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Establishing Biofuels Crops in Costa Rica Through Sustainable Agriculture

Introduction

Costa Rica is known to most as the place to go for vacation, or even to retire. Flanked on both sides by oceans, with mountainous rainforests between the beaches, Costa Rica is a very attractive destination for tourists. No, people don't usually associate Costa Rica as being a place from which they get bananas, pineapples, and coffee, though those are this small country's top three agricultural exports.

About 5,050 of Costa Rica's 50,660 square kilometers of land are used for crop production. That's almost 10 percent of the land. About 20 percent of the workforce is employed in agriculture, and agriculture accounts for 8.6 percent of the Gross Domestic Product (GDP). While there are quite a few large plantations, almost half of all farms are less than 10 hectares (25 acres) in size (Encyclopedia).

Though agriculture is important both socially and economically for Costa Rica, its participation in the economy is decreasing. Agriculture went from about 12 percent of the GDP in 1998 to 8.6 percent in 2006. Workers in agriculture numbered 270,800 people in 1998, but was 254,500 in 2004, despite the increasing population (Arauz). As the farming community decreases and urbanization continues, the rural communities are weakened from loss of their members to the cities. This leads to even more people moving away from rural life. The population decrease in rural communities is not good for farmers, as there are fewer people they can rely on for support.

In February 2006, I went to Costa Rica with a group from Iowa State University to view agriculture there. We went to farms and research facilities and saw much of the country. I toured citrus, banana, pineapple, organic vegetable, chrysanthemum, fern, coffee, and melon farms. I also visited an orange juice plant, HortiFruti (a company that distributes fruit and vegetables), a research facility studying ways of keeping banana roots free of nematodes, Doka (agricultural research organization) headquarters, a DIECA (sugarcane grower) research facility, and an outpost of the INA (National Training Institute) which is an organization that trains youth in business practices. What I experienced prompted me to write this paper about this country.

Family Farm

In Costa Rica, few, if any, true subsistence farms are in operation, so I shall endeavor to describe the average family farm. A household generally consists of two parents and their children. The father is, by tradition, the head of the family. Women, however, are now breaking out of the traditional role of the housewife and are finding jobs outside the home (Leitinger). The two main staples of their diet are rice and beans, and they also eat bread, plantains, fruit, vegetables, and beef. The average annual income for a household in Costa Rica is about 5,100 U.S. dollars and school is compulsory for nine years, but there are cases where children drop out because they are needed on the farm. For grades one through six, the attendance is 99 percent of all children, but this drops to 71 percent for grades seven through nine (Bureau).

The size of most of these small family farms is less than 10 hectares (25 acres), but there is a wide variety of food crops that can be grown in Costa Rica. Rice, corn, beans, potatoes, sisal, yucca, vegetables, fruits, and tobacco are primarily produced for domestic use (Encyclopedia). Bananas, pineapples, coffee, melons, ornamental plants, and sugar are the main export crops (Bureau).

While I was in Costa Rica, I learned that there are several different agricultural regions in the country. The crops grown in each region are based on the climate of that region, so different crops are grown in different parts of the country. Having different crops means that different methods of farming must be used for each region.

Many small farms are located in the mountains, where the roads are bad and the land is very steep. To use a tractor or other machinery on most of these farms is next to impossible. Therefore, most farmers rely on beasts of burden such as oxen to tend their fields. Some of the steeper fields (where the ground is practically vertical) are used as pastures for livestock, but there are still many fields on steep hills. The hills and bad roads also make transportation of farmers' products difficult. Of the 35,330 kilometers of roads in Costa Rica, only 8,621 kilometers are paved. During the rainy season of May to November, the many kilometers of unpaved roads would be a challenge to negotiate (World Factbook).

These steep fields lead to a major problem: soil erosion. However, soil is not the only thing being washed away by the rains. Chemical runoff from pesticides, herbicides, and fertilizers used by most farmers is polluting the environment. Although one quarter of Costa Rica's rainforests is protected, deforestation is still a serious problem. Forests are cleared mostly for cattle ranching and agriculture. Soil erosion, chemical runoff, and deforestation are three serious environmental problems that can be traced directly to agriculture (World Factbook).

