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Vibrant Risks:

Scientific Aquaculture and Political Ecologies in China

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Abstract

Vibrant Risks:

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This dissertation examines how the dissemination of science in shrimp aquaculture is intertwined with issues of sustainability and risks in south China. In the Leizhou Peninsula of Guangdong Province, shrimp aquaculture took off in the mid-1980s with the dissolution of collective farming, when farmers were encouraged to become enterprising and independent shrimp farmers who produced an export-oriented commodity. In the early 2000s, after the exposure of illicit drug residues created trade barriers for farmed shrimp from China, the focus of science and technology extension shifted from disease control to food safety. The change from food quantity to quality reflects how the global food regime promotes a discourse of sustainability that is hinged on dynamic growth of limits in response to capitalist crisis.

I explore how shrimp farmers have experienced the paradox of being incited to do high-intensity farming on one hand, while assuming a heavy burden of risk on the other. To

experience this risk at first hand, I rented a shrimp pond from a village to conduct experimental shrimp farming myself. This was an excellent ethnographic gambit as villagers were eager to teach me the ins and outs of shrimp farming, yielding rich insight about why they inadvertently face a drive for overproduction but suffer from depreciation of labor values as well as heightened risk of disease. This "treadmill effect" of forever increasing the intensity of farming cannot happen without the involvement of extension agents and scientists. Using methodologies developed in Science and Technology Studies to study laboratory scientists, I adapted these to the study of field science to examine how the science and technology of disease control and food safety standardization might generate new risks. While predicated on excluding the observed pathogens and hazards, these technologies disregarded the vitalities of unobservables. I examine how forms of nonhuman agency emerge from developmental schemes pushing for high-intensity production by looking at the complex dynamics between the biological materiality of the shrimp species themselves, the emergence of new pathogens, and the innovation of pharmaceutical technologies as a means of "crisis management" that mimic the increasingly unstable conditions of global capital accumulation.

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"To go down to the countryside for three years is rather easy; what is hard is to strike roots for life (*zhagen*)" (Red Flag, 1975 12/1).

Introduction

One ordinary day in February 2003, I, then a master's student of Applied Anthropology at the University of South Florida, was driving around Florida Gulf Coast to conduct a survey sponsored by the National Marine Fisheries Service to study the transformation of fishing communities. My colleague and I saw a group of fishermen wandering outside a fish house and decided to stop our car here. As we started our interview, we learned that many shrimpers had been sitting at the docks for months due to a sudden price slash one and a half year earlier. As we engaged in a conversation, a shrimper asked where I came from. I replied immediately, "China," thinking that was a just a mundane question for a person looking non-white. Unexpectedly, many shrimpers shouted at me, "You Chinese raised farm shrimp and crashed our lives!" This tragedy began after the EU levied a ban on shrimp imports from China after the detection of chloramphenicol residues in 2002. Soon Chinese aquaculture producers hastily transferred their exports to the U.S., which was not worried about the minute level of the antibiotic. As I saw shrimpers getting infuriated, I tried to calm them down by defending the Chinese producers, "The Chinese farmers made probably only one tenth of what you did here. How come they are the ones who took your money away?" My reaction surely failed to curb their effort of collective lobbying that eventually convinced the Department of Commerce to levy a punitive anti-dumping tax on farmed shrimp imported from six countries including China.

I was puzzled and intrigued by the antagonism between first-world and third-world laborers. After I started my Ph.D. program at the University of Washington, I decided do an

ethnography of Chinese shrimp farmers, thinking that by giving them a voice, the public could understand better the position and subjectivity of third-world laborers in the global food regime. Ironically, my seemingly patriotic zest was not quite appreciated by Chinese fisheries officials. In summer 2006, I started pilot research on the Leizhou Peninsula, the largest shrimp aquaculture base in China. When I first introduced myself to Sister Ling, director of the Leizhou Aquaculture Science and Technology Extension Center, my identity as a graduate student from a U.S. institution triggered her suspicion. She was straightforward about her apprehensions: waving the "Food Safety" flag, Western importers blatantly cast their disdain about backyard farms as they request China to develop standardized and industrialized food production in which the "mom-and-pop" farms will need to be incorporated or monitored by the food conglomerates. She feared that my report on family farms would counter U.S. importers' positive imagination of Chinese farmers and thus restrict shrimp imports. If shrimp are banned for exports and shrimp farmers cannot make any income, China might encounter problems of social instability. I stammered because I did not know how to ease her apprehension, as I myself could not anticipate the unpredictable outcome of my publication. The impasse of our conversation did not get over until Sister Ling signed, "Wow, if you are really a spy, it is the National Security Bureau's job to take you, but not mine as a fisheries official." Her words loomed in my mind from time to time during my one and a half years of fieldwork, forcing me to always reflect on my role as an anthropologist immersed in the power imbalance between researcher and informant, subject and object, as well as intellectuals and the mass. Talal Asad (1979), in his critique of the "totalizing method" and "ethnographic holism" of British functional anthropology, unveils how the objectification of knowledge in the

