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Food Security Through Environmental Protection

Out of the 920 million extremely poor in the world, two thirds of those people reside in Asia. And in those two thirds, more than half live in Southern Asia. Poverty in Southeast Asia is mainly a rural crisis: about 80 to 90% according to Rural Poverty Portal. Although the region has made tremendous progress in reducing poverty and expanding their ever growing economy, the gap between the poor and the rich continues to widen. With 60% of the people living in rural areas and half of region's land dedicated to agriculture, the majority of the residents depend on agriculture for survival (Environment Matters 2007). This makes the area more vulnerable to natural disasters caused by climate change. But with the cooperation and aid from intergovernmental and national programs, these predicaments can be averted. To prevent agriculture suffering from unthinkable consequences, policy-makers must prepare the people of the region for the inevitable climate change, help reverse natural resource degradation, adjust agricultural practices to water scarcity.

Southeast Asia is one of the fastest growing regions in the world. According to the World Bank, Cambodia, Lao PDR, and Vietnam grew at an astonishing rate of 7.5 to 10.5% in recent years. Although poverty declined to less than 30% of the region's population, many people still depend on subsistence farming for livelihood. Vietnam is a representative country for this region. More than three fourths of the population lives in the rural and 80% of the rural poor depend on subsistence farming (Rural Poverty in Asia 2008). About 70% of the 81 million people work in the agriculture and forestry industry. However, like many Southeast Asian countries, the region has limited cultivated land due to its mountainous geography. And also similar to its neighbors, the vast natural resources, like the rainforests that provide home to countless indigenous specimens, are disappearing at an alarming rate (Regional Brief 2008). As expected, the uncontrolled deforestation is shrinking the amount of arable land, putting more pressure on the rural poor. Even more alarming, the people living along the coasts will likely lose their homes and their forms of livelihoods in the near future. Because Southeast Asia is surrounded by seas and oceans, coastal regions are more susceptible to the detrimental consequences of climate change.

As mentioned previously, the region has made tremendous progress in eliminating poverty, but many subsistence farmers and their families still lack the proper diet, education, and income to improve their conditions. Subsistence farmers generally belong to the rural poor. While some farmers live on less than $1 U.S. a day, majority of the rural poor earns less than $2 a day (Rural Poverty Portal). With such meager incomes, they rely heavily on cereal, especially rice, for nutrition and calories because these staples are cheap and abundant. 73% of an average adult's diet is composed of cereal in Vietnam (Petracchi, Khoi, 1999). The people of this region eat little fruits and vegetables and meat, creating a big malnutrition problem. According to FAO, in Cambodia "the prevalence of underweight was 52%, that of stunting was 56% and 13% of children were wasted." In Laos, 28.4% of children under age of five suffer from malnutrition (Millennium Development Goals 2006). If the food prices continue to rise at this exponential rate, subsistence farming families will likely take the blunt of the impact and malnutrition will only exacerbate in this region. Due to their limited resources, subsistence farming families do not have the opportunity to educate themselves. Therefore, most of households have many dependents, like children. While the mean family size in Vietnam is around 5.2 individuals, the rural poor tend to have five or more children (Knodel, 1998). Since agriculture and forestry is the primary source of income for these families, more children equal a bigger work force; it is understandable why these families are larger than the expected norm. To ensure that the next generation will be better educated, Vietnam and its neighboring countries have established strict policies that obligate all children to enroll in primary school;

90% of children are enrolled at this stage. However, by the time of lower secondary level only a little over 70% are registered. For most subsistence farming families, the children drops out before they reach tenth grade level to go out and search for jobs and support their families (Wells, 2005).

Southeast Asian countries use over half of their cultivated land for rice production. In Vietnam, about 4.3 million ha are used for rice cultivation (Petracchi, Knoi, 1999). While in Laos, 84% of the cultivated land is dedicated to rice. Agriculture, in general, provides 52% of Gross Domestic Product and employs 80% of the work force (Kaufmann, 2003). Although majority of this region's people plant rice, some farmers cultivate variety of cash crops, like fruits, vegetables, rubber, tobacco and coffee. Most of the countries have an abundant water source, irrigation therefore is limited. In Vietnam, this plentiful resource of water supplies everyday needs, not only in agriculture but also in transportation. On the contrary, in Laos, where water source is not as evenly distributed, more fiscal has been devoted in the development of irrigation. Unlike many industrialized nations' commercial farmers, subsistence farmers mainly operate on a 1.5 ha plot. Because production of rice is almost completely based on the farmer's ability to control water supply, the region has been plagued by bad harvests depending on seasons of floods and droughts. Especially now with the climate change, the occurrences of natural disasters have been on a rise. Parts of the region will experience more prevalent food insecurity.

