Nature’s Wonders
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The Philippines is an island country of Southeast Asia filled with a myriad of wonders. Its 7,640 islands are located on the salty, blue waters of the Pacific Ocean. The tropical and beautiful land of the Philippines covers approximately 115,831 square miles. The land area of the Philippines is only slightly larger than Arizona, as the state has a land area of about 113,998 square miles!

However, the population of the Philippines is far greater than the 7.5 million people that live in Arizona. Over 110 million people inhabit the Philippines, and the island country is divided into three main areas! These main areas are the Visayas, Luzon, and Mindanao. The Visayas contains the major islands of Masbate, Bohol, Negros, Panay, Cebu, Samar, and Leyte. Luzon is the largest, northernmost island and includes Manila, the capital of the Philippines. Mindanao is the second-largest island and is found at the southern end of the Philippine archipelago. In each of these areas, there are plenty of stunning tourist attractions for visitors to see. Adventurous explorers will find much joy and fun in the Philippines, from extraordinary mountains to vibrant beaches and cities!

Davao city is considered to be the largest city in the Philippines by size, and it is an exceptional getaway for travelers. Popular attractions include Malagos Garden Resort, a nature theme park that contains the first chocolate museum of the Philippines, Eden Nature Park, a mountain resort that is perfect for relaxation and tranquility, and Mount Apo, the highest mountain in the Philippines with an elevation of 9,692 feet! You can also find the Philippine Eagle, a critically endangered bird species, in Davao City!

Camiguin island, also known as the Island Born of Fire, is a pear-shaped island with seven volcanoes that created several of its remarkable and stunning landscapes. The island is filled with natural beauties, such as pristine lagoons, lakes, waterfalls, and hot and cold springs. The island is also filled with white-sand beaches!

The Ifugao Rice Terraces are another example of the stunning landscapes that are located all around the Philippines! These rice terraces are situated in the mountains of north-central Luzon and were carved by the ancestors of the Ifugao tribe about 2,000 years ago! Spanish and American colonizers were not able to reach these historic terraces due to rugged terrains. Thus, the natives of the Ifugao province were able to maintain their customs and cultural practices for thousands of years!

Food is a significant aspect of Filipino culture. Some popular Filipino dishes include adobo, silog, dinuguan, chicken inasal, and Arroz Caldo. In vinegar and soy sauce, adobo is made by stewing meat, typically pork, chicken, or both. Bay leaves and peppercorns are added for a flavorful taste, and the meat is frequently served with plain rice. Silog is a Filipino breakfast that usually contains meat, sinangag (garlic fried rice), and itlog (eggs). Dinuguan is a Filipino stew made by cooking pork and innards in vinegar and pig's blood. It is typically served with a sweet steamed rice cake known as puto. Chicken inasal consists of grilled chicken marinated in ginger, lemongrass, calamansi, and vinegar poured over plain rice with annatto oil. Arroz Caldo is commonly served as a breakfast and snack meal. The dish includes rice porridge flavored with onions, ginger, garlic, and broth with cuts of chicken, hard-boiled eggs, and a sprinkle of calamansi.

Of all the dishes mentioned, there was a common food item, rice. According to Britannica, about one-half of the world's population, especially East and Southeast Asia, depends entirely on rice as a staple crop. In fact, 95 percent of the world's rice crop is consumed by humans!

Statista reported that the Philippines produced approximately 18 million metric tons of rice in the year 2019. This rice was both consumed domestically and exported! They also found that almost 496 million metric tons of milled rice were produced and harvested worldwide last year, making rice the world's second most important cereal crop! Now those numbers are incredibly large, but that is because there are many uses for rice!

In some cultures, including the Philippines, rice grain is thrown at couples during their weddings! The entire rice plant can be reused for bedding or fuel, turned into paper, or added to building materials! Rice has even been used to treat gastric and skin conditions in traditional medicines. It can also be boiled down for eye lotions and is an ingredient in beauty products that helps make hair shinier!

Rice not only feeds a large percentage of the world, but it also helps us live and manage through our daily lives. This is the same for other agricultural crops and their byproducts, but they all suffer the same problems. Disease, weeds, insects, and extreme weather conditions, such as droughts and floods, negatively affect our crops and hurt the agricultural industry. There are growing concerns over the short shelf life of foods and their low nutritious quality. Farmers are also struggling to keep up with the demand for food due to low land availability and uncontrollable climate issues. As complex and alarming as these problems may seem, we could solve all of these problems just by using what we already have in nature. This solution does include technology, but this type of technology involves nature and its many wonders.