discipline has helped reinforce the inequality between the West and Third World in what he terms "colonial encounter."

Sister Ling's concern cautioned me that the study of shrimp farmers did not necessarily give voice to them. What questions I chose to ask and what stories I selected to tell are political themselves. Given contemporary critiques of capitalism, how should we analyze the position of Chinese producers in the global food regime? Florida fishermen alleged that Chinese shrimp farmers are perpetrators who stole American jobs, while Chinese grassroots fisheries officials were worried that domestic small-scaled producers failed to meet Euro-American production norms. While conventional food commodity chain studies often easily locate a vulnerable periphery victimized by the hegemonic center (Wallenstein 2011[1974]), I found the divide between China and the West to be a murky one. Thus, the question whether China is harming or hurt by the West might not be a valid one as it assumes power to be a top-down force and the division between perpetrator and victim clear-cut.

If we jettison discourses of the "China Threat" or "the Victimized China," we can shift our focus from a quest of intension to an exploration of positionality. What brought U.S. fishermen and Chinese shrimp farmers together is exactly the conundrum that they both inadvertently face: a drive to overproduction and depreciation of their labor values. The influx of farmed shrimp from China happened right after the Chinese farmers temporarily overcame the plague of shrimp disease as they started to farm a new species called Pacific White Shrimp (*Litopenaeus vannamei*) in high-intensity monoculture backed by science and technology such as Specific Pathogen Free (SPF) broodstocks (parents), aeration machines,

water disinfectant, probiotics, etc. The anti-dumping tariff blocked shrimp export and triggered an inflation of supply, causing Chinese shrimp farmers to go bankrupt. For them, the increased labor input that produced high yields and the decrease of labor value from sunken shrimp price seems to be a paradox. The Florida fishermen also experienced the flip side of the problem. How could the influx of farmed shrimp fail to lighten their workload if both they and their Chinese counter part are food producers that provide substance for the same consuming market?

The confrontation between Floridian and Chinese shrimp producers presents a scenario different from the conventional understanding on the linear relation between "supply" and "demand." As the world population hit 7 billion in late 2011, the concern over "food security" has heightened. The FAO discerned a trend of growing demand of animal protein with a reduction in the share of basic cereals, although this momentum was somewhat damped by the global economic crisis in 2008 (FAO 2011). The surging demand for fish and fishery products is a manifestation of this trend, and farmers' desire to enter into the global economy is deemed self-evidence in an earlier report that claimed that "there are strong economic incentives for farmers to shift to higher value fish crops that yield higher profit margins" (FAO 2007:96). However, the report also acknowledged an inverse relation between increased production and reduced price, or the decrease of farmers' labor value. What FAO has not resolved is why farmers have strong incentives to produce but an inability to keep the price from falling. In other words, if overproduction works against the interests of farmers, why do they still want to follow the market law?

Scientific Aquaculture, Sustainability, and Risks

Farmers' drive to overproduction has become a major issue of concern in my dissertation. Why are they propelled to do so? While Chinese farmers could easily be identified as the victims of the excessive supply of shrimp, the perpetrators are more difficult to come by. The synonym of aquaculture, "Blue Revolution," coined after a more familiar term, the "Green Revolution," highlights the role of science and technology in boosting the productivity of all forms of aquatic farming. However, science and technology's potential in boosting yield might work as a double-edged sword that increase the risks of disease outbreak as shrimp live in more stressful environment. Similarly, the improvement of farming technology might increase shrimp production but at the same time depreciate the value of labor. Therefore, the question on whether the improvement of science and technology necessarily leads to a betterment of living should be shifted into the probing of social embededness of science—science is part of society, rather than outside of it. My study of the science and technology extension systems of shrimp aquaculture desires to shed light on how the dissemination of scientific aquaculture is intertwined with issues of sustainability and risks.

