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Vietnamese Aquaculture: Making Waves and Rolling with the Tides

Uncle Number 5 sits at the front of his house fanning away flies from his goods, and once or twice a year, selects a few pieces of *khô cá lóc* to send to us in the States. Yet even these rare gifts have become difficult to obtain. Following the crisis of April 2016, after Taiwanese company Formosa Plastics Corp experienced a chemical spill and poisoned 125 miles of Vietnam's coastline, marine wildlife is severely contaminated and many are weary to consume anything that comes from the waters. My uncle, whose living depends on retailing dried fish varieties, suffered a year of low supplies. But fish farmers and those involved in aquaculture have fared much worse. The incident with Formosa is just one of many hardships the fish farmers of Vietnam must struggle with; lack of efficient farming techniques and increasing international market pressures compile into an overwhelming issue facing the nation's fishing industry. This report aims to examine the livelihoods of fish farmers in South Central-South Vietnam and consider solutions to alleviate the pressures of aquaculture from a socioeconomic and environmental standpoint.

Vietnam stands as the 14th most populous country, with 96.3 million people residing on less surface area than that of California (Worldatlas, 2018). The nation is governed by communism, with one socialist party and lower ranks of authority spread over provinces and municipalities. The majority of the population, 65.8%, is rural. Positioned at the southeastern tip of the Indochina peninsula, Vietnam is a prime location for global trade and offers fertile agriculture along the Mekong River Delta. Central and South Vietnam exhibit a tropical climate with dry and rainy seasons, and are extremely humid. Typical diet staples uniting the highly diverse country include rice, vegetables/herbs, fruit, and protein mainly derived from fish and pork. Poorer diets depend on starches such as yams. Food is either obtained through local market vendors or subsistence farming. For those involved in fish farming, they depend on their livestock as not only a source of income but also as an integral part of their diet.

The average farming household size is five: a couple with three children. More prevalent in the rural central and southern regions of the country, extended family members live together, including grandparents or a relative as labor aid. Most farms are operated by the immediate family but larger farms hire on workers. The farms, often connected to the house, float on water. Traditionally, these structures are buoyed by bundles of bamboo but the majority have updated to PVC, metal or plastic barrels. Nets, cages, and walkways create an intricate lattice between huts. Despite being precariously perched on the water, all houses have access to electricity. Even as a developing country, 99.2% of the population has access to electricity, 46.5% to internet (Trading Economics, 2016). Children are sent to school on land, and farmers must ensure their profits are enough to repay loans and cover the cost of education for multiple children. The high cost of providing an education through secondary school is discouraging but parents are increasingly investing in their children's academia, and the country's literacy rates for both males and females have grown since the unification of the country in 1975. Incomes are variable, depending on the size of the farm. A farmer with 20 cages can expect to earn upwards of \$100 million VND (\$4,322 USD) annually which is enough to support three children's education (Tuoi Tre News, 2017). Larger farms that can be found in the famous Chao Doc area in the Mekong River Delta, house up to 150,000 fish and must earn at least \$23,500 USD a season to accommodate expenses such as loans, paying workers, and other expenses (Victoria Hotels, 2015).

Historically, fish ponds were dug in rural areas and fish were raised on agricultural waste until harvested. Farmers then drained the ponds and used the sludge as fertilizer for crops before repeating this cycle. There was no feed or fertilizer use. The modern farming model is radically different. Nowadays, fish are raised on soy-based commercial feed pellets and live directly below the farmers themselves, densely packed into cages and netted sections. The soy pellets have replaced farm byproducts (rice bran, vegetables, ground-up trash fish and snails, manure) that were fed to fish before (Eaton, 2012). Though prior practices may have been more sustainable and economical than importing the feed, the switchover is partly in response to pressures for food safety standards imposed by retailers in Europe and the US.

Aquaculture has an overall positive impact on the economy, accounting for 6% of GDP with export values exceeding \$7 billion in recent years (King, 2015). This sector provides jobs for both men and women, employing around nine million directly and indirectly (Urch, 2017). Despite Vietnam's turbulent past, foreign investment has steadily poured in after the Comprehensive and Progressive Trans-Pacific Partnership (CPTPP) was finalized. For the past decade, Vietnam's FDI (foreign direct investment) has netted about \$10-12 billion per year (DOS, 2014). Fisheries exports are Vietnam's fifth largest source of foreign exchange with aquaculture production accounting for about 65% of total fisheries exports in value. These exports comprise of black tiger prawn and *Pangasius* (catfish) (Hayes, 2016). But seafood safety along with competition from regional shrimp exporting countries have dampened the industry's growth. The US and EU decreased their demand in 2015 after rejecting multiple shipments containing antibiotic residue and other contaminants. Rising concerns over food safety have forced VASEP (Vietnam Association of Seafood Exporters and Producers) to reevaluate industrial practices, highlighting the lack of standard policies for quality and safety screening currently in the system. While family-operated fish farming provides for local market vendors and means of obtaining food, industrial farming is what drives the aquaculture sector of the country. Despite their differences in scale, both methods share similar issues regarding efficiency and environmental damage.

If not handled properly, aquaculture can have detrimental environmental impacts: wetlands and coral reefs are cleared for farms, fish escaping broken nets or during storms can become invasive species, potential overharvesting of "trash" fish for feed (marine byproduct or wild freshwater fish), and pollution from the usage of antibiotics are liable to seep into surrounding ecosystems. In addition, small fish farmers must compete with industries for water space and output and have thus increasingly resorted to higher density operations reliant on feed formulas designed to accelerate the growth cycle of fish. Such intensive systems are susceptible to disease and decimation should an outbreak occur (WWF, 2012).

