

Grace Campidilli
Iowa State University
Ames, IA
Cambodia, Sustainable Agriculture

Cambodia: A Malnourished Country in need of Sustainable Agriculture Practices

Throughout the developed, western world, the average food consumer generally experiences virtually no anxiety surrounding the production of crops and reliability of crop yields. However, in many developing countries, crop producers are failing to meet the demands of impoverished communities. This failure is often due to developing countries' neglect and/or inability to implement genetically modified crops and effective crop production methods. The differences in agricultural practices between developed and developing countries are not resultant of simple preferences, but rather fundamental misunderstandings and governmental intervention pertaining to GMO implementation. Many countries in southeast Asia, including Cambodia, experience some of the most devastating effects of unsustainable agriculture practices. Although Cambodia's poverty level has significantly lessened in recent years, over 40% of children and the majority of adults still suffer from malnutrition on some level (Southeast Asia: Prospects and Challenges). Because Cambodia is a poor, malnourished country, GMOs and effective, sustainable crop production methods need to be implemented to grant Cambodia the ability to progress as a country and allow Cambodian citizens access to nutrient dense food for centuries to come.

Cambodia has some of the world's most valuable biodiversity, serving as home to thousands of rare plant and animal species. Cambodia is also home to a population of 16 million individuals, with 79.3% of the country's population living in rural areas (Eliste and Zorya). Operating under an elective constitutional monarchy, Cambodia is currently governed by monarch Norodom Sihamoni (Southeast Asia: Prospects and Challenges). Cambodia's geography is characterized with hills and valleys, accompanied with an abundance of freshwater sources. Furthermore, Cambodia's climate, which is comprised of high temperatures year-round and a monsoon season from May to October, is favorable for the production of the country's major crops: rice, cassava, maize, and mangoes (Cambodia - Agricultural Land). The country's agricultural resources consist of 3.7 million hectares of cultivated land; 75% of the cultivated land is devoted to rice. However due to the forests that comprise a large portion of Cambodia's landscape, there is little land left for farmers to cultivate. The majority of household Cambodian farmers hold small farms of 2 hectares or less, which amounts to less square footage than the area inside of two 400 meter tracks. Moreover, a large portion of Cambodia's citizens are farmers; 65% of Cambodia's total workforce, including 80% of the country's rural workforce, work in agriculture (Eliste and Zorya).

Cambodians value having a strong sense of community, and take pride in the communities in which they live in. Moreover, a typical household in Cambodia has two to three kids and is run by the mother, and then taken over by the eldest child when the mother is no longer capable of managing the family. Seeing as Cambodia experiences an annual monsoon season, Cambodian families often will reside in small houses constructed on stilts, which provide protection from the extreme flooding (Southeast Asia: Prospects and Challenges). Many families will farm and catch food for their own meals that primarily consist of fish and rice. In fact, many Cambodians' rice intake equates to three-fourths of their daily calories (Just a Pack). Although Cambodia's citizens theoretically have free health care available in city hospitals, many families lack access to adequate health care, proper vaccinations, and other medicine due to Cambodia's vast rural population. Resultantly, there is an ongoing pandemic of illnesses in Cambodia, including malaria, tuberculosis, diarrheal diseases, and respiratory infections. Moreover, Cambodia is a warring country. This state, in combination with inadequate health care infrastructure and general malnutrition puts the majority of Cambodia's citizens' health at risk. In contrast, as of recent decades, the Cambodian government has provided families better opportunities for education as well as access to telephones, electricity, roads, and markets (Improving Access to Education in Cambodia). These recent improvements have been instrumental in lowering Cambodia's poverty rates from 42% in 2002 to 18% in 2012. Nonetheless, starvation and dehydration are still major problems for many families. Around four million Cambodians lack access to sufficient water supply and six million Cambodians lack access to sufficient sanitation (Cambodia: Nutrition Profile). Because many Cambodians are reliant on their own food production to survive on a daily basis, many households have significant difficulty affording sufficient food for their families. Likewise, if household farmers can't grow their crops in nutrient-dense, fertile soils, they won't be able to produce nutritious food.