In China, the definition of scientific aquaculture experienced a shift from "ecological aquaculture" to aquaculture for food safety in early 2000s. At that time, the EU "Chloramphenicol Incident," which resulted in the prohibition of shrimp imports from China due to detection of antibiotic residues and subsequently triggered U.S. fishermen's anti-dumping lobby, has been regarded as a watershed moment to see aquaculture research and extension to shift from disease control to that on food safety, indicating a change of science's concern from the health of shrimp to the health of human beings. If science is assumed to always work to improve lives, why does it shift its domain from the

life of animal to that of human beings? Or, if the shift indicates the priority of the new over the old, why would there emerge a contradiction between the two domains of lives if we think that shrimp is raised as food for human consumption? A similar conundrum arises when we ask why food producers in different parts of the world are pitted against each and why consumers agitate against producers. How should we understand these various ways of contradiction in life?

The conceptualization of scientific and technological changes thus cannot be separated from social changes in which they are embedded. In China, shrimp aquaculture started in the mid-1980s amidst the collapse of commune agriculture and was promoted as a rural development project in which the state dispatched technology extension teams to introduce the cultivation of shrimp, a high-valued cash crop designed for export to wealthy countries. However, farmers' enthusiasm to boost yields and become entrepreneurs was soon dampened as they suffered huge losses from a disease epidemic.

In 1993, a devastating disease outbreak struck the costal shrimp ponds from south to north China, causing production to decrease from 220,000 tons to less than 70,000 tons, a significant drop of 70 percent (Briggs et al. 2005; Feigon 2000; Flegel et al. 2005; Xu and Wang 2001). The outbreak was later referred as the White Spot Syndrome Virus (WSSV) disease, named after a virus that was believed to be the causing agent. By designating the causal agent to be an excludable virus, this explanation has ignored how intensified farming practices harmed pond environment conditions and exacerbated stress on shrimp, while regional transportation of live broodstocks (parents) and juveniles of Black Tiger Shrimp (*Peaneus monodon*) helped pathogens to invade new environments (Briggs et al.

2005). In China, a developmentalist mindset continue to dominate scientists and extension officials, who tended to brush aside the notion of the limit of environment as they searched for a way to control disease with increased intensity and introduction of foreign species.

Scientists immediately searched for solution of disease control and bifurcated into two camps divided by their interest in organism or the environment. The virologist experiment with the shrimp organism and advocate an approach of pathogen exclusion by trying to eliminate undesirable pathogens. In late 1990s, China introduced from the United States the trademarked product called "Specific Pathogen Free" (SPF) broodstock of new species Pacific White Shrimp (*L. vannamei*) that was based on the concept of pathogen exclusion, a concept that emphasized the role of the virus over and above the role of the environment in disease outbreak. However, the "universal" potential of SPF works as a double-edged sword as it operates based on the exclusion of observed and identified pathogens. The failure to exclude hidden pathogens has turned SPF broodstock into a new source of risks when they are transported to new regions. The other camp of aquaculture scientists counters the pathogen exclusion approach as they promote methods for improving the pond environment through introducing probiotics, a substance that suppresses the growth of harmful bacterial for better water quality. However, as their notion of environment is limited to the shrimp pond, the failure to take other factors into account dampens their credibility among the farmers. When they market probiotics to farmers, they fail to find out that its application in sustained rain will exacerbate the adverse condition of the shrimp environment.

The ineffectuality of "ecological aquaculture" was exposed with the mushroom of drug residue scandals starting early 2000s as microbial drugs such as carcinogenic antibiotic and fungicide were identified by importers of the European Union, the United States, and Japan, hinting the insufficiency of using SPF and probiotics alone. Health-savvy consumers' eagerly pointed fingers at the Chinese producers as the source of the problem -- scrambling to find out when, why, and how farmers used illicit drugs. However, I would like to urge readers not to be tempted by a desire to locate the origin of the issue—"a will to truth" (Foucault 1982)---- but to reflect on how our conceptual framework changes to enable the visibility of food hazards. Blaming the immoral or misguided farmers should give way to more nuanced understanding of the power dynamics of the global food regime, veterinary scientific development, and consumers' growing concerns over health. Globalization is predicated upon an extension of food supplied over miles and a separation between production and consumption, incubating potentials for numerous food-borne risks and diseases. The debut of "illicit" drugs unveils how, before the deleterious effects of drug resides were identified, veterinary drug developers only focused on the issue of drug efficacy (*yaoxiao*) test overlooking the effect of drug metabolism (*yaodong*). This inadvertently reveals how the so-called difference between "effects" and "side-effects" is always contingent and is an issue of representation, depending on whether we can make undesirable effects visible. Finally, the stark division between wholesome and unhealthy food might lead to unexpected consequences. For example, the current overproduction of shrimp has to do with how protein has been touted as a good element of nutrition and how seafood is a high quality protein with Omega-3 fatty acids. When shrimp is produced to

