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Philippines: Improving Farming Resistance to Climate Change

With over 7,600 islands of diverse geography the Philippines has a population of roughly 117.5 million people with 50% living in urban areas and 50% living in rural areas (Worldometer). About 42% of the land in the Philippines is cultivated for agriculture (US Department of State). While this is a large portion of land, the agriculture sector still struggles with keeping a stable output of crops. The majority of the farmland in the Philippines is small and sectioned off with most farms under 3 hectares or 7.4 acres averaging to be about 1.29 hectares or 3 acres (Habito) roughly the size of 1.5 - 2 professional soccer fields. These small farms are less profitable and inefficient with output. Major crop and resource exports of the Philippines include semiconductor devices, electric machinery, automobile parts, textiles, rice, coconuts, pineapple, bananas, corn, and sugar (US Department of State). The climate in the Philippines is advantageous for growing crops year long, however, they suffer from severe tropical storms and natural disasters which makes farming more difficult. The climate in the Philippines is tropical with high temperatures and humidity contributing to a dry and a rainy season. The country lies in the typhoon belt which makes it subject to several typhoons per year (PGASA). The Philippines operates under a constitutional republic with 3 legislative branches led by a president, currently Ferdinand Marcos Jr., who controls the state and government (US Department of State). 50-57% of the people in the Philippines are food insecure with the severity ranging from moderate to severe (Ferrer et al). Half of the population is struggling with food insecurity with minimal efforts to solve the issue. Filipinos suffer from continuous reports of hunger and poverty with the younger demographic struggling with malnutrition (Denya).

The average Filipino household is 4 people, which is steadily decreasing annually (Howe). Filipinos have access to jobs that require a basic education including customer service/call center agents and technology upselling with wages ranging from $300-$460 per month (JobStreet). Jobs available to those without formal education include retail, agricultural work, hospitality, and manufacturing with an income of $230-$400 per month (JobStreet). The typical diet consists of adobo stew, rice, fish, vegetables, and pork with rice being the most prominent in all meals and fish being the more prevalent protein (Vickers). The fish can be served raw or cooked and the rice is made in all forms (NIHR). High rice intake leads to health issues such as high cholesterol due to elevated salt and carbohydrate levels. Their consumption of pork and their methods of cooking also lead to high fat content which is less nutritious and results in health risks. An improved diet would consist of more vegetables and rice alternatives, however, these are not available in all areas and aren't as accessible as rice. Other than farming, the Filipino people can obtain their food from local wet markets and sar sari stores which are found in both urban and rural areas (Paunan). The Filipino people prepare their food by grilling, frying, steaming, sauteing, or boiling (Knorr). Furthermore, infrastructure and services can be harder to acquire in some communities which impacts the lifestyle of the people. Filipinos have limited healthcare options, especially those living in rural areas. In urban areas, healthcare is more accessible with modern and higher quality facilities. In contrast, rural areas with rugged terrain are harder to reach and do not receive appropriate healthcare services (InferVision). Additionally, education in the Philippines varies. In urban populations, education is free and accessible for K-12 and higher education is available (International Trade Administration). However, in rural communities education is less accessible and lower in quality with most individuals dropping out at a young age (Xian). There are inconsistencies in infrastructure depending on regions. Half the population has access to clean water and the other half lacks access to sanitation facilities (Planet Water Foundation). The infrastructure is currently less modernized and unsuitable for plumbing and irrigation. Even though infrastructure in urban areas is being urbanized to keep up with the demand, rural

areas have insufficient roads, electricity, and internet access (WorldVision). Additional challenges Filipinos face include low income, high inflation, risk of natural disasters, and high drop-out rates (Wilson).

Food insecurity in the Philippines is persistant in all communities and one of the biggest causes is recurring devastation from natural disasters and an increase in severity due to climate change. Due to typhoons, floods, and droughts it is hard to maintain good crop output and keep the crops alive for harvesting. The severity of this problem increases as climate change becomes a more prominent issue. All countries contribute to climate change, specifically in the Philippines, greenhouse gas emissions through agriculture and deforestation are main contributors. Due to rising sea levels, there is more urban migration which can increase emissions and put more strain on the cities (Koons). Since climate change results in more typhoons, the Philippines, especially coastal areas, experience more flooding and biodiversity loss. Powerful winds and rain combined with higher temperatures make growing crops less sustainable. Rural families will struggle to maintain their farms and are unable to fish leading to a struggle to acquire food. Food becomes more expensive as less crops are produced leading to malnutrition (Climate tracker Asia). Less fortunate Filipinos rely on farming and are ill prepared for storms and are impacted the most by the increasing effects of climate change. Marginalized groups consisting of the indigenous community such as the Aeta are most susceptible to being displaced by storms and do not have the means to rebuild. These populations use their crops for income and are more vulnerable and susceptible to poverty or severe food insecurity (UC Berkeley). Climate change would devastate marine environments due to rising temperatures and land environments due to soil dehydration from droughts.