Agriculture plays a significant role in Cambodia's economy as it contributes 37% to the country's GDP annually (Cambodia Country Fact Sheet). Moreover, since such a large portion of Cambodia's workforce is involved in the agriculture industry, the sustainability of agricultural practices in Cambodia is quinessential to its progression as a country. Since sustainable agriculture is directly tied to environmental health, economic progression, and social and economic equity (Agricultural Sustainability Institute), implementing sustainable agriculture practices is necessary to minimize the 33% of Cambodians that are malnourished. The issue of malnutrition in Cambodia starts with their soil. Cambodia's soils are not fertilized as effectively as farming soils in developed countries, and thus crops that are produced have little nutrition (Possible benefits of GM crops in developing countries). Although agriculture yields grew 5.3% during 2004-2012, a growth rate which was among the highest in the world, due to land expansion and utilization of improved technologies, Cambodia's rice production has become stagnant since 2013 (Eliste and Zory). Land expansion is no longer an option for this land-locked country. So, existing farms' yields must improve to aid the malnutrition crisis in Cambodia. The impact of implementing sustainable agriculture practices would likely have an equal impact on

Cambodian men and women since both equally contribute to the country's agriculture industry. However, implementing these practices would significantly decrease child mortality rates and lessen the prevalence of malnutrition-induced stunted growth throughout the region (Cambodia: Nutrition Profile).

Although Cambodia's government is not opposed to creating legislation pertaining to sustainable agriculture practices, the government has displayed that it lacks the capacity to effectively implement policy due to lack of financial and technological resources. However, in order for the country to progress, Cambodia must first legalize the use of GMO crops. Most small farmers in this region fear commercialization and don't have the networking capabilities to sell their crop directly to a consumer. Instead, farmers are often at the mercy of any broker willing to strike a deal, which almost always results in low profits for the farmer (Southeast Asia: Prospects and Challenges). GMOs, crops that are genetically modified to be more nutritious and resistant to disease, in Cambodia would allow farmers to have bigger yields and larger profits. In order for malnutrition to decrease, the relationship between everyday farmers and their seed suppliers first must be addressed. Currently, many farmers don't trust GMO crops due to misconceptions and fears about big seed companies, like Monsanto (Possible benefits of GM Crops in developing countries). Thus, the vast majority of the farming population in Cambodia views the planting of genetically modified crop as highly controversial and unsafe. Once relationships are formed between Cambodia's agriculture sector and seed companies like Monsanto, then farmers will be more comfortable with the idea of producing GMO crops. In turn, more nutritious food will be produced within the country.

Neighboring countries have implemented GMOs, and the results have decreased hunger within their borders dramatically. The Philippines, for example, is a pioneer in Southeast Asia for implementing genetically modified crops. They have adopted Bt technology (a type of pest-resistant GMO) for corn and, most recently, eggplant. This technology has allowed the Philippines to increase corn yields by 24% and resultantly, the country's malnutrition rates have decreased significantly (Nkechi).

Since many of Cambodia's crops are not genetically modified, fungal pathogen infection is very common, and it takes a significant toll on rice yields. Studies have found widespread occurrence of diseases caused by fungi *Acidovorax avenae*, *B. cepacia*, and *Pseudomonas fuscovagine*. These diseases are similar to sheath brown rotting in plants, indicated by brown lesions on the rice plants' leaves, collars, and stems, as well as discolored glumes (Kother, Noble, et. al). Given Cambodia's sandy soil and extreme flooding that occurs during monsoon season, fungal pathogens easily infect crops (Veng). Furthermore, the negative effects of disease in crops can be diminished further by farming with a variety of both traditional and improved crop strains. Using a variety of crop strains, especially in rice, boosts crop productivity and broadens the genetic base of crops, as many studies have shown (Why is Crop Diversity Important). "Scuba" rice

varieties produced by the International Rice Research Institute have been implemented in a variety of Southeast Asian countries to keep crops bountiful in flooding. Additionally, Golden rice, a rice with fortified nutritional content, has been implemented in these countries to provide high amounts of Vitamin A to malnourished populations, which generally are Vitamin A deficient (Cambodia: Nutrition Profile). Thus, if Cambodian farmers were able to gain access to genetically modified strain of rice with genes resistant to detrimental fungal bacterium in addition to increasing the country's crop diversity, higher yields and less malnutrition would surely result.

