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Indonesia, Sustainable Agriculture

Indonesia's Healthier Future Through Sustainable Agriculture

Food security, environmental sustainability, and economic stability are difficult to manage and improve upon, especially when even small changes can be detrimental to a population. However, these improvements are crucial to make, particularly in countries dependent on farming, like Indonesia. Indonesia's quality of life and environment can be improved by integrating a plan to improve sustainable agricultural practices.

Indonesia is an archipelago of over 17,000 islands (6,000 of which are inhabited), and there are 5 major islands. The country has a presidential republic, currently run by Joko Widodo, as well as 33 provinces with their own local systems ("Facts & ..."). Being an island nation, they have a tropical, hot, and humid climate. There are many mountains and over 100 volcanoes on the islands. More than 70 volcanoes are active, which add to the many natural disasters the nation faces like: tsunamis, earthquakes, volcanic eruptions, floods, drought, forest fires. Despite the dangers the country faces, they have the 4th largest population in the world at approximately 275,122,000 people. Around 43% of the population lives in rural areas and 31% of the nation's land is cultivated (Central Intelligence Agency, "Indonesia").

Approximately 10% of Indonesia's population lives under the poverty line, but 18% of smallholders (management of a small scale farm) are below the poverty line. "Generally, the poor are classified as either farmers, fishermen or 'urban poor' ... the farmers group is numerically the most significant," ("Country Profile...") which means that 32% of the workforce is more susceptible to poverty (the other 68% works in services and industry) (Central Intelligence Agency, "Indonesia"). The farms in Indonesia are extremely small with an average of .56 ha per farm, or 5 ha for some farms owned by larger companies. In comparison, the average farm size in the United States of America is 180 ha. Smallholder farmers make around 28,654,000 IDR a month. The minimum wage for an urban job is around 3,941,000 IDR, but the opportunity to make more is higher in urban jobs than in farming (Sanz, "Sustainable..."). Indonesian farms generally produce rice, palm, coconuts, soybeans, and coffee, as well as bananas, tea, rubber, and sugar cane. Palm oil is one of the country's main exports, in addition to coal, natural gas, cars, gold, and fish (Central Intelligence Agency, "Indonesia").

Family is very important in Indonesia. Although it is growing increasingly more popular to only have two children, it is still very common for married children to continue living with their parents and/or grandparents. Most meals are unstructured or replaced with small snacks throughout the day. Rice is traditionally eaten at every meal, generally with vegetables, or durian, and some type of meat. Poorer families generally eat more yams and soybeans, which are also Indonesian staples, because of the high cost of rice. Fish is also common, especially for the poor. Rice is usually steamed and frying is otherwise the most common food preparation. Occasionally, they will also grill, simmer, or stew foods. Coconut milk is often used as a thickener and spices are very common. Meats depend on what is prevalent on the specific island. Chicken, goat, and beef are the most common, and some islands eat duck, pig, mice, dog, and/or buffalo ("Indonesia - Food..."). About half of the population prefers traditional markets, but others shop at super or hypermarkets ("Indonesia's Food...").

The access to necessities in Indonesia is inconsistent. Indonesians have fairly cheap and available healthcare coverage, but because of limited resources the health care can only do so much (Wiseman, Virginia, "An Evaluation..."). Education is fairly available, but after primary school it usually requires fees and higher education is somewhat hard to pursue. Plus, the children of farmers often have to drop out in order to help their families earn money ("Indonesia School..."). Although many are unpaved, the islands have large road systems and access to markets (but many people can not afford staple foods like rice which is leading to a rise in malnutrition) ("Indonesia: World..."). A majority of inhabitants have one or more mobile cellars, and 99% of the country has access to electricity (Central Intelligence Agency, "Indonesia"). The main access issue Indonesians face is to clean water and toilets. 25 million Indonesians do not use toilets and only 7% of wastewater is treated. This leads to preventable illnesses and very high infant mortality. Numerous people in Java, one of the main islands of Indonesia, rely on the Citarum River, one of the most polluted rivers in the world, for their water. Smaller islands have even less access to fresh, clean water. They have to rely on spring and rainwater which is unreliable during dry seasons and drought (Alexander, "10 facts..."). The main barriers families in Indonesia face is extreme currency deflation, limited access to clean water, and the unsafe working environments of farming.