meet the demand of the protein craze, the use of drugs in order to meet demands seems inevitable, leading to other health concerns.

I look at the science of disease control as well as food safety regulation to understand how science is embedded into a notion of "sustainable development" that serves to legitimate capitalism to expand into new horizons. While the concept of "sustainability" seems to be premised on a critique of the destructive forces of capitalism, in recent years, political ecologists have called for a more nuanced analysis that attends to the transformative capacity of capitalist production under neoliberalism (Choy 2011; Cooper 2008; Escobar 1996; Hayden 2003). Nature, which used to act as an independent sphere demarcated from the social and guided by autonomous laws, is increasingly becoming the "environment" of the capitalist system. Moreover, the discourse of sustainability serves to redefine the boundaries between nature and society. "In view of today's 'global' perils, the main issue now is less the restrictive notion of the 'limits of growth' as it is a 'dynamic growth of limits'" (Lemke 2002:55-56). "No longer is nature defined and treated as an external, exploitable domain; through a new process of capitalization, effected primarily by a shift in representation, previously 'uncapitalized' aspects of nature and society become internal to capital" (Escobar 1996: 47).

The pursuit of the "dynamic growth of limits" can be reflected in the development of aquaculture science that seeks to push the limit of stocking intensity in shrimp farming. In the Leizhou Peninsula, the booming of shrimp aquaculture accompanied the revival of gambling, once considered as feudalist remnants that were almost eradicated during Mao's time (Oxfeld 1991). Underground lottery produced in the adjacent province of Hainan

flooded the peninsula in mid-1990s and have become the major pastime activity for residents (Wang 2011). As shrimp farmers participate in lottery activity, they also call shrimp aquaculture a gamble, which defies any attempts of calculating the costs and benefits, enticing you to forever increase the stake especially at times of losses. This "gambling" discourse might stem from the Chinese folk ideology of "fate," a belief that even when one makes one's best efforts, failure will happen contingently (Harrell 1987; Oxfeld 1993). Harrell (1987) distinguishes the concept of "fate" from "true fatalism," as the former recognizes the possibility of failure even when one makes one's best efforts rather than rendering one's life into inertia as the latter advocates. While Oxfeld (1993) confirms the co-existence of fate and hard work as both necessary for business success, she also critiques the notion that gambling is considered to be a kind of squandering activity that is incompatible with rational market calculation. In her research among the Chinese tanners living in Calcutta, India, she observes that the discourse of fate that gamblers articulate does not seem contradictory to the Chinese entrepreneurialism of hard work and aspiration for social well-being. Rather like the belief in "fate and skills," gambling actually expresses the "contradictions" inherent in people's entrepreneurial ethos between "prudence" and "risk taking." After all, "it mimics and revolts against, reinforces and undermines the compulsions of the market" (Oxfeld 1993: 120).

While the above argument renounces the notion that gambling is inherently irrational, they have not delineated how the construction of risk/uncertainty relations works as a form of governance in modern society. Ewald observes the change of definition of risk at two historical timeframes. The concept of risk debut at the end of the Middle Ages with maritime insurance, which designated natural disasters not imputed to wrongful

human conduct. In the nineteenth century, the notion of risk underwent an extension to move beyond nature to the society in what Ewald terms "ecological risks," indicating "biological balances between a population and its environment" (Ewald 1993:222) . They feature three main characters: 1) In terms of scale, they exert an irreparable damage that impacts large population; 2) They defy a linear interpretation of causality and temporality which now become "dilated, diffuse, and expansive"; 3) They lead to a radical transformation of the problematic of responsibility, as "regardless of where the fault or error behind the catastrophe lies, the cost of repair is beyond any one individual's means and can only be borne collectively." All these features of uncertainty makes it hard to levy a legal definition of risk, as threshold and balance are based not as much on calculation as on social "acceptance" (Ewald 1993:224).