The first step in addressing the need for a more sustainable aquaculture industry must start at the government level. Compliance by state administered organizations and increased transparency will not only build credible rapport for foreign investors and markets, but it will also pave the way for greater cohesion in regards to standardizing the industry. As of now, corruption is rampant in the government, with profits put ahead of the public. A recent example is the handling of the Formosa incident. The Vietnamese government agreed with the Taiwanese company on a \$500 million compensation and pledge to clean up the toxic waste. Citizens of the nation, especially the four provinces of central Vietnam most affected, felt this was not enough and voiced their opinions, demanding stricter environmental protocols and higher monetary compensations. Authorities detained dissidents and violently broke up peaceful protests, silencing bloggers and banning independent scientists from collecting water samples to run tests (The Guardian, 2017). A government that denies free speech and does not prioritize environmental protection for the sake of industry cannot develop. Therefore, it is imperative that the government changes its approach and for global awareness/markets to create the pressure for change. Online platforms such as Global Young Voices continue to feature stories to increase awareness and shine a light on

censored events such as the scientific investigations in Vietnam sponsored by UNESCO-CEP (RadiciGroup).

Acknowledging the need for higher standards, private companies have started to revamp their practices. A notable story is that of Hung Vuong Corporations, one of the largest pangasius farms in the country. Fish is the future of meeting the world's growing demand for protein, and Vietnam currently supplies 90% of global pangasius supplies (WWF, 2012). Thus, Vietnam has committed to having their farmed pangasius certified under the Aquaculture Stewardship Council (ASC), a non-profit independent organization co-founded under the WWF aiming to certify responsibly farmed seafood. Hung Vuong's company in cooperation with ASC standards, revised methods on 18 farms to include feed that contained more vegetables than meat and conducted more rigorous professional training with workers to educate them on food safety practices. ASC also requires farms to treat their wastewater in sedimentation ponds before releasing it back into the river and encourages lower stocking densities. Foreign consumers can help as well by choosing to purchase ASC certified seafood.

Other promising international projects include the one launched this year between The Vietnam Chamber of Commerce and Industry and the Confederation of Norwegian Enterprise (Urch, 2017). This two year program aims to link businesses with vocational training schools to create a skilled workforce that meets employer requirements. It also seeks to expand awareness on the career opportunities in aquaculture, hoping to change the perception of this low-status job into a rather innovative and growing sector of the economy that needs skilled professionals. Continued collaborations with such programs will produce better informed farmers and nurture a more environmentally conscious industry. NGOs can also assist with educating local market farmers on sustainable practices by holding workshops for those who cannot afford schooling.

One of the largest investments farmers must make in maintaining their stocks is feed. Without knowledge of the potential pollution from heavily processed pellets and overharvesting of trash fish, farmers are left to continue their unsustainable practices with little intervention from government mandates or local market demands because they are just as unaware. Most non-industrial farmers rely on trash fish. Not only is trash fish an inefficient use of resources but it can pollute the surrounding waters and breed disease. Research done in 2008 between Guangzhou Hiner Biotech and Con Heo Vang Company yielded an extruded feed for snakehead, a popular fish variety cultivated in the southern Mekong area for domestic consumption. Extruded feed is preferable to pellets because they float rather than sink, minimizing excess debris and pollution. The advantages of extruded feed are as follows: higher levels of protein that adequately meet diet needs of snakehead, lower FCR (feed consumption ratio), less disease, and greater profit margins (AQUA Magazine, 2010). Similar research is being done by Roel Bosma's team from Netherlands' Wageningen University (Eaton, 2012). They are searching for ways to make fishponds waste free and are experimenting with new feeds that will solidify fish feces for easier removal, improving water quality control. Vietnamese universities and private companies should invest more in such research so that findings in efficient farming techniques can in turn maximize sustainable business production and broaden public knowledge.

In the central province of Quang Nam, a unique model of fish farming holds potential — literally. Situated on the Song Tranh Hydroelectricity Reservoir, fourteen households have built their farms upon this body of water. District administration encouraged this practice back in 2012. Because open waters such as rivers and marine coastlines face fierce competition in terms of area and price for lease, aquaculture on these enclosed spaces make use of unused “ponds” and can take advantage of the

ecosystem with its self-recruiting species that migrate through the passage. Combining these with farmed fish lowers the need for constant restocking. This model should be expanded to other hydropower reservoirs as they are a relatively cost-effective endeavor for those in poverty due to lower stocking rates, plus the closed system is more manageable. Government policies regarding open water leases will help with regulation of water/land usage and ensure small farmers fair access to spaces without the fear of being bought out by private companies.

A practice that has yet to be implemented is the usage of underwater drones. Already, companies like Deep Trekker sell drones specifically for aquaculture for monitoring purposes, with product packages ranging from \$3,000-\$10,000 USD (Vallier, 2017). Drones would provide useful insight into underwater activities such as fishnet tears for early detection fixes, preventing fish escapes. Companies like Blue Robotics envision producing affordable ROVs that will capture information such salinity and dissolved oxygen levels. An even more ambitious goal would be to employ drones for feed distribution, removing the dangers of human check ups and risk of drowning for children. Government subsidies would help with initial costs and lower interests on loans for farm expenditures would make market entry and upgrades more affordable.

The prospects of aquaculture and the livelihoods of small fish farmers are far from dismal — but only with united cooperation between corporate and governments. Investments in research for new feeds and technological tools will advance the industry towards more ethical and sustainable goals; corporate responsibility and continued international market pressures will spur awareness and government change; and strategic partnerships with independent organizations will undoubtedly benefit aquaculture and its people at all levels across the globe.

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