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## **Reflection Triggers Growth**

Reflecting on past generations, one can see the efficiency they possessed. We can look back on those ancient societies and learn a lesson from their resourceful and conservative behaviors. Today, much is wasted in American homes. We have been blessed with surpluses, yet we take all of this for granted. In the past, gifts from the earth were cherished and not wasted. For example, when Native Americans harvested an animal, every part of the creature was utilized. Some products were used as nourishment for the body, some for tools and clothing, and others for shelter or recreation.

Past societies elicit an endless respect for land. Gifts from nature, used for survival, were received with gratitude. Native Americans believed in the circle of life: what is taken from the land is returned. Whether a tree is hewed, a deer harvested, or a human dies, all are returned to the earth. Through an understanding of the circle of life, plants and grasses are fertilized. In today's hustling society, that great respect for the land has been lost. The air is polluted by fuel-guzzling vehicles, fossil fuels are taken from the land, and animals' natural habitats are overtaken by industrial growth. A lesson from the past, implementing respect for the land and efficiency for its preservation, sustains the life cycle.

Every living plant and animal contains internal energy and the necessity to survive. These traits certainly become noticeable when changes arise. For example, when explorers first arrived in America, they stepped into a land filled with diversity compared to their familiar environment. Their need for exploration and adventure led them to travel farther than they had ever been. The explorers' passion for the unknown led them to discover a great place filled with opportunities and new experiences. Due to the actions of recent generations, we have been forced to look into new energy sources.

An impoverished country with a rich desire for change pioneered the search for new fuels. Brazil, the largest South-American country, started the first ethanol production project in the mid-1970s (The Promises and Challenges of Biofuels for the Poor in Developing Countries). With 3.2 million square miles, Brazil is the tenth ranked economy of the western world (Culture Quest: Brazil Fact Sheet). The country has a population of 176.5 million (as of 2003) and is growing annually at a rate of 1.2 percent (Geography, Agriculture, and the Economy).

Agriculture has an immense impact on Brazilian society. Ten percent of Brazil's gross domestic product (GDP) is related to agriculture. Around 44% of the land area is suitable for agriculture. Out of this land, only one-sixth is cultivated for crops. The remaining land is used for pasture. Brazil is also the economic leader in the Latin American region (Geography, Agriculture, and the Economy).

A typical subsistence family in Brazil is difficult to define but consists of a mother and father and their children, although since the legalization of divorce in the 1970s, single parent families are also present. Women are the head of 27% of the rural poor in Brazil (Rural Poverty in Brazil). This is mostly due to the fact that men have to migrate to other parts of the country in search of seasonal work. A typical meal consists of rice, beans, and beef or chicken. In poor regions of the country, refrigeration is a luxury, so dried meat with vegetables is common. Subsistence farms grow their own food and rarely participate in the cash market. Homes in the poor regions are usually constructed of woven branches plastered with mud, and the roof is made of clay tiles. Houses may also be made of stone and mortar covered with stucco and lime. Education in Brazil is free, but surprisingly, forty percent of children of compulsory school age (eight to fourteen) do not attend. Also, around half of the Brazilians are illiterate (Enchantment of the

World). Income of typical Brazilian family ranges from \$766 to \$3,035 putting the country in the lower middle-income group.

In Brazil, there is no such thing as a typical farm. The country has two distinct agricultural areas. The first, located in the southern part of the country, has substantial rainfall, better soil, adequate infrastructure, and more experienced farmers. The second is located in the northeast region of the country. This region lacks ample rainfall, good soil, sufficient developmental capital, and adequate infrastructure. This is the region of the country occupied by subsistence farmers. Most subsistence farms are small in size. The farmers usually raise their own draft animals to assist them in farming and do not use purchased fertilizer. Farmers in this region are becoming more important as they have recently been exporting forest products, tropical fruits, and cocoa. The central region of Brazil contains large areas of grassland most suitable for grazing. Agriculture products grown in the different regions of Brazil include coffee, soybeans, wheat, rice, corn, sugarcane, cocoa, citrus, and beef (Agriculture in Brazil).