The concept of "ecological risks" elides a deterministic understanding of cause and effect and has helped me reflect on the relation between science and economy in the global food regime, two issues germane to the development of shrimp aquaculture. It illuminates on why scientific researches continue to introduce new realms of risks as they are hinged on controlling the observable pathogens and hazards, but disregard the observable risks. What scientists call "carrying capacity" is to be understood not so much a barrier imposed by nature, but a social endeavor to experiment the growth of limits. Moreover, global food regime has tremendously extended "food miles" and thus rendered the delegation of responsibility difficult or even impossible. While the origin of food safety hazard might be traced, the producer or processor is in no way able to account for the risks of society. Economically, the globalization of food production and consumption has masked further more the appropriation of surplus value. Different from the Fordist manufacturing workers

who worked under constant surveillance and discipline to become redundant with the improvement of productivity, the neoliberal shrimp farmers actively take risks in shrimp aquaculture so as to boost output. In China, despite of nearly 30 years of development, shrimp farms have not experienced the degree of centralization where a mega capitalist controls a large area of shrimp ponds and turn farmers into wage labor. Therefore, without a bounded factory fall and a proletarianized laborer, the degree of exploitation—usually associated with employment relations—is hard to pinpoint. However, Marx reminds us not to essentialize the divide between capital and labor as some one who controls the means of production and some one not, but pays attention to the value flow in a dialectic manner. In capitalism, unlike the feudal society, what is appropriated is not material goods in the form of corvée labor, but abstract value, measured by the socially necessary abstract labor time (SNALT) needed to produce a commodity (Marx 1976 [1867]). In terms of shrimp farming, the appropriation of surplus value might not appear in the farming process, but in food conglomerates' control of inputs and supplies as well as the value-adding practice of food processing. Moreover, farmers' ability to still enjoy a communal form of life due to the lack of proletarization might reduce the costs for the reproduction of labor, manifested in SNALT, and indirectly confer surplus value to the shrimp businesses. We can delineate from the operation of agrarian capitalism a more insidious ways of exploitation, "…the discursive linking of risk and globalization/uncertainty has become central to programmes of work flexibilization, casualization, and fragmentation" (Amoore 2004:175). As farmers are encouraged to become risk-taking entrepreneurs, at times of disease outbreak and food safety hazards, they are supposed to become the sole agent to bear the loss. It is interesting to see the irony that this high risk industry has not seen any coverage from an insurance

company, confirming Ewald's observation that the definition of risk has shifted from insurance risks to ecological risks.

Science as Disenchantment and Democracy

In southeast China, shrimp aquaculture took off in the 1980s in family farms under the policy of Household Responsibility System (HRS) that accompanied the dissolution of commune production which was blamed for discouraging individual entrepreneurship. When China experienced the transition of leadership from class leveling path to the technocratic path (Andreas 2009), the development agenda shifted from an emphasis on political redistribution to that of economic growth. As China was poised to enter the global economy under the "reform and opening up" policy, the ten years of Cultural Revolution were the focus of the blames for China lagging behind both economic and scientific development.

However, it is incorrect to say that the Maoist government paid no attention to scientific development as the country during the Cold War was urgently trying to improve production so as to "Catch up with Britain and Overtake the United States" (*chaoying ganmei*). It has been a controversial issue for scholars who debate whether Maoist development can be labeled as "scientific" or not, given the fervent political campaigns that constantly intervened scientific policy and involved many scientists into the turmoil of class struggle. The Great Leap Forward Movement (GLF) (1958-1960) and the Cultural Revolution (CR) (1966-1976) are two of the major campaigns that scholars disagree about. Judith Shapiro (2001), in analyzing environmental disasters during the socialist era, critiques how Mao's desire for modernity actually contrasted with his disregard for

