is with larger corporations who own banana plantations. These corporations give cheap labor wages and typically do not share profits with local farmers.

Many smallholder farmers and rural communities are aware of the toxins from pesticides and wary of new technologies that may endanger their health and the health of their children (Agne and Waible, 1997). What are the motivations for smallholder farmers to adopt new biotechnologies when they are already cash poor and in isolation (Sittenfield, et. al, 2000) and skeptical of western science?

IV. Agricultural Research

Even as rural poverty and the demand for farmland and pasture deforests even more forests, conservation concepts of ecology and sustainable agriculture have emerged in Costa Rica. These holistic approaches to conservation and rural development have been presented through a variety of organizations and educational institutions, including CATIE, or the Tropical Agricultural Research and Higher Education Center. This organization began in 1942 and today has over 2500 acres on its campus with over 300 species of crops and plants (Wyels, 2003) for research purposes. In this short review, I will cover a recent biointensive workshop held in Costa Rica, rice production and biotechnology. There are many more aspects of agricultural research that cannot be covered here.

Sixty Costa Ricans attended a 6-day Biointensive Workshop on organic farming and agricultural innovation from March 27th through April 1st, 2006 held in Costa Rica. All information about this workshop was derived from the website: www.growbiointensive.org/costa-rica-conference/conference_report.html. A very important group at this workshop was the Ministry of Agriculture and Livestock (MAG) who had fifteen field agents in attendance. They represented all parts of the country. Perella was the Costa Rican coordinator for the workshop. The purpose of this international meeting was to give small farmers a more competitive edge. Perella has also done work at a small experimental organic farm called *Finca del Lago*. Perella states: "Costa Rica may become the most 'double-dug' (per capita) country in the world." 'Double-dug' is a new technique being implemented in organic farming. What it means is planting crops in beds where the gardener digs 12 inches down and then loosens the soil 24 inches deep. The plant roots are able to penetrate easily and the soil gets more air. Moisture stays in the soil, weeding is easier, and the process of erosion is slowed. This will help to preserve Costa Rican farmland soil as opposed to other damaging techniques.

Costa Rica was the host country for the biointensive workshop and many organizations participated, including the workshop's co-sponsor, the Movimiento de Agricultura Organica Costarricense (MAOCO). There are other projects that are under active evaluation for the future. A national Biointensive Workshop may occur in March or April of 2007 to continue this collaboration of scientists and farmers. An important component of outreach is the establishment of local factories to produce strong D-handled spades and forks for Costa Rican farmers. This will help to produce useful hand tools for farmers in the mountain regions, as well as help to provide labor in the local factories.

Another Costa Rican participant of the Biointensive workshop is considering building solar seed dryers for women farmers as they dry seed. These would be very helpful in the humid tropics, because seeds are hard to dry fully which impairs their storage life. More outreach to women will help them to develop better skills for cash crop production and subsistence farming, and all the poor families headed by women can strive for a better lifestyle.

Demonstration gardens for organic farming have been made in the form of "mini-farms" at high schools, elementary schools, and other locations. Participants really enjoyed getting to know each other and working as a team. This is a great project for educating people further about farming and agriculture. Escuela Marie Ana Marin is the largest elementary school in Costa Rica, with 1600 students. They do not

have sufficient fresh vegetables, and the director, Rosa Otiz, is dedicated to organic farming. It is a small site with good soil but there are hidden pipes and concrete slabs that make working with the soil very difficult. These endeavors to educate young people about organic farming will hopefully bring better opportunities in the future for farming families to have sustainable practices.

The Rice Biotechnology Program, as described by Sittenfield et. al. (2000) in their article: Costa Rica: Challenges and Opportunities in Biotechnology and Biodiversity is doing research in making biotechnology and biodiversity combine to improve crop growth and eliminate problems with rice production. This rice program, supported by the Rockefeller Foundation and the Costa Rican United States Foundation for Cooperation (CRUSA), is part of the current research in agriculture today. These scientists are looking at certain characteristics of wild rice, which may contain useful traits for crop improvement. They are also working on ways to prevent diseases in rice and control pests without the use of pesticides, which have caused health issues in the past. Flooding is also a problem in rice production in Costa Rica, which is another aspect of this program's research. The project is working towards developing flood tolerance in wild rice species.

