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Philippines: Applying Sustainability in Rice Production and Freshwater Aquaculture

An archipelago composed of 7,107 islands, Philippines's flora and fauna could not be any more diverse. Farming ranges from the country's indigenous fruits and vegetables to the all-familiar rice paddies that sustain a majority of the rural population. Besides agriculture, the nation is also productive in the fisheries sector where fish is comparable to chicken for protein-source. Unfortunately, the food security of the Philippines is threatened by environmental degradation as current rice production and fishery sector practices in the rural towns are short of being environmentally friendly. "Increased agricultural production has always been a priority in relation to environmental protection in the Philippines," says Nicomedes Brione in his University report regarding the sustainability issues in Philippine agriculture. Furthermore, climate change adds itself to the nation's environmental concerns as seen by the devastating floods that have been affecting the country's livelihood this past year. The country's food supply will continue to be unpredictably threatened by climate change, but the factors contributing to environmental degradation, which threaten food security, are things the country can control. The two main sectors that the country can improve on are sustainable rice-farming practices and the freshwater aquaculture production.

Olivier De Schutter, a United Nations Rapporteur on the Right to Food, wisely said the following regarding the correlation between apparent world hunger and the environment (Worldwatch Institute):

> There is reason for this: for too many years we have focused on increasing food availability while neglecting both the distributional impacts of food production and their long-term environmental impacts. We have succeeded, remarkably, in increasing yields. But we must now realize that we can produce more and yet fail to tackle hunger at the same time, that increases in yields- while a necessary condition for alleviating hunger and malnutrition- are not a sufficient condition, and that as spectacularly boosted overall levels of production during the second half of the twentieth century we created the conditions for a major ecological disaster in the twenty-first century.

Schutter was making a point that food production is something that we have already shown we can achieve, but now, our challenge is a matter of both continuing the increase in food supply while still keeping environmental issues in mind. Sustainable farming and fishing, the two prime sources of food, should be developed and implemented in all areas of the world. In Philippines, the sustainability can and should be addressed in the areas of rice production and freshwater aquaculture.

Rural poverty in the Philippines varies from one region to another for land and water resources are unevenly distributed. According to IFAD, in 2009, poverty was prominent in rural areas where 80% of the then 88 million people lived (now estimated 103 million according to CIA's July 2012 report), and those people depended on subsistence farming and fishing. Between the farmers and fishermen, the fishermen are reported to have a higher incidence of poverty, 41.4%, compared to farmers with 36.7% (NSCB). These poverty rates can be attributed to the problem of overfishing and climate change which contribute to decreased catches and optimal times for venturing out in the waters.

Despite the dominance of men in the agricultural and fishery sectors, women do participate in active areas such as "landless workers, traders of agricultural and fishery products, and engaged in micro-manufacturing enterprises" with a labor participation on 50.2% (Women in Agriculture, Environment and Rural Production). The status of women in Philippines is continually improving through the roles they silently play in food production and market trade.

Rice-fish farming is not a novel concept for the Philippines, or any rice-dependent country in Asia, rather it is a practice slowly abandoned by the farmers upon the arrival of the Green Revolution (Ahmed and Luong-Van). In fact, in 1999, a report about "Socioeconomics of Rice-aquaculture and IPM in the Philippines: Synergies, Potential and Problems" by Horstkotte–Wesseler cites Sevilleja and dela Cruz on the history of rice-fish farming in the country and the reasons of its consequent decline:

> In the Philippines, Sevilleja (1992) reports that research on rice-fish farming systems started in 1974 at the Freshwater Aquaculture Center (FAC) of Central Luzon State University (CLSU). A technology package was developed for low-cost fish production in rice farms. Based on these research results, a national program for rice-fish culture was initiated in 1979 by the Department of Agriculture, covering 41 selected provinces in the 12 regions of the country. At its peak in 1982, the program had 2 284 cooperators with a total area of 1 397 ha. Since then, a general downward trend in total area and productivity of rice-fish culture could be observed. In 1986, the last year for which records are available, the number of cooperators had declined to 550, covering only 185 ha. Several reasons have been cited for the decline in adoption since 1982: irregular delivery of irrigation water, the perceived necessity of using pesticides in rice production, unavailability or small size of fingerlings and lack of exposure to rice-aquaculture all pose constraints to farmers who would otherwise be able to implement the technology (dela Cruz et al. 1992).

