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Adapting Agricultural Methods and Perspectives in Laos to Improve Nutritional and Economic Security

Being designated a ‘least developed country’ by the United Nations (DESA), the Lao People’s Democratic Republic has faced difficulties in developing the resources necessary to care for the needs of its population. Still grappling with the scars of colonization and war, the Laotian people struggles with food insecurity, with the country being ranked 87 out of 117 countries in the 2019 Global Hunger Index (Global Hunger Index) and local health officials stating that “up to 60 percent of our children have not eaten good food from the time they were in their mothers’ womb” (Avary and Finney). The most common approach taken by international groups to address this issue is to directly provide food or monetary aid to citizens. However, there are alternate methods that address food security while improving Laos’ self-reliance by making use of the country’s extensive agricultural sector. With careful planning, Laos can encourage and enable citizens to provide for their own personal nutrition. By using various methods to incentivize Laotians to diversify their own crop output, Laos can tailor its agricultural system to both improve nutrition and promote economic security among its people.

Laos is a small country located in the middle of Southeast Asia, being the only landlocked country in the region. Its borders are largely defined by the Mekong River to the west and various mountain ranges to the east and north. Much of the northern and eastern half of the country are mountainous, with plains and river basins to the south being where most of the population resides. The climate is generally tropical, with the presence of monsoons creating three distinct seasons (the dry season being split into a ‘cool’ and ‘hot’ period). Historically, Laos has been ruled over by various native and foreign kingdoms in East Asia until being colonized by France in the early twentieth century as part of French Indochina. After WWII and gains in its independence from the French, Laos grappled with rivaling political factions and the Vietnam War until communist leaders successfully gained power and established their own government in 1975. The Lao People’s Democratic Republic has since been governed under the sole Lao People’s Revolutionary Party, which has slowly worked to develop the country’s economy, infrastructure, and institutions, with mild success. While it is one of few remaining countries to openly promote communism, aligning itself ideologically with neighboring Vietnam and China, the country has been under increasing Western influence as it continues to rely on countries like Japan, Australia, and the United States, along with various Western and international groups to drive progress through foreign aid and development (Auclair et al; Britannica et al, 2021).

Subsistence agriculture - agriculture carried out by individuals to meet their own basic needs - continues to be a major way of life for Laotians. While some urban communities exist such as that around the capital Vientiane, roughly two thirds of the 7.2 million population still live in relatively isolated rural communities (Britannica et al, 2021; USAID), with most housing consisting of elevated wooden or bamboo structures of only 35 square meters. Households generally consist of biological parents and their unmarried children, with families containing on average six to eight members. Diets are largely made up from what is grown within the community, with the diet of most of the population consisting of steamed or boiled rice accompanied by vegetables and meat, though in some cases the amount of food accompanying the rice is quite small (Auclair et al.).

There are many factors which contribute to poor access to nutrition in Laos. Mountainous terrain and enormous amounts of bomb remnants from the Vietnam War greatly restrict land use, with only 10

percent of the country's land being considered agricultural. However, nearly all of the rural population works in agriculture, meaning the remaining land is broken up into small plots of only 1.6 hectares on average (USAID). These small, individual ventures make it difficult for groups to specialize output in order to produce an adequate food supply. Diverse terrain also contributes to poor infrastructure (Britannica, 2021), which makes it difficult for communities to trade agricultural products with one another, as well as making direct relief programs difficult to carry out. The lack of infrastructure also isolates communities from the outside world, meaning citizens cannot capitalize on outside markets to procure goods.

While these forces and many more play pivotal roles in the state of food security in this country, this research focuses on how a lack of variety in Laos' agricultural input contributes to poor food security. As with all civilizations, most of Laos' agriculture is focused on cultivating a staple crop; rice forms the backbone of Laotian agriculture, with more than 3,000 varieties in the region taking up 80 percent of all cultivated land (Delforge). This has been incentivized by the government by methods such as limiting rice exports, with the aim of making the country self-sufficient in rice production. Both policy and improving agricultural technology in Southeast Asia mean that the country has practically achieved this goal, with rice production doubling over a span of twenty years from 1990 to 2010, ending with farmers being able to generate a surplus of nearly 350,000 tons (World Bank).

