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**The Effects of Technology On Food Production, Education, and Transportation In
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It is no secret that there is an overwhelming food crisis in Ecuador. Although known for its biodiversity, issues regarding food insecurity are at the forefront in the media. By analyzing and understanding the socioeconomic makeup of Ecuador, we, The World Food Prize Foundation, can find a way to compensate for their lack of technological resources while also preserving their culture and traditional practices. Small scale farmers are responsible for 64% of agricultural production in Ecuador (World Food Program USA, 2021). The land that these farmers harvest is crucial to their well being. Keeping their farms in operation guarantees survival, but Ecuador experiences harsh geographical conditions. This requires intense labor that forces farmers and their families to designate all of their time to keep their land fertile and viable to produce food. Although the education system is strong, 25% of children drop out of school by 5th grade. (US Bureau of Labor Statistics, 2022) According to Humanian, “The shift to online distance learning led to many school dropouts as numerous children did not have access to the Internet, mobiles, laptops or other electronic devices. In the 2020/2021 academic year, there were approximately 100,000 children that did not register for school due to the lack of access to digital devices” (US Department of Labour, 2020). This shows that the lack of technology also has an impact on education, which is crucial for children, especially young girls. Although the land that these families tend to have is the basis of their livelihood, the work involved prevents many children from attending school past the age of 10. Not only is Ecuador facing a lack of technology for agriculture and education, high oil prices cause issues regarding the transportation of food. Adequate food production is pointless if there is no means of transporting produce to markets for distribution. When applying technology to a problem, we have to consider all aspects of food production, from how it is grown to how it gets to a family’s plate. By upgrading each step of the food production process, Technology could compensate for the time and commitment necessary to grow and transport food in the unstable conditions that Ecuador endures.

A majority of farming is done by small scale farmers who operate plots of land inherited from previous generations. A study done by four scientists in small indigenous Kichwa communities helps create an understanding of what issues small scale farmers are experiencing. Exploring the lives of these farmers helps us create an understanding of what needs to be done to help feed the populations of Ecuador. The second priority after establishing food security is creating opportunities in education. A member of one of the local communities brings up concerns regarding his children’s ability to both farm and attend school. “In time there will be no plots for us to sustain ourselves. There is no way of getting more agricultural plots. I have realized that my children need their education so that they have [something] for their future. (Respondent # 11) It is clear that these small communities have heavy concerns on the state of their personal plots of land, and other local organizations are noticing this.” “The Environmental impacts and scarcity perception influence local institutions in indigenous Amazonian Kichwa communities” done by Oldekop, Bebbington, Homes, and Villamarin states that there are small scale institutions and organizations that are putting effort into helping these farmers with their production of crops: “Chontacocha has received regular technical support from local authorities and NGOs. At the time of the study Chontacocha was getting agricultural training on pest control for cacao production from a Spanish NGO, and had received a batch of hardwood saplings from the local authorities under a reforestation initiative. Previously they had received agricultural training and help with aquaculture projects and poultry farming as well as advice on the risks of clearing forest patches near streams.” These organizations are limited in their efforts. If outside

resources could offer this kind of technological assistance on a larger scale, the impact would be exceedingly positive. The World Food Prize Organization has the ability to provide advice and technological assistance in more massive quantities than smaller organizations, although it is crucial they work together. Working with these small scale local communities, for example, the schools that provide financial assistance in exchange for numerous resources, could create effective and cooperative change. In order to provide effective assistance to these populations, it is crucial that larger more influential organizations closely listen to the needs of each individual family operating the plot of land. Although the community studied only represents a fraction of the population, we can compare it to other communities because of the similarities between all small scale farmers. Each specific technological solution is to be modified based on the specific needs of that farmer. Technology in these areas would expand the amount of common pool resources being produced in these indigenous communities. Analyzing small groups of local farmers allows us to understand the needs of the community, and having large scale and small scale organizations work together helps create a resolution where everyone is satisfied.

Machinery in agriculture is crucial in compensating for the struggles small scale farmers are facing. Technology will help produce enough crops for profit and it will also allow children to have an education. “Such changes have allowed societies across the world to gradually reduce the drudgery of agricultural production and free agricultural producers from the heavy physical toil of farming. As a consequence, there is now less need for labor in primary agricultural production; workers are released for employment in other sectors, such as industry and services, children are free to go to school, and women can pursue non agricultural employment opportunities or household activities.” (Food and Agricultural Organization of the United Nations, 2022) If technology was accessible to these communities in Ecuador, they would be able to overcome the many obstacles that prevent them from producing an adequate amount of common pool resources. This technology must be used in a way that understands and addresses marginalization between groups. It must benefit everyone, especially women and disabled persons. Despite claims that technological growth causes job shortages, machinery creates a variety of jobs, and crops will be produced at a higher rate as well. Children will be able to pursue higher education which guarantees a raise in income. It is also crucial that the culture and agricultural traditions of the communities are preserved. This is done by closely understanding the tactics in which farmers plant crops, and teaching citizens a more efficient approach to technology based on previous techniques already being practiced. We are not erasing or drastically changing their agricultural practices, but simply elevating and expanding them. AI and new machinery would allow farmers to utilize the small plots of land to which they are limited to. Since it is extremely difficult to find other land, they must work with what their families have tended to for generations. As motorized machinery spread to America, crops began to be produced at an exponential rate. According to the State of Food and Agriculture Report by the United Nations in 2022, “The use of tractors as farm power became one of the most influential modernizations of the twentieth century, as it allowed, and even triggered, innovations in other agricultural machinery and equipment, such as threshers, harvesters and a wide range of associated implements.” Motorized vehicles, AI, and other methods of technology could be crucial in helping these small scale Ecuadorian farmers overcome the difficulties that they face.