Despite the decline in mainstream popularity of rice-fish farming at the start of the 21st century, there has been a resurgence of this potentially sustainable practice in recent years. From December 2007 to May 2008, field research was conducted regarding the status of employing rice-fish farming in Bangladesh to help meet the food security of local farmers (Ahmed and Luong-Van). The study site, Mymensingh area of north-central Bangladesh, is similar to the rural situations in Philippines in that it has a similar warm climate and frequent monsoon visit, and most importantly, rice is also the nation's staple diet. The study reported on the two types of rice-fish farming systems currently practiced in that area, concurrent and rotational, and the two rice crops indigenous to that area: boro and aman. Studies showed that the concurrent system, practiced by 54% of the farmers, showed higher average annual rice yields while having less fertilizer use. On the other hand, average annual yield of fish was higher in the rotational farming due to "higher inputs of fish seed, feed and fertilizer" (Ahmed and Luong-Van).

Based on the above Bangladesh case study, the reapplication of sustainable rise-fish farming to the rural communities in the Philippines will be beneficial in that not only will a more balanced source of diet be attained, fish and rice, but less environmental disruptions are achieved through the minimal use of fertilizers. In addition, soil fertility is increased in the concurrent system as the fish constantly replaces nitrogen and phosphorus taken by the rice crop. As noted by the study, perhaps the most important factor limiting the practice of rice-fish farming amongst poor households is that "lack of technical knowledge" which accounted for 42% of the study's participants.

Soil and water degradation can also be solved in the rice-production through the implementation of "agroecological farming", or commonly known as regenerative agriculture, which operates in the principle of understanding the complex interactions amongst plants, soil and animals to develop a sustainable way of farming (Buck and Scherr). The method of sustainable rice intensification (SRI) where the plant is carefully managed along with its soil, water and nutrient source: "plant seedlings at a young age, space plants far apart, use organic matter to fertilize, transplant only one or two seedlings per hill, apply small amounts of water and alternate wetting and drying during the growth period, and use manual weeders and integrated pest management" (Buck and Scherr). Benefits from this system included a 47% higher yield from using organic fertilizers and a 40% reduction in water usage. This farming system could

be applied to areas with rural communities with diversified crop and livestock production, source of organic fertilizer, and areas with water scarcity issues.

Fishing the waters is an important source of income to the rural coastal communities in Philippines, but lack of effective regulation when it comes to limits of catches harms this industry. Just this August in Mindanao, overfishing of the lucrative tuna has led to conservationists, such as World Wildlife Fund and Greenpeace, to speak up about the near extinction of five of the eight tuna species (Espejo). The significance of addressing this overfishing issue is that not only are the waters being depleted with wildlife, but the livelihood of the community suffers as well. Currently, Philippines ranks as the third-largest tuna catcher and, consequently, is also globally known as the second biggest manufacturer of canned tuna products (Espejo). Back in January of this year, Vice President Binay addressed the recurring overfishing problem, as evidence of 32% decline in global fish stock, by impressing unto the fisherman to allow "stock time to recover so that we may once again benefit from a consistent and continuous yield" (Clapano).

As global fish stocks decline, society increasingly turned towards aquaculture and its role in providing quality fish and seafood for the past few years. In Philippines, aquaculture currently accounts for 47.32% of fishery production compared to 27% in the municipal and 25.68% in commercial catches (BAS). In a global perspective, UN Food and Agriculture Organization estimates that half of the fish consumed worldwide comes from aquaculture (Asia Sentinel). China leads the pack while Philippines lag slightly behind at 740,000 tons (Asia Sentinel). These figures show the great potential for Philippines, and the rest of the world, to increasingly combine production with sustainable practices in the freshwater aquaculture arena. Practices that will insure continued supply of fish while keeping environmental concerns in mind.