This is an important step forward in improving the state of food security in Laos, but in some ways the focus on rice has undermined the production of other vital crops. As previously noted, rice production uses up 80 percent of all cultivated land; this deeply cuts into the amount of land available for the production of vegetables and other food crops, which contributes to widespread malnutrition in the country. Diets heavily based in rice and other cereals fail to meet many daily nutritional requirements (Garg et al.), as they lack nutrients present in other food sources. Excessive rice consumption may even contribute to certain adverse health effects, as for example being linked to an increased risk of type II diabetes (Harvard).

The high production of rice also leaves Laotians vulnerable economically. Limited harvests of staple crops can have considerable effects on both poverty and hunger (IAEA), meaning a society especially dependent on their production is more at risk of these effects. Additionally, as previously noted, the government has policies in place to limit rice exportation, with only 10 percent of rice crop being sold on the market (Delforge). This severely hampers economic growth for both individuals and the nation in an environment where the main crop of most farmers is rice. This all contributes to poor physiological and economic health for Laotians; however, systemic solutions have traditionally been difficult to implement as most agriculture is for subsistence - carried out by individuals - making it difficult for the government and other organizations to reliably manage agriculture. Therefore, developments must be made that allow individual farmers to improve their own nutritional intake and economic success by changing how they approach cultivating rice.

One of the most common methods to combat nutritional deficits is to fortify food products, which several groups have attempted to do within Laos. However, there are several caveats that make this method ill suited to this nation. In select cases nutrients in fortified food may be more difficult to uptake. For example, the process of removing fat from products before fortifying them can make nutrients like

vitamins A and D more difficult to uptake, as they are fat-soluble (Khidhir). Additionally, nearly all of Laos' food supply is home grown; this means that rather than fortified food being purchased and distributed by businesses, organizations must directly give food out to citizens. Not only is this inefficient, but the country's poor infrastructure makes reliably delivering relief to communities quite challenging. It also prevents Laos from developing a truly self-sufficient food supply as it relies on external forces to provide its citizens with a complete nutrition. In order to allow individuals to improve their own nutrition, there must be an effort to *bio*fortify crops. Rather than adding additional nutrients to food products after production, biofortification is the process of developing and improving crops strains (such as by increasing nutrition) by inserting select genes into crops, selective breeding or other practices. There have already been many developments in producing more nutritious rice and other crops, and this practice is apt to supplementing diets reliant on staple crops (Garg et al.). Producing biofortified crops to be distributed to Laotian farmers would be an effective way to enable people to produce their own nutrition.

However, it is important to take into consideration how likely people are to accept the types of crops used in such a project. The Laotian government has previously worked on a program with the International Rice Research Institute [IRRI], encouraging citizens to use improved rice crops (though in this case, the improvement was a higher yielding strain). However, the people were not receptive to this new strain and the project did not succeed. This is because there are a plethora of unique rice strains throughout Laos with unique colors and scents that Laotians take pride in. As stated previously, there are more than 3,000 unique varieties of rice within Laos, all with unique colors and aromas which Laotians are accustomed to and proud of. The government's strain was adapted from a Thai strain of rice, which citizens rejected as it was not familiar to them (GRAIN). This point is also vital to the implementation of biofortified crops; while a modified rice or sweet potato strain may be highly beneficial for citizens, these programs will be more successful if they take care to involve crops citizens are specifically accustomed to. A new project between the Laotian government and agrosience groups like the IRRI that creates biofortified variants of local crop strains (predominantly rice) would greatly increase the likelihood of success, helping to improve Laotians' nutritional output.