Just as in America, Cambodia's agriculture sector is the backbone of their nation. However, in order for Cambodia to become more economically stable and lessen civilian malnutrition rates, their farming practices must change. By building relationships with seed companies and correcting misconceptions in Cambodia about genetically modified crops, the door can be opened for Cambodia's agriculture sector to use GMO crops that are resistant to fungal pathogen infection and flooding, and produce high yields. Once these solutions are implemented, Cambodia's poverty and malnutrition rates will likely both decrease, and the country will undoubtedly be able to produce nutrient-dense food for generations to come.

Works Cited

- “Agricultural Sustainability Institute.” *What Is Sustainable Agriculture*, UC Davis, 2018, www.asi.ucdavis.edu/programs/ucsarep/about/what-is-sustainable-agriculture.
- “Cambodia - Agricultural Land.” *Cambodia Agricultural Land Percent Of Land Area*, <http://tradingeconomics.com/cambodia/agricultural-land-percent-of-land-area-wb-data.html>.
- “Cambodia Country Fact Sheet” *Country Fact Sheets | Food and Agriculture Policy Decision Analysis (FAPDA) | Food and Agriculture Organization of the United Nations*, www.fao.org/in-action/fapda/publications/country-fact-sheets/en/.
- “Cambodia: Nutrition Profile.” *US Aid*, <http://www.usaid.gov/what-we-do/global-health/nutrition/countries/cambodia-nutrition-profile>.
- Eliste, Paavo; Zorya, Sergiy. 2015. *Cambodian agriculture in transition : opportunities and risks (English)*. Washington, D.C. : World Bank Group. <http://documents.worldbank.org/curated/en/80509/Cambodian-agriculture-in-transition-opportunities-and-risks>.
- “Health Care in Cambodia.” *Cultural Survival*, 2014, www.culturalsurvival.org/publications/cultural-survival-quarterly/health-care-cambodia.
- “Improving Access to Education in Cambodia.” *The Borgen Project*, 17 Oct. 2017, <https://borgenproject.org/access-education-in-cambodia/>.
- Just a Pack. “A Day in the Life of a Cambodian Rice Farmer.” *Just a Pack*, 10 Jan. 2018, <http://www.justapack.com/day-in-life-Cambodian-rice-farmer/>.
- Kother, Noble, et. al. “Bacterial pathogens of rice in the Kingdom of Cambodia and description of a new pathogen causing a serious sheath rot disease.” *Australian Centre for International Agricultural Research*, 1 Sept 2010, <http://onlinelibrary.wiley.com/doi/full/10.1111/j.1365-3059.2010.02310.x>
- Nkechi, Isacc. “GMO Corn is transforming farmers’ lives in Philippines” *Cornell University*, 25 January 2019, <http://allianceforscience.cornell.edu/blog/2019/01/gmo-corn-transforming-farmers-lives-philippines/>
- “Possible benefits of GM crops in developing countries.” *Nuffield Council on Bioethics*, 2014, <http://nuffieldbioethics.org/report/gm-crops-developing-countries-2/benefits-gm-crops-developing-countries>
- Seng, V. “Sandy Soils of Cambodia.” *Food and Agriculture Organization of the United Nations*, <http://www.fao.org/3/ag125e/ag125e07.htm>
- “Southeast Asia: Prospects and Challenges.” *Food and Agriculture Organization of the United Nations*, www.fao.org/3/a-bt099e.pdf
- “Why is Crop Diversity Important.” *Crop Trust*, 2016, <http://www.croptrust.org/our-mission/crop-diversity-why-it-matters/>