In agricultural research today, scientists are working together with farmers and farmers' cultures to develop innovative and sustainable practices. In Per Pinstrup-Andersen's (a former WFP laureate) and Ebbe Schioler's book, Seeds of Contention, they write about a genetically modified rice crop. Currently, many research projects focus on small-scale farmers and poor consumers. If these projects were to succeed, many Costa Rican rice crops could be saved. Other benefits are a resistance to viruses and diseases, the ability to ward off pest attacks, and to add a higher iron content. All of these things would benefit small-scale Costa Rican farmers immensely and help build a healthier future for Costa Ricans rural children.

V. Obstacles on the Path to Sustainability

Most of Costa Rica is barely accessible through their road system since this system is in a state of extreme disrepair. Costa Rica's infrastructure has not been maintained and is not an interest for new investments. This makes it difficult for people in rural areas to travel to nearby cities. The Costa Rican roads need repairing so that smallholder farmers and rural communities will have easier access to markets. Many smallholder farmers aren't able to sell at larger markets easily because of the difficulties in travel and connecting with the right people. Also, there is still a very elitist society present in agricultural policies and decision-making. The larger farm communities, as well as big corporations, are the main ones making choices and running the agricultural economy (Bureau of Western Hemisphere Affairs, 2006).

There are several environmental problems preventing sustainability in Costa Rica. Grain crops, especially rice, have suffered due to damaging weather conditions. The crops are not able to withstand the heavy rain and floods. As mentioned earlier, the soil degradation of the majority of Costa Rica's land is very severe. Farming techniques that will not destroy the land need to be accessible and affordable for smallholder farmers. The degradation of Costa Rican soil has led to cattle and lumber taking over as exports, but this presents a problem just as serious: deforestation. Additionally, world markets, such as the fickle coffee trade, have forced agricultural workers to destroy plants instead of harvesting them (Augelli, 1987; Wyels, 2003).

Deforestation and globalization are ruining some of Costa Rica's most valuable natural resources. Corporate businesses that have no personal interest in Costa Rica's welfare, such as Intel and Proctor & Gamble, have made investments in Costa Rica. The exploitation of land for beef and lumber production

exacerbate forest destruction, which has deforested a large part of the private held forestland (Bureau of Western Hemisphere, 2006).

Costa Rica needs to be able to support its people and feed its poor. By exporting all its agricultural products and needing to bring in so much food aid there has become a problem with self-sufficiency. Smallholder farmers are not able to feed themselves and their families as well as if they remained more focused on self-sufficiency. Also, equal treatment is important for sustainability. The environmental issues need to be addressed soon, before there isn't any farmable land left.