scientific knowledge. She portrays how the anti-righteous movement in 1957 turned scientists into dissidents of persecution and set up conditions for Mao to launch his later campaign hinged on voluntarism as exemplified in the slogan "Man Must Conquer Nature" (*ren ding sheng tian*). Her book recounted the persecution of two prominent scientists, the demographer Ma Yinchu who advocated a Malthusian discourse that cautioned how large population might pose a hurdle to development, and U.S.-trained hydrologist Huang Wanli who opposed dam construction that catered to the "Soviet gigantism." Shapiro argues that the Anti-Righteous Movement silenced intellectual activism and swept smooth the subsequent campaign of GLF that fell especially in the two iconic disasters in Mao's conscription of the commune, including the "inflation trend" (*fukua feng*) in which local cadres wrongly scaled up grain productivity, and the "backyard furnace" in which peasants, without knowledge of metallurgy, were mobilized to produce steel out of scrap metal, resulting in massive deforestation and famine. She paints a picture in which political fervor dominates scientific strategy to produce great disasters.

While Shapiro criticizes political movement for contaminating scientific integrity, not all scholars think that "good science" should be outside of politics. Volti (1982) insists that GLF movement represented Mao's determination to pursue a road of scientific development that often created a hierarchy between mental and manual labor as well as between industry and agriculture common in developed countries. The GLF was pushed forward as the policy of "walking on two legs," meaning the simultaneous development of urban industrial sector and the small-scale rural industries (Volti 1982). Mao called forth the collectivization of communes as a prerequisite for the application of large agricultural machinery. Unfortunately, due to the low skill of peasants, the quality of the steel turned

out to be undesirable. However, the policy of "walking on two legs" continued in the 60s and 70s and galvanized the development of the "five basic industries" in the countryside, including: cement, energy, iron and steel, farm machinery, and agricultural chemicals, substantially boosting farm production. China's decision to pursue an indigenous scientific and technological development definitely could not be reduced to a merely Maoist zeal, if we remember that the republic had cut off scientific ties to the Capitalist Bloc upon its establishment in 1949, and further to the Soviet Union at the onset of the GLF.

The Cultural Revolution that took place less than a decade later has received more vehement criticism by many Western pro-democracy scholars and Chinese pro-market critics. However, in recent decades, more and more scholars have begun to call for a reconceptualization of the movement "in its own terms"(Esherick, Pickowicz, and Walder 2006), emphasizing the importance of thinking science as political rather than residing outside the political sphere. Schmalzer describes the popularizing of paleoanthropology knowledge especially in the development of the Peking Man exhibition at Zhoukoudian at the outskirt of Beijing that tried to educate the masses about Engels' notion that "Labor Created Humanity." She demonstrates how the rationale of "mass science," revolutionary as it seemed, contained "a deep-seated and unresolved contradiction between reverence of the masses on the one hand and concern about their lack of scientific knowledge on the other" (Schmalzer 2006:210). Sadly, the radical potential of the mass science falls short as the link between labor and humanity was reduced to physical activity, and did not include agent that "are uniquely qualified to interpret evidence of human origins" (Schmalzer 2006:209).

Joel Andreas, based on his historical and ethnographical study of Tsinghua University, one of the top universities in China, argues that Moa launched the Cultural Revolution to attack the two privileged groups that set themselves apart from the masses: the new political elite and old educated elite. After the initial years of violence (1966-1968), Mao commissioned "Workers Mao Zedong Thought Propaganda Team" to supervise the red engineers to prevent the reestablishment of conventional bureaucratic line of authority. Moreover, Cultural Revolution launched a series of campaigns to achieve class-leveling in the field of culture by radically reforming the education system to bridge the intellectuals' "three separations" (*sanda chabie*): "separation from practice, separation from workers and peasants, and separation from productive labor" (Andreas 2009:169). For example, Mao's July 21 (1968) directive replaced the university entrance examinations into a recommendation system wherein worker-peasant-solider students were recommended by factories, villages, and military units to attend the university. The open door education policy requested teachers to offer practical training programs in university factories. Andreas points out an important distinction between CR and the reform era in that in the former era, engineers were considered only an auxiliary force to the party leaders, but afterwards, mass mobilization was replaced by "scientific management," and "engineers were now considered to have the best qualifications to be administrative and political leaders" (Andreas 2009:238). The triumph of "red engineers" in the post-CR period feeds into a developmentalist ethics that is built upon enlarged social inequality.

