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Costa Rica, Sustainable Agriculture  
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### **Costa Rica- Sustainable agriculture**

This paper will present Costa Rica's agriculture and how that can be reformed to a more sustainable and green agriculture that benefits all parts of the population and their health. Also, solutions and recommendations how Costa Rica could obtain an even better agroecological agriculture and society is discussed as well as what measures Costa Rica already have implemented in the agriculture.

Costa Rica is a republic with a head of state and government and the current president is Carlos Alvarado. Costa Rica has a population of about 5 million people where almost 80% live in urban areas and about 20% in rural areas. The proportion of the land in Costa Rica that is farmed, is a bit more than one-third (34,5%), where coffee and bananas are the most important crops. The most important products for export in Costa Rica are bananas and electronics (Landguiden, 2017). Costa Rica's most important partner of trade and investments is the USA (Globalis, 2014). Costa Rican farmers and multinational companies in Costa Rica apply two primary methods in farming, permaculture and plantations. Plantations are agriculture where market crops are cultivated at a large scale, often by global enterprises. Permaculture means permanent agriculture (hence the name) and thus sustainable cultivation (Wikipedia, 2020). Agriculture of medium size (3-10 hectare) is the most common agricultural structure. Large farms are less common and often managed by companies and international corporations (FAO, 2020). Some of the most common forms of agriculture around the world are plantations, self-sustainable farms and high-tech farms (Mikael Larsson, 2015).

The natural geography of the country is highly variable. The country is in the tropical zone, but the climate and weather of the country varies a lot depending on the landscape of the country. At the east coast and in the north there are lowlands, while a fertile high plain extends into the central parts of the country. By the coast the climate is moister while it can be both very warm and dry at the plateau. Fifty percent of the country is today covered by forests with anything from cloud forests, tropical rainforests and tropical dry forests. This makes the biodiversity in Costa Rica enormous and a total of 25% of the country are natural reserves (Landguiden, 2019). Costa Rica has three main soil types: ultisol, andisol and inceptisol. Ultisol is a red clay soil and its geological structure can make it difficult to cultivate without a considerable effort, but there are some solutions to make the soil more manageable. Inceptisol is for example brown forest soils and dark soil types that have developed from sedimentations from volcanic ashes etc. Andisol is a very porous soil type with a volcanic origin as for example Volcanic ash (Brittanica, n.d.).

The majority of the population in Costa Rica live in one-family houses. It is not unusual that several generations and different parts of the family live together. Nor is it unusual that the children stay at home until marriage. Those better off usually have one or more cars and a maid, often a woman from Nicaragua. The lower middle class, with somewhat lesser conditions, acts and lives under somewhat lower living conditions. As in many other regions and countries in the vicinity, rice and beans is the staple food for the majority of the Costa Ricans regardless of social class. Chicken and beef, pork and fish are consumed. Some examples of common meals are Gallo pinto, Casado, Arroz con pollo and Olla del carne. Most of the Costa Ricans work directly or indirectly in the service sector. In Costa Rica the welfare

is good in many ways. The welfare is at the same level as in many of the world's richer countries and a well-developed welfare system covers employees and their families and includes healthcare and pensions.

In Costa Rica the basic education is free of charge and duty to attend schools has been around since 1869, therefore the skills to read and write are very high. Moreover, the access to education and the access to primary healthcare is good. The healthcare has got high standards and therefore the child mortality is low. A big part of the population has access to clean water and toilets. In 2015, 99.7% had access to water and in 2017 97,8% also had access to toilets (Landguiden 2017). Approximately 20% of the population in Costa Rica is, however, considered to be poor and below poverty line, despite this the majority has access to, for example, health care (Globalis, 2014).

In Costa Rica, 74.1 % has access to the internet (Human Development program, n.d.). The roads in Costa Rica are in comparison with the rest of Central America good as the roads most often are paved independent of the geographical location. Costa Rica's infrastructure is, however, affected by lack of investment and management (Wikipedia, 2020). Also access to electricity is good (The world bank, 2014).

Conventional agriculture has put pressure on indigenous traditions since the application of pesticides has doubled in Costa Rica's agricultural field during the last two decades (The world bank, 2014). Costa Rica is currently in the world top-group for using the largest amount of pesticides per hectare. Plantations are a large factor for leakage and other effects that pesticides have on the environment. Usage of intensive agricultural chemicals on large plantations make the production of market crops the most toxic factor for nearby areas and environments (Wikipedia, 2020).

When large areas are being clear-cut and only covered with one sort of plant, called monocultures, the potential for pests and other disturbances to become very serious and devastating is increased. A large diversity of species acts as a biological control to protect and stabilize entire areas. Then only some species will be affected by different disturbances. Plantations have occupied habitats for biota, which has created an enormous shift in biodiversity. Among other things, one of Costa Rica's most poisonous snakes, "Fer de lance", has been favored by this sort of agriculture since its prey nowadays has less places to hide. Before this sort of agriculture, its survival chance was only around 2 % while it today has increased until ca 60-70 %. This is a clear example of how large effects that clear-cuts, and plantations have had on for example the environment and the biological diversity (Wikipedia, 2020).

A trend that is currently ongoing in Costa Rica is how the usage of small scale sustainable agricultural methods increases. Costa Rica has declared that they should become the first carbon dioxide-neutral country in 2021, and to make smaller but crucial changes in agriculture is the first step to reach such a goal. Sustainable farmers practice methods such as crop rotation. In crop rotation, different types of crops are planted in the same area across a sequence of growing seasons. Costa Rica's climate enables food and income to be provided for bigger parts of or all year around as the harvest periods are very long which is a big advantage with crop rotation. The method is moreover decreasing the risk for pests and diseases and reduces erosion of the soil, which is a large environmental problem in Costa Rica (Wikipedia, 2020).