The widespread growth of rice not only directly affects nutritional output, but also perpetuates unsustainable farming practices. By creating fields predominantly filled with rice, Laotian farmers have created large monocultures - areas dominated by the cultivation of a single or small number of crops. Large populations of identical plants can drain the soil of specific nutrients, which harms the productivity of all crops grown in the area. Monocultures are also found to be more harmful to soil microcosms and more attractive to pests (FoodPrint), both of which hinder the potential output of agriculture. Rice farming in Laos is also largely driven by swidden farming, known more harshly as slash-and-burn farming. This is a common technique of preparing land for cultivation in Southeast Asia, where areas of forest are cut and burned to be used as agricultural land. Normally the land is abandoned after several years of use and allowed to recuperate, regrowing into forest before being cleared again. In this way, it is possible to carry out swidden agriculture sustainably (Britannica et al, 2019). However, with growing populations that will lead to an increasing demand for rice production, farmers may drastically increase use of monocultures and swidden farming, resulting in large scale soil degradation and habitat destruction throughout the country.

These practices can be remedied in several ways. For example, the government and other organizations can provide informational resources so that farmers can better educate themselves in agricultural practices, or they can regulate swidden farming to restrict the amount of land allocated to such practices. However, one of the most effective solutions would be to promote the use of intercropping - cultivating multiple kinds of crops on the same plot simultaneously. This would help counteract the effects of monocropping - intercropping helps to preserve soil health, reduce the threat of pests, and allows farmers to grow more produce with the same amount of land (PAN Germany). As intercropping also increases the

amount of food that a single land plot can produce, intercropping would help to decrease demand for land, leading to less swidden farming, while also increasing overall nutritional output.

It should be noted that this process is already used to an extent by Laotians to grow vegetables along with rice, as evidenced by various sources (GRAIN; Ives). However, based on the existence of a significant number of studies aimed at analyzing new intercropping methods (Bouahom et al; Sichanthongthip; Yap et al.), there is still room for further improvement and implementation. For instance, one study suggests the failure to implement newer methods is due to them not being suited to the country's unique environment (Yap et al.). To combat this, development and relief organizations should support and fund research into developing Laotian-specific agricultural methods, like intercropping with multiple food crops, in order to increase nutritional output while lowering demand for land. For example, the government could hire farmers to experiment with potential intercropping systems, or funds can go towards existing research to find efficient crop combinations. By supporting effective intercropping in Laos through these and other means, Laotians will be better able to produce their own nutrition along with preserving their environment.

Agricultural outputs can also be diversified by fostering agricultural exports to other countries. While current production largely consists of rice, the government views this production as a means to feed its citizens and as such works to minimize rice exports. This not only prevents economic forces from incentivizing improvements in production, but also hinders economic growth as the main occupation of most citizens does little to generate revenue for the country. Meanwhile, industrialized countries in East Asia such as China have an increasing demand for various agricultural products like vegetables (IDB) as they move to industrial or service economies - demand which will have to be met by foreign markets. This is an ideal incentive to drive crop diversification; by encouraging Laotians to produce for this market, farmers will make income while also producing higher amounts of other food crops. Laotian farmers will most likely consume these products as well, thus also increasing their nutritional output for themselves. The new income could then be reinvested back into the country, which can be used to drive projects to improve other aspects of Laotian society, such as infrastructure or education. In this way the government can encourage crop diversification while also becoming better situated to attend to other needs as well.

The Lao People's Democratic Republic still faces a unique challenge in developing so that it can support its citizens. It still faces the repercussions of war and existing outside of many technical revolutions. However, Laos can still utilize its current agrarian structure to its advantage. By educating the populous on smarter agricultural techniques and altering local crops to have higher nutritional value, Laotian farmers can have control over their own nutritional output. Taking advantage of opening market opportunities will additionally help to develop vegetable cultivation while also producing vital revenue for citizens and the country as a whole. Through these developments Laos will be better able to participate in global society while also assuring the well being of its citizens.

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