Transportation of food is crucial to ending and preventing food scarcity. Technology can be incorporated in the last phase of crop production as a vessel for transport. Advancements made in food production are meaningless if we let quality food sit to rot. Once crops are produced, they have to be directed with careful intention. These systems in which food distribution is managed must be given the resources needed to organize how food makes its way to a household. Lack of intention to where the food is sent leads to mismanagement of produce and ultimately food waste. An article published by The Global FoodBanking network “Approximately 900,000 tons of food in Ecuador is either lost or wasted annually, most of which could be redirected to Ecuadorians experiencing hunger. About 33% of the population experienced food insecurity between 2018 and 2020, an almost threefold increase from 2014 to 2016.” (Global FoodBanking Network, 2022) It is important to control where this food is going as soon as possible. The food could be wasted if not transported correctly and in a timely manner. Although it seems like a straight forward solution, wasting food has become the norm. Dr. Alicia Guevara states, “We have so many products available that waste has become a habit. Sadly, our beautiful country ranks second in chronic child malnutrition in the region.” Technology will allow for easy communication between point A and B. It will also make up for the issues regarding availability of fuel. Ecuador has experienced a crisis regarding oil prices. Oil is the main source of energy for all sorts of transportation, but most importantly by train. Allocating food around the country requires oil, and unfortunately, “Transport consumes 52 million barrels per day (mb/d) of oil, which accounts for more than half of the world's oil demand and is the fastest growing sector since 2000. Transport, which can be passengers or goods, has very diverse manners, such as road vehicles, railways, ships and airplanes.” This has hindered the transportation of agricultural products to urban areas like Quito, and the wholesale marketplace of Ambato. All of this oil is inconvenient and inaccessible. Technological advancements like electric power for transportation similar to a subway could allow food to be taken to rural markets for distribution. “In Ecuador, in 2017, there was an availability of 7,743,582 tonnes of food, of which 1,175,455 tonnes were imported (MAGAP, 2019). This implies that 85% of these unprocessed foods are part of an agro-food chain.” This means 85 percent of produce is at risk of becoming waste due to lack of efficient transportation. New technology would greatly assist in getting food to where it needs to be. Trains that rely on oil are unreliable because of the current circumstances. In order to compensate, implementation of renewable energy would allow for a sustainable subway system to transport food. Investing in this type of energy would greatly increase the productivity of transportation and combat the lack of oil. Although Ecuador has almost twice the population of New York, “70% of its energy from renewable resources” (Mapway, 2023) A subway system would be the most ideal method of transport, but it must be structurally sound enough to endure the harsh geological conditions that Ecuador experiences. Earthquakes in Ecuador can have a magnitude as strong as 7.0. This would completely devastate an underground subway system. This hypothetical transport system would have to be installed above ground, and it would need to be sturdy enough to withstand harsh geographical conditions. If we could help Ecuador install a subway network, then food waste would be an issue of Ecuador's past. However, this would be a time consuming and expensive process, but it would be worth it if we could bring Ecuador out of this cycle of food insecurity.

Technology could be the key for lowering the time and commitment necessary to produce and transport food, despite all of the economic and geographical issues Ecuador faces. Understanding

small indigenous communities helps come up with a large-scale solution that can be modified to fit the needs of each and every local farmer. In our position of privilege, it is easy for us to assume what is best for those who live amongst different conditions. Superpowers like the US have often abandoned genuine support in an attempt to better its image. Ecuadorians are aware of their situation, and ultimately our solution is determined by what they think is best for their country. The solutions that have been presented would be modified based on feedback from leaders and citizens alike. No one knows Ecuador like those who live there, and their situation defines what we need to do in order to compensate for their lack of resources. As an organization created to keep bellies full, we have the money and technology necessary to support the growth of countries. We can apply our own technological advancements to theirs, and they would be able to pick and choose which techniques work the best. Although our own methods have been proven to be effective, we cannot ignore the traditions that have already been in place for hundreds of years. These communities do not need us to dictate their every move when it comes to farming, they simply need our encouragement and support. As advocates for food security, it is not in our best interest to look down upon those who are in a rough situation. It is crucial that we familiarize ourselves with their day to day lives and techniques that they have already been practicing for years. In turn, we can also learn something from them as well. Although these communities do not have the technology that we do, they know the land better than anyone else. Although they have their own means of producing crops, we can still suggest some of our methods in order to increase productivity. Different kinds of machinery, such as AI and tractors that are far more efficient than livestock, can be used to produce crops and keep children in school, as well as provide jobs for a multitude of diverse people. Education is crucial in providing Ecuadorians with a stable income. Finally, technology provides a solution for the transportation issue regarding oil prices. Although transportation could be arguably the most important step in food production, it is greatly overlooked. We always notice how food is grown, but we don't really think about how it gets to our grocery stores. These hidden steps between the producer and consumer must be brought to light so we can see how we can improve the system. Technology could be the key to food stability in Ecuador, and by understanding the components that create and distribute food, we can apply these scientific technologies to every aspect of food production.

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