These issues that Indonesians face can be improved through sustainable agriculture. Sustainable agriculture is the usage of better practices to grow crops for environmental, economic, and social benefits. The combination of soil erosion from improper farming set-ups, forest fire pollution, and pesticides all contribute to climate warming and Indonesia's unsafe water. Indonesia has attempted to make reforms on pesticides, but "despite these efforts, many pesticide products currently remain in common use in Indonesia that have been banned in the countries of origin due to their toxicity," ("Country Profile..."). Agenda 21 was passed to help reform pesticide usage and water management, and although it had some success, it is not nearly enough. In September of 2019, "Indonesian President Joko 'Jokowi' Widodo announced a moratorium on the issuance of permits for new development of state forests into oil palm plantations until 2021," however the benefits of acts like this are now starting to revert because they were only structured as short term solutions ("Indonesia Pledges Accelerated..."). The poverty that many farmers face makes it very hard to incentivize better practices. "Individual farmers can make larger profits by selling their land to investors than by using it to produce food," ("Country Profile...") so even the few farmers who are committed to the traditional Javanese values of preserving balance between nature and man will soon be forced to sell their land to bigger businesses in order to survive (Putri, "The Story Behind..."). Women are disproportionately affected by pesticide usage because while men do the heavy lifting like harvesting crops, women are the ones who spray the pesticides. Because of the improper equipment and the usage of extremely harsh chemicals that are widely banned in other countries, the women breathe the toxins in, get it on their skin, and carry it on their backs. Women are even given milk or pudding, and told it will help them detoxify, when in reality there are no studies to back this (April, "Women Risk..."). Children are also exposed to the dangerous farming conditions of Indonesia. Many children drop out of school to help their parents meet quotas to keep their jobs. Child labor is forced and unsafe as they are around heavy machinery, and face respiratory damage from forest fire pollution and pesticides ("The Truth Behind..."). Although the usage of unsafe agricultural practices affects mainly rural populations, it also affects urban residents. Pesticides pollute water sources, which is further promoted by soil erosion. Water in Indonesia is already not treated well, so the addition of pesticide toxins only makes this worse.

In order to combat the health hazards and environmental damage in Indonesia, they need a solution and plan of action. A possible plan is to optimize terrace farming and prevent pesticide usage. Although this option does not help with forest fires, it would cover many major issues like soil erosion, water pollution, water depletion, and farmhand safety. Many Indonesian farms already use terraces, but those who do not should implement it in order to optimize the benefits of the plan. Permeable cross-slope barriers,

specifically live barriers like shrubs or trees, are a specific addition to terrace farming that helps with biodiversity and water retention. Palm or coconut trees could possibly be used for the live barriers. Studies have shown that “such vegetative barriers can also support the re-establishment and maintenance of biodiversity, while helping... to control pest and diseases of the main crop,” but this is much more effective “if these fields are not subject to the use of pesticides,” (Sustainable Land...). If this were to be implemented by farmers, there would be a natural incentive not to use pesticides. Terraces can also be further improved by reshaping them with ridges. The ridges help optimize water retention, without flooding the crops if there is excess water (Sustainable Land...). This is especially useful in Indonesia, where they suffer from both floods and droughts. Terraces have been proven to work in multiple countries including other island nations like the West Indies (Champagain, Tejendra, Manish, “Agronomic...”).

The United Nations, to which Indonesia is a member, has helped the country with implementing more sustainable agriculture in the past, so they are a possibility for managing this project. The formation of terraces on farms that have none will cost at least 40 to 102 USD per hectare (“Choosing Terrace...”), as well as the additional cost of shrubs and reforming existing terraces to include ridges, which is very expensive especially for a country with extremely deflated money and farmers being generally the poorest people in Indonesia. On top of that, farmers will need additional funds to support themselves, because they will lose their crops while the land is being reconstructed. Money could possibly be raised through the government system, seeing as they have already implemented “plans to provide cash and production subsidies for 2.4 million poor farmers... [with] Rp 300,000 a month in cash and production subsidies... worth another Rp 300,000 [Rp is the same currency as IDR]... for a three-month period,” (“Government Prepares Cash...”). Additional funds could possibly be raised by the Consultative Group for International Agricultural Research (CGIAR). CGIAR is successful because it has strong partnerships with the countries it works with and global resources. Through this program, the United States previously helped Indonesia lower the amount of Indonesians below the poverty line. They did this by helping rice farmers become more self-sufficient, and seeing as the United States and Indonesia currently have a diplomatic relationship, funding similar to this seems possible (Herdt, “Assisting Developing...”). Americans have a vested interest in helping Indonesia’s agricultural sustainability, other than caring for fellow people. This is not only because of foodstuffs we import from Indonesia, but because of the necessary machinery and natural resources that Indonesia could not export to the United States without healthy and fed Indonesians. Fortunately, the necessary construction will also create jobs to further lessen unemployment and give farmers temporary work.

Similar to planting vegetative barriers with terraces, farmers could also plant trap crops. Trap crops attract pests so that less are attracted to the desired crops (“Trap Cropping...”). In a case study on *Liriomyza huidobrensis*, one of the main crop pests in Indonesia, trap cropping was successful in deterring the pests. However, it was less successful than pesticide usage and much more successful when pesticides were used on the trap crops. With this in mind, a plan of action could include using trap crops sprayed with phyto-pesticides to minimize pests while also minimizing any pesticide usage on crops (“Evaluating Trap Cropping...”). Trap cropping is a large part of push-pull agriculture. This model of farming was successful in minimizing pests in sub-Saharan African farms while also lessening soil runoff. Push-pull agriculture “is appropriate and economical to the resource-poor smallholder farmers” which is the same landownership system in the vast majority of Indonesia (“Push-Pull’...”).