The current situation of rising food prices has severely impacted the poorest percentile of Southeast Asia. Last year alone, rice prices have risen 16%, but since this January, the prices have jumped exponentially to 141% (The New Face of Hunger 2008). By March of 2008, the price of rice hit a 19 year high. Nations that mainly import rice have experienced unprecedented social unrest, the food protests in Indonesia for example (Bradsher, Martin, 2008). Then in the Philippines, government officials laid out strict laws that forbid hoarding of rice; those who dare to violate the laws will be punished with life imprisonment according to the Economist. Experts and analysts have blamed the current market on poor harvests and restrictive trade policies, increasing price of oil, diversion of crops for bio-fuels, as well as increasing demand for this year's sudden food insecurity (Dykman, 2008). Whatever the reason might be, this food insecurity hit some parts of the region harder than others. Countries like Vietnam, Cambodia, and Indonesia have imposed rice export restrictions to slow the hike in prices, which is like adding fuel to fire. "Large purchase tenders made by the Philippines, the world's largest importer, have occurred at increasingly high prices, reaching over $1000 a ton in mid April," Milan Brahmbhatt and Luc Christiaensen reported for the World Bank. On the surface, these high prices can benefit the farmers, but contrary to this notion, subsistence farming families are the worst off. If the price increases by 10% for the main staple, the rural poor, which belongs to the lowest income quintile will witness a 0.3% welfare loss, while the rest of the income levels will benefit from this increase (Soaring Food Prices 2008). For families that earn less than $2 a day, their entire income may be devoted to purchasing food.

At the start of the twenty-first century, the world has witnessed countless number of natural disasters. From floods to droughts, and from hurricanes to blizzards, all of them could be traced back to the culprit, climate change. Just in these couple of years, temperatures have raised one to two degrees Celsius. Although this moderate rise seems harmless, it will reduce crop yields in seasonally dry and tropical regions; Southeast Asia will be negatively impacted. Food insecurity will be a major problem for countries with small-scale rain-fed farming systems (Climate Change Adaptation 2008). Further warming will adversely affect all regions on Earth. High temperatures are not the only consequences of climate change to consider; according to the *Environment Matters* "Agricultural productivity is likely to suffer severe losses due to high temperatures, drought, flooding, coastal inundation, soil degradation, and associated factors." Asian Development Bank predicted that if temperatures continue to follow the current trend, crop yields will decrease 2.5 to 10% by 2020, and 5 to 30% by 2050. The reduced crop yields will put 132 more million people at risk of hunger in 2050 for the entire Asian continent. The number of malnourished will increase by 5 to 170 million globally by 2080 with no temperature rises; the slightest

intensification will devastate poor developing nations, like Cambodia, Laos, and Vietnam. In addition to decreased food productions, water supply will also suffer from climate change. Regions in Southeast Asia that have large river basins will have a decrease in fresh water supply. Also increasing rate of glacial melt will cause more frequent and detrimental floods and land slides.