In Costa Rica I saw several different marketing practices as well. Costa Rica has the capability to market agriculture products internationally, nationally, and locally. I went to the farmer's market in San José—easily the largest farmer's market I have ever been to. Hundreds of people were doing their shopping there, and there were hundreds of stalls selling all manner of products. Most small farmers do not market their goods internationally, due to the competitive nature of the international market. Most sell locally or sell their products to a larger company, such as HortiFruti, that will distribute the products throughout the country. Since biofuels crops are not widely marketed internationally yet, Costa Rica could be a leader in that market by growing biofuels crops.

Biofuels

Biofuels, though seemingly an excellent source of energy at first glance, have their pros and cons. On one hand, biofuels could cut down on pollution, slow the world's dependence on fossil fuels, and provide a much-needed source of income for impoverished farmers. On the other hand, if too much land is used to grow biofuels crops instead of food crops, the world could be facing a food shortage that is even more severe than the one it already has. What direction it will take has much to do with the use of resources and the implementation of growing biofuels on the farm.

One thing that could revolutionize biofuels production is the development of cellulosic ethanol. Cellulosic ethanol comes from the structural matter of the plant instead of the starch, meaning that ethanol can be produced without destroying the food source. This is very important because it means that both food and energy can be derived from a crop, instead of just one or the other. Cellulosic ethanol has a higher net energy yield than that of ethanol made from starch. Also, many of the crops used in producing cellulosic ethanol are perennials and do not have to be planted every year and they usually use fewer fertilizers and pesticides than corn (Uldrich). There are a few cellulosic ethanol plants in operation in various parts of the world, and more are yet to come (BIO). If a cellulosic ethanol plant was set up in Costa Rica, it would create a demand for biofuels crops. This may make a farmer more willing to try growing them.

Education

Education and the spread of ideas are important for any kind of progress to be made. Technology and research mean very little if no one who can put it to practical use knows about it. Therefore, some sort of outreach program is needed to educate farmers about methods that could allow them to grow food and biofuels.

In Costa Rica, there are few of these programs for the family farmer. The University of Costa Rica (UCR) is one of those few. The University of Costa Rica has sessions throughout the year about progress made in agriculture that all farmers are welcome to attend. This is a good start, but Costa Rica needs more than just a few sessions a year at the university.

One dilemma with the University of Costa Rica's programs is that without direct communication between farmers and the University of Costa Rica, the ideas university researchers come up with may not be very practical for the average farmer to use. Another difficulty is that most are located at the University itself or at one of their six regional campuses. This may be too far for some farmers to want to go, especially since the mountains make traveling take longer and the roads are often in poor condition. The main problem, though, is that many farmers think that it is merely interesting to see what researchers are doing. Seeing a process in a 'laboratory environment' seems more unobtainable than seeing that process done in practice. They may have the feeling that these practices are to be implemented in the future instead of the present. The lack of education for most of them may make them feel out of place or even intimidated in a university setting.

Sustainable Agriculture

Sustainable agriculture is, in essence, long-term agriculture. This type of agriculture is profitable, ecologically sound, and community-enhancing. Sustainable agriculture is important for the overall social health of the country because small rural communities are just as important as large urban communities, and one focus of sustainable agriculture is to develop the farming society.

The best way to implement growing biofuels crops in Costa Rica is to make the new farming practices sustainable, so biofuels crops can be grown for many years and become an important part of agriculture. Support from the government, university system, and biofuels industry will be needed to help farmers grow and process biofuels crops in a sustainable manner, which can provide a positive impact for all partners involved.

Practical Farmers of Iowa (PFI) is an organization that is run by farmers for the promotion of sustainable agriculture. It has been very successful since its conception over twenty years ago. PFI started out with less than twenty members meeting in each other's homes, and now has over 700 members. It has been so successful that several Midwestern states have tried to copy it (PFI).