Instead of using chemicals to prevent and stop for example pests the farmers cultivate for example lemon grass, lemons, mint and rue which are pest repelling. To grow plants variedly and change plants every

season also prevents pests since they often feed on a specific crop which is now only available for short periods. Other methods that sustainable farmers practice is among other things companion planting as well as agroforestry. The more sustainable methods that are applied within agriculture, the less energy will be necessary in general for the farmer since the agricultural system is being maintained by itself (Wikipedia, 2020).

Something that has had a large effect on the ongoing trends is the climate changes since they have contributed to both local and global changes as well as problems for agriculture. Farmers try to aid agricultural problems through sustainable solutions for future generations. Several Costa Ricans are proud that Costa Rica is among the world's leading countries within climate smart agriculture. For many farmers is sustainable agriculture moreover an economic relief (World Bank, 2013).

In the countryside in rural areas prevails poverty to a larger degree than in urban areas. Approximately 20 % of Costa Rica's population is estimated to be below the line of poverty. This affects their food security and the most exposed groups are the old, women, children and disabled. A relatively large part of the uneducated population with reduced living standard is refugees from Nicaragua (FAO, 2020). The harmful agricultural chemicals from large plantations have a large effect on nearby areas. This also affects indigenous tribes since they live and farm the rivers that are affected by leakage from these plantations and moreover, they have no legal right to prevent this. One example is the Bribri tribe which lives in Costa Rica (Wikipedia, 2020).

The current reforms in Costa Rica are beneficial for the country's environment, nature and climate changes. However, the plantations are a large problem. Important forest is cleared at the same time as the usage of pesticides is high. There is also a risk that large corporations and companies outcompete and buy smaller scale farms. Costa Rica is currently making large efforts to reform agriculture since they have declared that this should be the first carbon dioxide-neutral country in the world until 2021. They have therefore begun to apply methods within agriculture such as crop rotation and companion planting. On the other hand, there was a long period when Costa Rica clearcut their own forest and created large future problems for themselves. The country has a long way left but several projects have already been initiated (Wikipedia, 2020).

In similar countries methods have been tested for example to create protective zones to enhance the biological diversity and sustainability. Pollinators and birds can be protected by cultivating plants at specific locations. This can also provide protection against leakage and natural enemies and other potential threats. Even methods like agroforestry have been implicated in similar countries and similar solutions probably would fit in Costa Rica. Since Costa Rica is ahead in agroecological development compared to the rest of Central America, and methods available have to a large degree already been tested and started to be implemented in agriculture. Some of these methods have already been mentioned earlier in this text. However, there are variations and improvements that can be implemented.

One solution to improve the agriculture of Costa Rica is to integrate animals and crops. Industrial agriculture tends to keep animals and plants apart. In many cases, the animals live far away from where their food is produced. Now research has shown that it can be both better economically and more efficient to let the animals interact with agriculture. Then, unnecessary transports can be stopped and the animals can graze among the plants and thereby thrive and naturally clear the fields from weeds or unwanted vermins. This coexistence can be very advantageous if done properly and well planned. Another solution

could be to plant a variety of different crops together to maintain the biological diversity, often referred to as companion planting. To also adopt agroforestry methods, to mix trees and shrubs with smaller crops would give plants water and animals natural shelter and shade. These solutions uphold and promote biodiversity which acts as a natural regulator, capable of protecting and stabilizing whole areas and its inherent species. These solutions can even potentially lead to an additional income. Both these methods can be implemented in the agriculture of Costa Rica. These methods can be added to the already taken measures to obtain a sustainable agriculture. These methods are to a certain degree relatively alike and therefore possible to implement on the same farm. For smaller farms this progression can be easier to perform.

The politicians of the world need to make progress in the progression to obtain a sustainable agriculture in Costa Rica as well as in the rest of the countries in the world. Political decisions regarding agriculture are essential for these reforms to take place. Without political pressure, changes will not occur to the same degree because of the economical profit. For big companies and corporations, a substantial change will be expensive and tiresome which then may lead to the cancellations of reforms. Therefore, the politics needs to be a large part of the project. However, citizen movements are also important since changes in the society are difficult to obtain without the support of the people. However, the “will to change” is to a relatively large degree present in Costa Rica because of political goals and values. Even organizations that support the green and sustainable revolution is essential and necessary, among them ANAI, ANAO, CEDECO, MAOCO, CAC, AEF and the World Bank.

The project would to a large part be financed by the government by possible subventions and tax reductions for sustainable agriculture. That could act as motivation for larger companies to reform their farms. It could possibly be needed to enforce restrictions for unsustainable plantations in case political policies are not followed. Small farmers seem to have a greater and broader acceptance for sustainable ideas, and that is mostly culturally accepted. However, it's the bigger and more complex farms that are the problem. The change will be big and possibly costly which can act as a discouraging factor. For farms that are managed to obtain as much profit as possible a change cannot be done with profit and thereby stopped.

Finally, we can see that Costa Rica is heading towards an agroecological agriculture. Costa Rica has implemented a lot of methods to accomplish a more sustainable agriculture for future generations. But there are more to be done and some obstacles still need to be overcome, amongst others powerful companies with big plantations. Since Costa Rica has a political agenda that favors agroecological farming, these reforms are not likely to be a too large obstacle to overcome.