Biotechnology was a term first coined in 1919 by Karl Ereky, a Hungarian engineer. It refers to the process humans use to change the basic makeup of organisms for improved products. It famously includes genetic engineering, which modifies and enhances the phenotypes of living organisms by extracting the valued DNA of one organism and placing it into another. So now that we know the science behind biotechnology, what exactly does it do for us?

Biotechnology can increase the food quality of our crops, which can improve the health of several individuals, prolong the shelf life of foods, reduce food waste, and secure global food security. We can also lower the pressure on farmers to use more land by maximizing the output of crops, which will allow us to fight hunger and feed the 9.9 billion people expected in the year 2050.

With biotechnology, we can decrease our usage of harmful herbicides and pesticides. According to scientists, they have been linked to increased cancer risks and can cause water, soil, and air pollution. With biotechnology, we also can make crops climate-resilient and disease resistant. This will allow crops to grow anytime and anywhere, maintain productivity in farming, and better the lives of millions.

The Philippines has a tropical and maritime climate. There is high humidity, high temperatures, and abundant rainfall. Typhoons also have a significant influence on the weather and climate conditions of the Philippines. A large amount of moisture, cloudiness, and precipitation in the Philippines is due to the impact of typhoons. These typhoons typically form in the region of the Marians and the Caroline Islands of the Pacific Ocean. The Philippines are also prone to other natural disasters such as floods, landslides, and tsunamis.

Rice may be prized in the Philippines, but the weather and climate conditions of the island country make growing the staple crop quite tricky. Rice grows well in standing water; however, many rice varieties will die if they are completely submerged by water for more than three days. Extreme temperatures stress rice plants, floods ruin paddy fields, and heatwaves can prevent the plant from growing at all. High levels of humidity can even cause disease to spread among the plants. The abundant rainfall, high temperatures, high humidity, and vulnerability of

floods in the Philippines deter any chance of a successful growing season for rice farmers, especially those who live on less than 3 dollars a day.

However, there are more concerns related to the environment in the Philippines. Air and water pollution levels exceed accepted health standards, and greenhouse gas emissions increase due to human-related activities. According to the Global Alliance on Health and Pollution, air, water, and soil pollution caused 16.4% of all deaths in the Philippines.

The country suffers from nutritional problems as well. Rice, its staple crop, can be a great energy source as it can contain decent amounts of manganese, protein, fiber, and vitamin B. However, it lacks beta carotene, which converts to vitamin A upon consumption.

Vitamin A deficiency is a severe problem in Southeast Asia and Africa. It greatly affects small children and pregnant women. The World Health Organization reported in 2012 that approximately 250 million preschool-aged children were affected by vitamin A deficiency. Providing them with vitamin A could have prevented a third of all under-five deaths, which is about 2.7 million children who could have been saved from dying unnecessarily.

Vitamin A deficiency compromises about 40 percent of children under the age of five in developing countries, which majorly increases the severeness of common childhood infections and leads to more deadly outcomes. The medical consequences of vitamin A deficiency include impaired vision, irreversible blindness, reduced capacity to transport oxygen in the blood, reduced immune response, and impaired skeletal growth.

Thanks to biotechnology and genetic engineering, the environmental and nutritional issues of the Philippines can be solved. Golden Rice was genetically modified to produce beta carotene, so a bowl of this rice could bring both sight and life to those in need. It executes this by providing 30-50% of the estimated average requirement of vitamin A. Sub 1 rice was genetically modified to produce higher yields and be tolerant to floods. Bt corn was also introduced to the Philippines, which helped decrease their usage of pesticides that have been linked to water, soil, and air pollution, as well as increased cancer risks. These crops can also be genetically modified to suck up carbon dioxide more efficiently, a common greenhouse gas.

Its government has approved the use of GMOs in the Philippines. In fact, the Philippines recently approved the safety and usage of Golden Rice in July of 2021, making it the first country to support the GMO. However, farmers are reluctant to grow these GMO crops due to hostility, criticism, and fears from activists and organizations, such as Greenpeace.