A promising solution to the overfishing problem is the movement towards sustainable fishing campaigned by a non-governmental organization (NGOs) called RARE. With hearths in the community level, the organization campaigns at 12 key sites in the country where the coastal communities are being educated about the importance of allowing fish to repopulate by establishing protected fishing sites and no-take zones (NTZs). The marine protected areas (MPAs) are designated by the government and communities, and then within those areas, fishermen draw up NTZs where fishing is banned thus allowing greater yields because of fish repopulation. The principle that the organization works upon is the idea that, "Fishing communities have the most to lose from overfishing," and so if the community is aware of the economic implications of irresponsible catches, it will most likely pursue its own efforts of sustainable fishing.

Perhaps the main source of constraint in rice-fish farming, or in a freshwater aquaculture production, is the increasing cost of feeds (Ahmed and Luong-Van). Generally, fish feed is composed of fishmeal for protein source fish oil for the lipid source. In the Philippines, Ilolilo farms have turned to a creative improvisation by using kangkong and chicken entrails as feed for their catfish (BAS). Currently, ongoing research is being done in using soybean, corn products and livestock products as source of essential feed components (Browdy). In order to ensure continued productive yields in the aquaculture industry, research and development in the Philippines regarding alternative feed sources needs to continue and proper management of the tanks themselves have to be exercised.

A sustainable practice in freshwater aquaculture production can also be done through the practice of Integrated Multi-Trophic Aquaculture (IMTA) where waste is utilized as food source for another aquatic species (Browdy). An example of this practice is seen in Canada where researchers are testing out the application of IMTA with salmon culture (DFO).

Something that I have been experimenting with for the past two summers is the application of hydroponics and phytoremediation in freshwater aquaculture. In my study, I determined that wheatgrass,

a popular plant in terms of its health-benefitting juice, is fully capable of decreasing nitrate levels in a lab-prepared nitrate water source. Utilizing the wastewater from an aquaculture tank or pond as water source, a farmer could both potentially earn another source of income and decrease water consumption as nitrate is efficiently regulated his aquaculture system. In addition, the use of other plants that are capable of remediating heavy metal contaminated waters could also be used. In essence, an aquaculture production system with successions of crops that each performs specific roles of "cleaning" the water of nutrients or waste can be implemented. Governmental agencies in the Philippines will need to invest financial resources on further research and development if it desires to manipulate the aquaculture industry in a way that makes it sustainable and productive.

In order for freshwater aquaculture to develop in rural communities, governmental agencies and international organizations have a big role to play. The Asian Development Bank's evaluation study effectively summarizes the requirements for aquaculture farms to work in rural areas: "Fish farming also requires human capital, social capital, financial capital, and a vital operating environment that can facilitate access to markets, support services, facilities, and infrastructure". Rural communities in the Philippines will be more inclined to just stick with traditional practices of rice-farming, raising livestock like chicken and pigs, and fishing in nearby waters, if the resources stated above are not sufficiently provided to them. Rural farmers and fishermen will likely stay-off new practices that they are not familiar with, involve high risks, and require a sizeable investment. Therefore, it is the responsibility of the government to educate, encourage and provide the resources if it desires to practice sustainability. A development that will reduce environmental degradation, but most importantly, will make sure that land and water resources will still be available to future generations.

In addition to developing innovative practices in farming and fishing, the knowledge and situation of indigenous people in the country should continually be taken into consideration. An instance of this is the Second Cordillera Highland Agricultural Resource Management Project (CHARMP) in northern Philippines where indigenous farming systems are recognized for their environmentally sustainable values (IFAD). Practices like rice-terrace farming, where rain water is efficiently used, should be expanded in sustainable farming practices.

In a country where rice and fish are the staple crops, reaching sustainability in rice farming and the fishery or aquaculture sector should be a great concern for Philippine's government. These two crops are especially vital to the poorer regions of the country who generally cannot afford to eat nutritious boxed cereals or frozen meat. Examples of sustainable practices that Philippines could learn from and seek to develop are rice-fish farming, agroecological farming, establishment of no-take zones (NTZs) in marine areas and devising an Integrated Multi-Trophic Aquaculture (IMTA). The results of employing sustainable agricultural and fishing practices might not be immediate, but the promise of the continued supply of various land and water resources will be realized.

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