Environment degradation is a serious problem in Southeast Asia. Because forestry is a huge economic sector, many nations have exploited and carelessly depleted their natural resources for economic growth. Indonesia, for example, has one of the world's most extensive and diverse forests in the world. Currently, 48.8 % of the total land area is covered with priceless forests that provide home to innumerable aboriginal species (Little Green Data Book 2008). However, deforestation has exhausted this once plentiful natural wonder. The deforestation rate between 1990 and 2005 was 1.5%, while the rest of Asia and the Pacific group were at a minuscule 0.1% rate ("Little Green Data Book," 2008). The depletion of the forests released 2563 million tons of green house gases (GHG), while energy, agriculture, and wastes combined only discharged 451 million tons of GHG (Indonesia and Climate Change 2007). This makes Indonesia the third largest GHG emitters in the world. "About 24 billion tons of carbon stock are stored in vegetable and soil, and 80% of this is stored in standing forest," (Indonesia and Climate Change 2007). Therefore cutting down these forests would release an extraordinary amount of carbon dioxide, hastening the global warming problem. Already the nation has witnessed moderate temperature rises, about 0.3 degrees Celsius per year (Indonesia and Climate Change 2007). Along with the increasing temperatures, Indonesia will also experience more intense rainfall "with significant increase in the risk of flooding" (Indonesia and Climate Change 2007). The biggest concern for climate change is food security. Because climate change will alter precipitation, evaporation, run-off water and moisture, agricultural production will be adversely affected. Recently in 1997, the El Nino event caused a detrimental drought that affected 426,000 ha of rice. The projected decrease in soil fertility is anywhere from 2 to 8%, resulting in a decline in rice yield of 4% each year, soybean of 10%, and corn of 50%. Rice supply will be further endangered when the coastal waters rise, inundating the limited cultivated land area. Rural regions, like Krawang and Subang, will witness a 95% reduction in rice supply. When this nation already imports majority of its cereals, this decrease in production will push many more into starvation.

Climate change is an indirect impact of deforestation. The direct consequences of logging and land conversion are the exhaustion of soil nutrients and disruption of the unique ecosystem. Tropical forests have very thin and poor nutrients in the soil. Almost all of the nutrients are in the living plants and the decomposing litter of the forest floor (Lindsey, 2007). By using the slash and burn technique to convert forest floors to farming land, the newly cultivated area can support crops for only a few years. The primary cause of deforestation in many regions around the globe is subsistence farming (Lindsey, 2007). Many Indonesians and Southeast Asians use this method to support their families. However, this form of land conversion combined with deforestation is the number one source of pollution (Indonesia and Climate Change 2007). Besides the immediate harm to the human society, the squandering of forests will devastate the rich biodiversity. Indonesia houses the third largest tropical rainforest after Brazil and Congo Basin (Indonesia and Climate Change 2007). But more than 50% has already been degraded. Right now the lowland forest, the one with the opulent timber resources and valuable biodiversity, is most at risk. They are predicted to disappear in Kalimantan by 2010 (Indonesia and Climate Change 2007). To prevent the dire consequences of deforestation, nations must set effective policies and enforce upon them.

Agriculture is closely tied to the environment. When humans have carelessly destroyed nature for thousands of years, the challenge of reversing this trend seems almost insurmountable. However, if humans preserve the current natural resources, protect water supplies, and adapt farming to the inevitable climate change, developing nations can feed its growing population. Subsistence farming is the major method for agriculture in Southeast Asia. So to reverse natural resource degradation, policies must be set and enforced. For example, in the forestry sector, preventative measures include reduction of

deforestation and degradation of tropical forests, sustainable forest management and forest restoration, including afforestation and reforestation (Challenges and Opportunities 2008). In agriculture, steps include reduction of non-carbon dioxide gases "through improved crop and livestock management and agro-forestry practices, enhanced soil carbon sequestration in agricultural soils via reduced tillage and soil biomass restoration," and preserving valuable water resources (Challenges and Opportunities 2008). But before any of these measures can be passed, a policy for wide education reform should be considered. Many subsistence farmers in this area lack the proper educational background to make the right decision about farming techniques. Education in general will bring many rural farmers out of poverty; programs that aim specifically at environmental services can increase agricultural productivity and sustain natural resources. Especially since the demand for environmental services will increase because of "the greater awareness for their value and their increasing scarcity," this reform can create new jobs and opportunities for the rural poor (SOFA). In the long term, universal educational program will benefit small farmers and the environment.