Solutions that have been explored to address this issue include bamboo windbreakers and alternative wetting and drying (AWD). Bamboo windbreakers are used to form a barrier around farming plots to protect the crops from high winds. Since bamboo is a flexible plant, it can remain steady against high winds to protect the crops from wind damage. Bamboo also keeps soil from eroding or water loss from extensive runoff; as a result, providing suitable protection for both the plants and village structures (Hornaday). Bamboo grows to its fullest height from April to June; therefore, in 60-90 days bamboo will be ready in time for the rainy and typhoon seasons (Cruz). According to PCAARRD, “39,000-53,000 hectares” of bamboo is present in the Philippines. This solution can be implemented throughout the Philippines as it is plentiful in the area and highly equipped to grow bamboo. The usage of bamboo to prevent high winds and soil erosion has already been implemented and proved to be effective for crops and homes but also in keeping environmental output low (Tort). Furthermore, the use of AWD techniques would allow for less water intake and loss but also maintain the yield (IRRI). AWD is a method where farmers water crops less and drain excess allowing for water storage in the event of a drought. This would allow for less loss during droughts and overhydration during floods. There would be a decrease in evaporation and soil seepage while also keeping the crops healthy to harvest. While the AWD technique has been tried, it is not widely used due to the amount of coordination and training needed to maintain the systems and is not as accessible to communities. Specifically, in rural areas there is degrading infrastructure and less funding or resources for both training farmers and establishing technology. In the United States, AWD techniques have been utilized in the Mid-South region which has shown to conserve water (Henry et al). While storms are not as severe in this region, the method has still shown to be effective. The US has not explored bamboo windbreakers extensively; however, I believe they can be cultivated in the US and could be helpful during hurricanes and floods (Bamboovision). Surrounding countries such as Thailand and Vietnam, also experience similar issues and have adopted similar techniques. To combat the effects of climate change on their crops, Thailand has tried AWD methods and alternative planting times (Raktham) which can be further researched for a solution in the Philippines. Changing the times of planting is effective in combating harsh winds and can be useful for accessing food at multiple times of the year. Though useful, this does not allow for crops to sustain during times of

drought and can be ineffective for dryer times of the year. In Vietnam, farms have initiated water capturing systems where rainwater is stored and repurposed during the dry season (UNDP). This solution has the opportunity to be highly successful for both crops and access for clean water for the community. With resources this can be implemented for both urban and rural areas with the only limitations being fluctuation and cost.

My recommended solution would be to implement bamboo windbreakers around farming plots to protect the crops. I would suggest a program to introduce and assist farmers on initial set up and maintenance of bamboo windbreakers. With non-profit and government funding, a program would be set up in several villages allowing for personal assistance in setting up the windbreaks. A moderate amount of bamboo is planted in each town or village to allow all residents to learn how to grow bamboo on their own farm prior to the rainy season and continue using protective measures for their crops. Windbreaks have shown to increase crop yield 15%-20% by preventing damage from erosion and winds (Gordon). This would protect the crops from wind damage and lessen the amount of food loss from damage. As a result, more families would be able to rely on their yield and make an income from exporting crops, eventually, lessening food insecurity. While this solution could be successful there are some drawbacks including diseases that threaten the supply of bamboo and alternative weather patterns that impact growth (Bamboovision). Additionally, there are wind speed limitations for which bamboo can withstand, with the maximum of 60 mph and the windspeed of extreme typhoons being 90 mph (Huihuang Bamboo). Bamboo can be seen as a less durable solution due to its limitations, which leaves many hesitant to try the solution. However, with proper technology and advanced cultivating methods this can be resolved. Treating bamboo is an effective way of preventing cracking and decay, which will allow for extended lifespan and resilience (TheBestBamboo). These treatments can be further explored with funding from organizations that support farming in rural communities (World Bank Group). Furthermore, bamboo may be seen as invasive to the crops and can endanger the crops; however, proper root pruning and potentially a trench barrier can prevent this issue from arising. Windbreaks could benefit the residents as they would maintain control of their farm with higher profits and decreased crop loss. Since bamboo is a more natural solution, it would be less invasive culturally as the windbreaks do not interfere with social structure or religious ceremonies. The Filipino landscaping is conducive to the implementation of this solution as farming plots are smaller and practical for growing bamboo. Since bamboo is versatile, its production would remain consistent, giving farmers a reliable future solution against high wind storms. Bamboo is a natural resource that would be less likely to run out long term and I believe would be more cost effective and sustainable than a technological solution. I believe this solution is attainable as it requires minimal supplies and supervision and is beneficial for both rural and urban populations.

To conclude, the Philippines is a highly cultivated country with several opportunities for farming and exports. However, agriculture is hard to maintain due to the high chance of storms and droughts that make the environment too harsh to produce high yields. The average meal relies heavily on the production of rice and this can be disrupted by the worsening issue of climate change. The Philippines has the ability to resolve the issue surrounding agriculture in both rural and urban regions with the most viable being bamboo windbreakers. This solution is feasible for all residents as bamboo is accessible due to the adequate weather conditions and can be controlled by farmers. Bamboo is also an economically efficient solution for villages with less funding and requires less replacement with proper care. With further exploration bamboo windbreakers could be successful in increasing the yield and profit of farms. By utilizing this technique, the farmers can live off of their yields while maintaining a nutritious diet from the crops. Long term, this solution is viable due to easy regrowth and for the future more advancements can be made for future solutions.

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