As mentioned above, the northeast region of Brazil contains the majority of subsistence farmers. Drought and dry, arid conditions hold this region back from farming efficiently (Geography, Agriculture, and the Economy). The northeastern families lack sufficient developmental capital, posing a problem for farmers. If they do not have enough money to buy food, they must grow their own, but the families still need to make enough money to survive. In order to raise more crops, they would have to get someone to loan them money until they could make enough by marketing their products to support themselves. Also, the farmers do not have adequate infrastructure, therefore transporting products to market is difficult. Technological change, diversification in production, and farm mechanization has presented a loss of rural employment over the past decades. As a result, Brazilians are migrating to other areas of the large country (Rural Poverty in Brazil). For the subsistence Brazilian farmer to be successful, these obstacles must be overcome: transportation, technology, diversification, mechanization, and monetary support.

In the last decade, despite two periods of international and domestic economic crisis over the last five years, Brazil has dramatically improved the living conditions for the nation's poor people. Yet the country continues to have one of the most uneven income distributions in the world (Geography, Agriculture, and the Economy). The need for education on agricultural yields and the research on crop sustainability, will improve the living conditions of the subsistence farmer. Furthermore, the aid in implementing methods from this research will improve living conditions. These families also need access to implementing methods from this research, along with support.

Due to oil price shocks, in the mid 1970s, Brazil began researching alternative fuels. Oil prices rose to \$40 per barrel, which pushed Brazil's annual oil import expenditures to more than \$10 billion. This caused a global recession. In order to pay for the high import bills and to develop domestic energy alternatives, the country borrowed heavily from other countries. Worldwide interest rates substantially raised in the early 1980s, which forced Brazil to implement strict economic adjustment. These in turn led to rapid inflation and negative economic growth. The production of ethanol has contributed to guaranteeing fuel security for the future and has also saved Brazil much-needed capital. More than 1.7 billion barrels of gasoline have been displaced by ethanol since 1975. This has saved more than \$65 billion in the cost of oil imports, and when figuring in the cost of paying back debt that gasoline imports would have required, the savings increase to over \$100 billion (Brazil's Experience with Bioenergy). The program was criticized when oil prices were low; people said that the program was uneconomic. By looking at the figures, one can see that the biofuels industry brings numerous benefits to the Brazilian economy (The Promises and Challenges of Biofuels for the Poor in Developing Countries).

Brazil has been very successful since beginning the study of alternative fuels. Several important factors play into why this country has been successful. Brazil's appropriate climate for growing sugarcane and the abundant supply of agricultural land come first (The Promises and Challenges of

Biofuels for the Poor in Developing Countries). The country's agricultural leaders established the ethanol and sugarcane industry with diversity in mind. Nearly all sugar mills in Brazil were set up for both ethanol and sugarcane production. Because sugar prices have been both on a general downward trend and highly unpredictable, with the flexibility of Brazil's plants, when sugar prices fall, industry can, to some extent, shift to ethanol production. Ethanol processing and sugar production have significantly improved between the years of 1975 and 2000. Sugarcane yields have seen a rise of around 33% in the Sao Paulo region. Ethanol production per unit of sucrose increased by 14% and the productivity of the process of fermentation has seen a 130% rise. Due to these improvements, the cost of ethanol production declined annually at an average of 3.8 percent from 1980-1985 and 5.7 percent from 1985-2005 (Brazil's Experience with Bioenergy). As oil prices have increased over the years, Brazil has been working to make the ethanol production process as inexpensive as possible (The Promises and Challenges of Biofuels for the Poor in Developing Countries).

By utilizing every part of the sugarcane crop, Brazil has turned the ethanol industry into an efficient practice. The country has taken advantage of synergies with heat and electricity production by using residues from the sugar-manufacturing process. Bagasse, a residue from the sugar-manufacturing process, is burned in boilers traditionally. It is used as a source of electricity and heat for the sugar and ethanol production processes (Brazil's Experience with Bioenergy). Other agro industries also utilize this surprisingly valuable by-product. By using bagasse as a source of heat and electricity, Brazil was able to export an increasing amount of electricity. In fact, electricity from biomass increased from the amount of 80 gigawatt-hours to 1550 gigawatt-hours from 1997-2004 (Brazil's Experience with Bioenergy).

Brazil is benefiting from the environment by using every part of the sugarcane crop. By using the bagasse as a source of electricity and heat, the country is reducing the amount of greenhouse gases. Other countries developing ethanol are not helping the environment. They are using fossil fuels to produce the biofuels, which are supposed to reduce environmental contamination. These countries really are not accomplishing much because the contamination they hoped to prevent is still taking place in the process of making a cleaner, environmental-friendly fuel. Also, if grown under the right conditions, bioenergy crops can contribute to improved environmental management. Bioenergy crops, grown on degrading land, can actually help restore the soil and biodiversity. Ethanol derived from sugarcane, as that produced in Brazil, is competitive with oil and also has favorable energy and carbon balances (Developing Bioenergy: A Win-Win Approach That Can Serve the Poor and the Environment). All of this has helped to create a successful biofuel industry in Brazil.