The second part of this plan is to lessen the usage of pesticides and deter farmers from using extremely toxic pesticides. As previously stated, the usage of vegetative barriers in terrace farming without pesticides can yield better crops and prevent pests. If the government implemented a tariff on all pesticides besides phyto-pesticides, farmers would only be able to afford the phyto-pesticides. Phyto-

pesticides are “made from natural plant extracts to help combat pests and diseases,” and do not affect surrounding plants and soil (“Use of Phyto...”). This type of pesticide is safe for human consumption, so if soil erosion (which would already be minimized by the terraces) brought the pesticide into the water, it would not be harmful to the people who drink it. Phyto-pesticides are also better for the environment because they do not kill wildlife; it just stops them from wanting to eat crops. These pesticides are also safer for the women applying it as it is derived from human-safe plants and will not be irritating to breathe in or touch. Dangerous pesticides that are currently in use need to be banned and enforcement on these laws needs to be implemented. Indonesia currently has bans on 37 active pesticide ingredients, which is lower than many other countries, but this is not enforced well. The best way to prevent illegal trade of pesticides is by preventing them from ever entering circulation in Indonesia. This can be done by hiring more customs officers and giving them higher wages to ensure they will prevent more pesticides from entering the country (“Monitoring Banned...”). Because it is impossible to stop all illegal trade, farm management also needs to be educated on which pesticides they can buy. As a government job, paying customs officers would be funded and coordinated by the Indonesian government. The United Nations supports the usage of phyto-pesticides and has studies regarding harmful pesticides, so Indonesia could again work with the UN to coordinate their plan. Preventing the usage of pesticides will help reclaim the indigenous farming traditions of Indonesia of balance between nature and man that has been lost in order to avoid poverty. Because this plan is not fighting against cultural beliefs, if the right funding for farmers is provided, it may be easier to convince them to cooperate with these changes.

Even with a better system, government intervention of pesticides may not be the answer, because it has failed in the past. An alternative could be to go directly to manufactures of these pesticides and see if a long term plan could be made to switch their manufacturing to phyto-pesticides or safer options. Another, would be to run an education program. Education will not solve everything though. Indonesians can clearly see the damage pesticides have on the workers, primarily women, but without alternative pesticides, they have no other options. Phyto-pesticides and safer pesticides need to be available in Indonesia, and the cheapest option. Because smuggling dangerous pesticides will avoid tariffs, the alternatives themselves must be cheaper. Options to make this possible could be grants, organizations like the UN or the Indonesian government, to farmers who do not use dangerous pesticides or searches of farms to fine farmers in possession of more dangerous pesticides.

Other than international, foreign, and government institutions; local programs should also be considered to help undergo these solutions for Indonesian agriculture. Some local programs include Partnership for Indonesia’s Sustainable Agriculture (PISAgro) and Local Initiative for Occupational Safety and Health Network (LION Indonesia). PISAgro’s mission is to address agricultural issues in Indonesia both in the interest of smallholder farmers and the environment (“Impact Mission...”). LION focuses on workplace safety and safety education (“LION...”). According to a case study done in Sulawesi, Indonesia, information in agroforestry is best believed and accurately passed around by farmer to farmer. Organizations like LION and PISAgro would be better than foreign aid because of language barriers and fear of outsiders, but better yet would be for these organizations to educate some of the farmers in Indonesia, and then have these farmers educate each other (“Can Farmer-to-Farmer...”).

When the United States tried to ban DDT (dichloro-diphenyl-trichloroethane), an insecticide that was effective against insect-borne diseases like malaria but extremely detrimental to the environment, it took a decade. People saw the immediate pros of pest control and preventing malaria, so it was hard to give DDT up for the long term cons of collapsing local ecosystems and health concerns. One of the major things that convinced Americans to support the ban was *Silent Spring*. This book by Rachel Carson helped educate Americans through numerous examples and real stories (“The Silent Decade...”). If Indonesian farm

hands were given a platform to anonymously (due to fear of losing work) speak up about the hardships they have faced, this may also help convince Indonesians to lessen their dangerous pesticide usage.

The construction of terraces will be a permanent improvement to farming that needs limited maintenance and is very similar to existing farm maintenance. The ban of harmful pesticides needs to be a permanent law in order to be effective, unlike past laws that have only been moratoriums. Funding to support farmers is only temporary, and eventually these farmers will have the capacity to make slightly more money while also having better work environments. This project is also environmentally sustainable as it prevents soil erosion, water pollution, adds biodiversity, and prevents the usage of pesticides which pollute soil and kill wildlife. Implementing this plan to improve sustainable agriculture in Indonesia is critical to improving Indonesians' quality of life.

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