PFI is a group of farmers sharing ideas and helping other farmers take the steps toward sustainable agriculture. It does this in many ways, including a variety of programs and projects, field days, and an annual meeting (PFI). Rick Foster of the W.K. Kellogg Foundation says, "We believe the current reversal of attitudes in the state of Iowa—to be much more community focused and looking to local food for both environmental protection and for economic growth of rural communities—have in large part been because of the efforts of Practical Farmers of Iowa."

Solutions and Recommendations

From the research above, I have concluded that what Costa Rica needs most in order to raise crops for biofuels production in a sustainable manner is an organization that can spread innovative ideas,

provide support for farmers implementing sustainable agriculture practices, and create a communication link between farmers and researchers so the latter can provide the former with what they need most. In other words, Costa Rica needs an organization very much like Practical Farmers of Iowa.

To begin an organization like this, a lot of cooperation between farmers will be needed, as well as some help from outside the farm. I believe that the best institution to help this new organization on its way is the University of Costa Rica. Because this university has locations throughout the country, it is in a good position to begin bringing farmers interested in this organization together. However, while the University of Costa Rica and the new organization may collaborate on certain projects, it is important for them to remain separate entities. This will ensure that the farmers have their own voices heard instead of the farmers listening to the professors.

Having already established communication with researchers through the University of Costa Rica, next the organization will need ways to spread the innovative ideas, methods, and technologies that the university's professors and researchers may find. One of the best ways to do this is another PFI method—having a field day. Field days take place at a farm that has been using these practices, and anyone can come and see what the farmer has been doing and how well it is working. Because of the different agricultural regions, the field days will probably need to be conducted regionally. This is a different method than the sessions hosted at the University of Costa Rica because farmers can see for themselves exactly how a farming practice is done and what a difference it can make in their farming operations. Field days also generate practical ideas that help solve on-farm problems. Eric Franzenburg, President of the board of PFI and coordinator of several field days, says, "Farmers all over the world are the same. When they get together, they like to talk about how their farms are doing. Farmers learn best from other farmers."

Once ideas have begun spreading, it will become necessary for this organization to provide support for farmers who wish to try new methods on their farm. One way to do this is to connect those people with an expert in that field, or with other farmers who have already implemented the changes on their farms. Also, if enough people in an area are interested in doing the same thing, the organization could put together a small group of farmers that can mentor each other. In addition to a mentoring group, the farmers could also work together to market their products. This is a good way of building up farming communities as well.

Another important aspect of this organization will be youth programs. It is important to get the youth of Costa Rica involved so the future of agriculture and the biofuels industry of Costa Rica remains strong. It is important for youth to make connections that will help them in the future. While the youth may not have the opportunity to continue their educations formally, they would have the chance to learn about agriculture in a practical setting.

This organization would not only help farmers begin growing biofuels crops, it can create a demand for these crops in Costa Rica. The organization could support the building of a cellulosic ethanol plant or other biofuels refineries. It could also help farmers make their farms more environmentally and economically sound.

Conclusion

Small-scale farmers in Costa Rica face many challenges: environmental issues, difficult farming terrain, bad roads, and lack of communication between farmers and researchers. These issues can be solved by cooperation between farmers, researchers, and the government. An organization that demonstrates practical sustainable agriculture practices could be organized to help make these changes and more. If the University of Costa Rica helped begin this organization, the organization could go far.

An organization for the promotion of sustainable agriculture would benefit Costa Rica in many ways. It would not only enable Costa Rican farmers to grow biofuels crops, but would be good for the environment and good for local communities. The farmers will also benefit from this unifying force by learning to use practices that can increase their profit. This organization, though, will not benefit just Costa Rica.

Costa Rica is one of the more advanced countries in Central America. Many of its neighboring countries look to Costa Rica for ideas and inspiration. If Costa Rica could successfully implement biofuels crop production and an organization that promotes sustainable agriculture, there is a good chance that other countries in that area will try to do the same. Costa Rica can lead Central America in the quest for sustainable biofuels agriculture. With Costa Rica setting an example for and perhaps helping other countries in Central America, the entire area could improve their farming practices and begin implementing biofuels crops in a sustainable manner.

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