The ethanol industry in Brazil has also created much-needed jobs for the poor. It was estimated in 2001 that ethanol production accounted for more than one million jobs in the South-American country. Around 65% of those jobs were permanent, with the remainder seasonal, harvesting jobs. In manufacturing and other sectors, the industry indirectly created an estimated 300,000 jobs. Unskilled workers have been given job opportunities because of the creation of jobs in rural areas on sugarcane plantations. Small farmers play a big part in ethanol production. In fact, there are around 60,000 independent producers, accounting for 30 percent of sugar production. The ethanol and sugarcane industries have created many opportunities for poor, unskilled workers in rural areas, but there is still work to be done in the northeastern section of Brazil (Brazil's Experience with Bioenergy).

Brazil has been successful in the biofuel industry because of major government support. The government provides incentives for consumers, supports technologies for biofuel production and sets technical standards. By doing so, consumers bought ethanol compatible vehicles and service station owners were not afraid to invest in biofuels. The government also ensured suitable market conditions. With the government's support, the ethanol industry in Brazil obtained a strong start (The Promises and Challenges of Biofuels for the Poor in Developing Countries).

Brazil has had its problems with ethanol also. In the late 1980s, due to poor management, supply was not able to meet the ethanol production demand. The sale of cars powered by ethanol in the late 1980s made up 90% of new cars sold in Brazil. This decreased to about 1% in 1996. Therefore, in the 1990s and early 2000s, there were no significant increases in the country's production of biofuel. Since 2003, when flex-fuel cars were first released, there has been a significant increase in ethanol utilization in Brazil (Brazil's Experience with Bioenergy).

As one can see, Brazil has been very successful with ethanol production since pioneering the industry in 1975. Looking at all the statistics and successes, one would think that Brazil wouldn't have a problem with poverty. Although the country is the leading economic power in the Latin American region, they still have 22.4 percent of the population living on less than \$2 per day. The country has made many advances throughout the past decade, but still has work to do in order to maintain the industrious giant they have created (Geography, Agriculture, and the Economy).

Although the ethanol and sugarcane industry employs many unskilled workers, there are still many unemployed subsistence farmers in the northeast region of the country. The sugarcane industry is tremendously strong, but has room for improvement. International institutions must ensure that the poor know about the opportunities presented by the biofuel's industry. Brazil also needs to provide farmers with research and extension services, infrastructure, and credit to help subsistence farmers expand and improve Brazilian lifestyle. These poor farmers need to be educated about raising energy crops. Although they live on some of the poorest soil in Brazil, subsistence farmers can still grow some sort of crop, which could benefit the biofuel industry. Through the use of technology, crops have been developed that are resistant to drought and pests. To aid the subsistent farmer, drought and pest control crops must be marketed at a reasonable cost. The need to eradicate poverty in this South American country is ongoing, but the manufacturing of biofuels will facilitate the quality of life in northeastern Brazil. The embryonic process will nurture many.

Brazil's success in the ethanol industry relies on the efficiency of diverse sugarcane production and independence from foreign products. The Brazilian government is making sure other industries and consumers support the biofuel industry. By doing so, the environment is protected and jobs are ensured for impoverished citizens. Resourcefulness and independence are the main factors to Brazil's success. Strong traits from past societies are proving to be successful in today's world. Growing societies reflect on the success of past generations to thrive in the future, just as Brazil has done.

To initiate success, a first step is crucial. If the Europeans hadn't taken the risk to sail across the vast sea, would the Americas have been discovered? If the Brazilians hadn't researched a new fuel industry, how much would a gallon of gas cost today? And, how many Brazilians would be without a job? Every living thing contains an internal power and energy. All it takes to pioneer is inspiration and motivation. Modeling Brazil's industrial strategies offers inspiration and motivation to other countries. Brazilians have improved their country while taking into consideration the environment and the impoverished. They have created a rapidly growing industry and are continuing to improve their practices. With government support and foreign markets, Brazil is sure to prosper.

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