There are concerns over the appearance of Golden Rice as the added beta carotene gives the rice plant more of a yellow pigment. However, in regions where malnutrition is a significant problem, the cosmetic appearance of foods would be the last thing malnourished individuals would worry about. There are also ethical concerns with the use of GMOs. Many fear that tampering with nature would cause unwanted ecological imbalances, but that is not the case. On average, every GMO takes 13 years in research, development, and rigorous testing before being approved and reaching the market. If a GMO crop were to pose any dangers to the environment or health of its consumers, it would not be supplied to farmers without being verified safe to use. Selective breeding is also a form of genetic engineering. Thus, humans have been switching genes in their crops and animals since the dawn of agriculture. Genetic engineering is just a more precise and effective method to achieve desirable characteristics in our crops.

There are even economic concerns regarding the use of GMOs. Many opposers of GMOs fear that private companies will take ownership of the improved seeds they produce and not share them at a reasonable price with the public. That means only large-scale farm production

centers will dominate the diversity of small farmers who cannot afford the technology. However, a meta-analysis of 15 studies found that, on average, two-thirds of the benefits of first-generation genetically modified crops are divided downstream, while only one-third gathered upstream (Demont et al., 2007). The benefit shares are expressed in both developing and industrialized countries. Thus, the concern that private companies will not split or share ownership of GMOs is not adequately supported by evidence from first-generation genetically modified crops.

The opposition towards GMOs is also due to the lack of education. Mark Lynas, a former opponent of Golden Rice, publicly admitted to not being educated about the safety and benefits of GMOs. He also claimed that people's hostility towards Golden Rice is starving and endangering many children's lives. Patrick Moore, one of Greenpeace's founding members and former president, is now a supporter of Golden Rice and agricultural biotechnology. He believes that it is a tool vital to saving many people's lives.

In fact, GMOs have been approved by the following scientific and medical organizations: the World Health Organization, National Academy of Sciences, the Royal Society of Medicine, American Association for the Advancement of Science, American Medical Association, American Society for Microbiology, Australian Academy of Sciences, Brazilian Academy of Sciences, British Medical Association, Chinese Academy of Sciences, Council for Agricultural Science and Technology, European Commission European Food Safety Authority, Federation of Animal Science Societies, Food and Agriculture Organization of the United Nations, French Academy of Science, Indian National Science Academy, Institute of Food Technologists, International Council for Science, International Union of Food Science and Technology, Italian National Academy of Science, Mexican Academy of Sciences, National Academies of Science (United States), Organization for Economic Cooperation and Development, and the Pontifical Academy of Sciences.

This lack of education is common, even in our industrialized country. According to a 2018 Pew research study, 49% of Americans believe that GMOs are worse for their health, but 52% of those individuals consist of low levels of science knowledge. YouGov conducted a survey that same year and found that 69% of American consumers do not confidently know what GMOs are! We have been safely consuming GMOs since 1996, and 95% of the 9 billion food-producing animals that we consume eat genetically modified feed.

The Philippine government approved the use of GMOs, which have even been supported and approved by several organizations that we trust for dietary, nutritional, and medical concerns! However, Filipino farmers and consumers are still reluctant to accept GMOs because of organizations like Greenpeace and the lack of factual information. We can combat this problem by implementing educational courses on GMOs within agricultural classes at Filippino schools. Suppose we can educate students of all ages about GMOs. In that case, we will ensure that the future's population is being supplied with factual information and stray them away from emotionally impulsive arguments. We can also educate consumers about the benefits of GMOs in grocery stores and foods markets. Educating consumers can be done by using posters or brochures, which store merchants can read or give to concerned customers. We can also label genetically modified food products as "GMO" with a brief explanation of their meaning so that consumers may know what they are eating and understand that it is safe to consume. We can even utilize social media platforms and news networks to help advocate the safety of GMOs.

The Farmer-to-Farmer Program, a non-profit organization, is a great platform we can use for GMO advocacy. The program offers technical assistance from U.S. volunteers to agribusinesses, farmers, and farm groups in developing countries to advocate and promote

sustainable improvements in agricultural processing, food security, and production and marking. Typically, these volunteers with domestic careers, farms, and agribusinesses are recruited from all fifty states and the District of Columbia. In the last five-year program, volunteers aided more than 1,900 organizations in boosting their annual sales by over $414 million and increasing yearly incomes by $70 million! Assistance from the Farmer-to-Farmer program will significantly benefit the small farmers in the Philippines as they tend to struggle financially.

It's important to remember that the problem with GMOs is not that they aren't safe; it's that people don't know they are safe. With proper advocacy, support, and determination, we can eliminate the negative aspects associated with biotechnology and genetically modified foods. Once we can truly utilize nature's wonders, we can save millions of lives and make the world a better place for all.

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