Although farmers have an unquestionable obligation to protect the environment, circumstances sometimes dictate the opposite. In the State of Food and Agriculture 2007, it stated that farmers often ignore the "externalities," like the runoff of harmful nitrates into rivers or the preservation of landscapes, because often these positive and negative impacts do not factor into their immediate incomes. Also, many of the harmful human activities, like deforestation and wasting water supplies, are necessities for some people's livelihoods. Farmers who destroy tropical rain forests are using the newly cultivated land to feed their families. To encourage farmers to cultivate in an environmentally friendly way, to promote land-diversion programs, and to discourage changes in land use (i.e. from forest to farm land), governments and organizations should compensate them for their efforts (SOFA, 2007). This Pay for Environmental Services, or PES, can potentially reduce poverty and food insecurity. However, this program is still maturing and cannot make guarantees because the success of it depends upon distribution of land ownership (SOFA, 2007). The governments of Southeast Asia range from communism to democracy, so to ensure that PES will benefit the poor, the governments must strive for one common goal: the improvement of their citizens' lives while sustaining the environment.

Besides reversing natural resource degradation and conserving water supplies, nations must prepare agriculture for climate change. Reduction of green house gas (GHG) emissions is a must. Agriculture is the world's leading non-carbon dioxide GHG emitter (SOFA, 2007). In Indonesia, agriculture sector is the main cause of methane production, with rice cultivation accounting 70% of the pollution (Indonesia and Climate Change 2007). To reduce GHG emissions, subsistence farmers can employ a variety of measures. Among these measures are "soil management practices that reduce fertilizer use and increase crop diversification; promotion of legumes in crop rotations; increasing biodiversity…promotion of low energy production systems; improving the control of wildfires and avoiding burning of crop residues," (Climate Change Adaptation 2008). Soil management practices, like soil carbon sequestration, have the potential to significantly reduce GHG while optimizing food production. In some research studies, "integrated crop and animal production, use of intermediate and catch crops and cover crops, compost application, crop rotation and diversification, and zero or reduced tillage" can improve soil carbon sequestration, while fertilizers and pesticides can negatively impact soil quality.

The success of these programs lies within the effective management and implementation of the policies. As proven many times before, the failure of preservation and climate adaptation programs lies within the execution of the policies. While the Indonesian government has been supportive of sustainable natural resource programs, like the restrictive deforestation policies, no one has yet to enforce upon these plans (Sustaining Indonesia's Forest 2006). 50 % of precious forests have already dissipated into thin air. Stricter strategies need to be set to stop illegal logging and land conversion. To do this, governments in

Southeast Asia should promote multidisciplinary institutions and processes (which can counter corruption), consider local specific strategies, develop low-cost policies that have multiple effects, encourage research for crop diversification and adaptation, and finance for all these improvements (Climate Change Adaptation 2007). Only if national institutions endorse these policies and enforce upon them, reversal of natural resource degradation and adjustment of farming to climate change can work.

Intergovernmental organizations, like the United nations, World Bank, FAO, UNFCC and many more need to be willing to mediate the many political, social, and economic conflicts between the nations for certain policies to succeed. If one nation follows these guidelines, soon others will too. Both international and national organizations must continually encourage subsistence farmers to cultivate in an environmentally friendly way while sustaining natural resources. More research is needed in this area, so the UNFCC should collect more data from individual countries, and FAO and World Bank should aid in the investigation. Right now, many governments are hesitant to support these programs because of the massive funding they need to subsidize. Private and civic organizations, corporations, and other groups can help sponsor some of these finances. Although in the beginning it might look as if this endowment is thrown into an abyss with no end in sight, the outcomes will garner more profit in the long run. Organizations should not treat this project as an endless and hopeless venture, but instead as an initial investment that will pay dividends later. Together we can overcome this formidable obstacle and improve the lives of millions.

In Southeast Asia, close to 70% of the region's people work in the agriculture and forestry sector. The unavoidable climate change will endanger all of these farmers' livelihoods. If the rural poor do not adjust their current way of living, millions of more people will fall victim to starvation. The continuing rise of temperatures can reduce yields by as much as 10%, which will only aggravate the food insecurity program. If prices continue to rise exponentially, subsistence farmers will likely devote their entire income to food. Children will undoubtedly suffer because many families will not be able to feed their dependents and support for their kids' education at the same time. The only way for farmers to advance their family circumstances is through better farming techniques and environmental protection. Intergovernmental organizations, national governments, and other corporations can help the farmers surmount some of the difficulties involved. In the next century, farmers need to manage the land more intelligently and work with the limited natural resources.

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