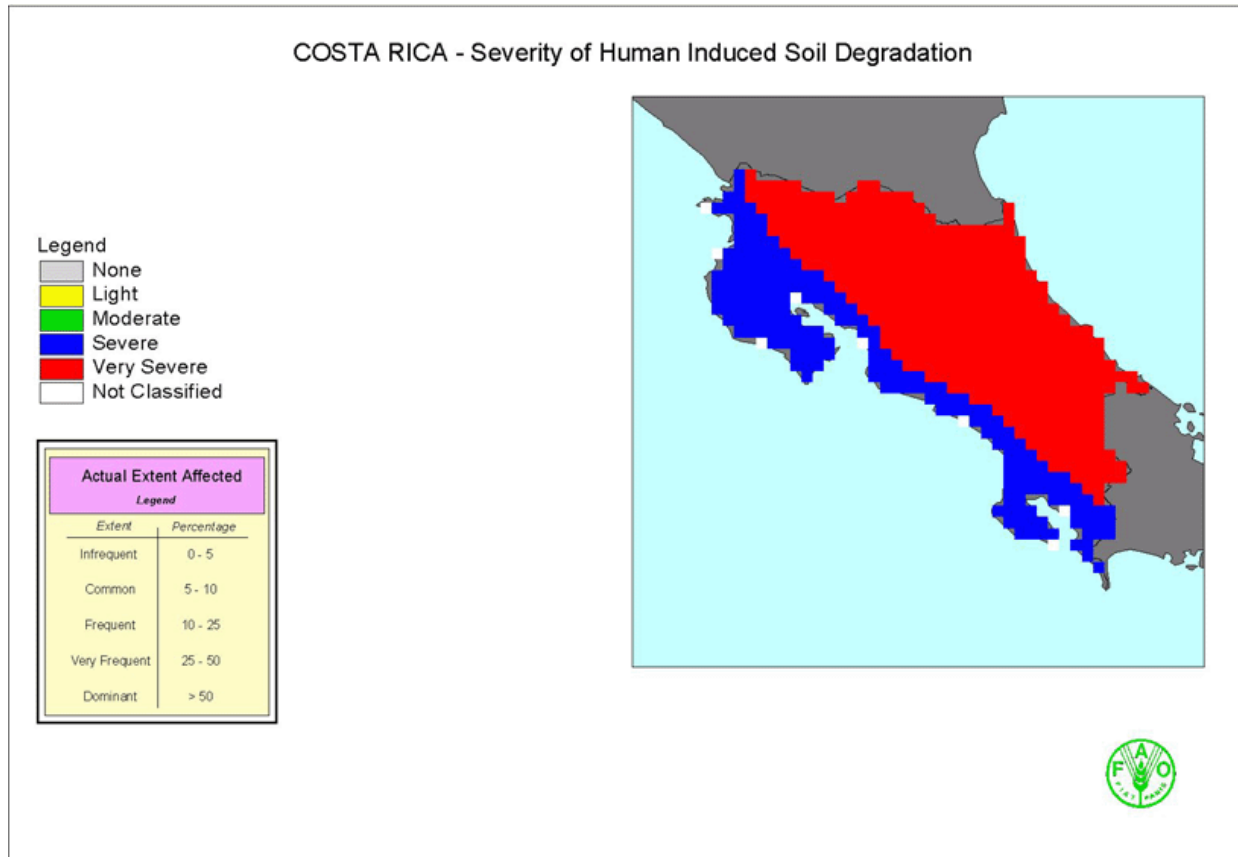
VI. Conclusion

Costa Rica has had many challenges with poverty, land distribution, and food stability. Recent solutions include the use of organic farming and educating small-scale farmers about advancements. Organic farming gives an opportunity to improve the state of Costa Rica's farmable land. There needs to be a balance between modern technology, such as GMOs, and traditional or organic farming. Certain biotechnological research programs can help to improve yield and withstand environmental obstacles. With the damage to soil, flooding, Costa Rican terrain, and pesticide poisoning present, a combination of organic farming and biotechnology advancements will be the most beneficial. It's important for any research or advancements for Costa Rica to be very environmentally conscious so as to prevent any further damage to the natural resources of this beautiful country.

Gordon Conway (1997), in his book The Doubly Green Revolution, offers the idea of a second Green Revolution that is more environmentally friendly. Conway argues that this revolution should be equitable and sustainable. This is especially important for Costa Rica because of all the environmental challenges that it has experienced in the past. If Costa Rica can be helped through advancements in biotechnology and improved farming techniques, while protecting and sustaining the environment, they will benefit strongly. At the same time the balance with organic farming and their traditional farming styles must be kept alive.

Costa Rica needs to take a greater interest in the welfare of the small farm families and poverty stricken. Although there is research being conducted, and there are programs trying to help with food security, there is still a large gap between the poor and the wealthy lifestyle. Poor families live very badly, and most hardly have the basic human needs. The agricultural market as well as economic income has become largely centered on big corporations. The big coffee and banana plantations, which have very little concern for smaller farm communities, are leading agricultural society. When Costa Rica is able to turn its eyes more to the poor families, and promote the efforts of those who are already reaching out to them, then there will be a much clearer path to food security and sustainability.

Appendix



Map A: FAO website: Food and Agriculture Organization of the United Nations. www.fao.org/ See Bibliography for full citation.



Map B: University of Texas library website: www.lib.utexas.edu/maps/americas/costa_rica.gif

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