Greenhalgh further complicates the concept of a science free from political ideology in her study of the controversial "one-child policy." Opposing the conventional belief that the policy was the outcome of a repressive state disrespectful of science, she shows how

"(t)he one-child policy is not about a strong state or its coercive practice, it is about Western science. More specifically, it is about the nation's dreams for transforming a poor, downtrodden nation into a prosperous, modern, global power *through selective absorption of Western science and technology"* (Greenhalgh 2008:2-3, emphasis original). In late 1970s a number of approaches were offered for population control, including Marxian economists who preached a Malthusian ideology to emphasize the burden of population on both society and rural families; the cybernetics approach pioneered by Song Jian who proposed to use methods of rocket science to achieve the best fertility trajectory for rapidly reducing the population; and finally the Marxian humanists headed by a peasant-turned-economist Liang Zhongtang, who revealed the costs of one-child-for-all policy in creating shortage of rural labor and disrupting social welfare for peasant families. Eventually, the second group prevailed with their sophisticated forms of modeling when natural science garnered high esteem based on "unchallenged prestige of science at a time when ideology was moribund" (Greenhalgh 2008:141).

These examples challenge the conventional notion that China has pursued its social policies at the expense of scientific expertise, which is premised on the idea that issue of social equality and national independence reduced science and technology to a subordinate role. In fact, the root of the political aspect of science can be traced to its ascendance in European Enlightenment period. In the 18th century, modern science gradually established its authority as a celebrated form of knowledge based on enlightened reason. Reason championed the power of disenchantment, assuming that once shed off the confinement of religion, human action could be automatically guided by rational thinking. Enlightenment thinker Immanuel Kant criticizes metaphysics for not enlarging human understanding of

nature, but rather narrowing human knowledge. Metaphysics is not based on experience, but totally based on concepts. In that regard, we understand things only as their representation, but not from experience or sensation. Kant tries to refute the metaphysical philosophy of "pure reason" which alleged that we should achieve our understanding of the world through *a priori* conception, because things like God, freedom, and immortality, could not be comprehended by our experience and only belong to the intellectual realm. He proposes the idea of "transcendental idealism" to bridge the gap between apriorism and empiricism, drawing our attention to what we think of things as, rather than the things themselves. "External objects are nothing but representations of our senses" (Kant 2001 [1781]:49). In this way, he turned human beings into actors seeking knowledge, rather than passive finders of objects. He regards enlightenment as an "exit" out of which human beings break off the (comfortable) bondage of guardianship and achieve freedom of thinking by employing not only one's intelligence but also their powers of observation.

Science's dual notion of both demystification and liberal freedom proves to be problematic especially when scientific knowledge was developed in the process of colonization. Sandra Harding reveals how modern science served the interests of European expansion, as "(t)he 'problems' that have gotten to count as scientific are those for which expansionist Europe needed solutions" (1998:7) and "benefits of science development are distributed to already overadvantaged groups in Europe and elsewhere, and the costs disproportionately to everyone else" (1998:8). The solution to deconstruct science's Eurocentric assumption lies in a quest for multicultural science that acknowledges non-Western origins in modern science and absorb non-western culture into global sciences in the future.

In the recent decade, postcolonial historians have taken up the effort to analyze colonialism's "civilizing mission." Rather than viewing colonialism as the outcome of Western domination through reason, it is important to examine the process through which science was developed in the West through colonial expansion and exchange with indigenous knowledge system. The colonies "were underfunded and overextended laboratories on modernity" (Prakash 1999:13). Raffles (2002) delineates how William Bates' fame in entomology did not happen simply as a consequence of objective scientific research out of curiosity, but was entangled with the exchange with indigenous knowledge in the Amazon. Eventually, Bates could not simply generate a universal Linnaean classification devoid of contexts, but he had to constantly incorporate native terminology and explanation into the scientific discourse (Raffles 2002). Fabian (2000) also unveils how natural scientists' conducted "objective" scientific research in Central Africa in late nineteenth century through coercion, deceit and violence.

The above discussion demonstrates that science has never been "pure" knowledge, but is always entangled with power either with colonialism, nationalism, or socialism. Recently, scholars have questioned the inadequacy of essentializing science as a unitary, oppressive force over society and of reducing nature to a foundational reality. They have started to explore an alternative perspective in the "co-constitution" of science and society (Hayden 2003; Latour 1987; Lowe 2006; Raffles 2002; Sunder Rajan 2006). Latour and his colleagues developed "Actor Network Theory (ANT)" which emphasized the "symmetry" of relations between science and society (Latour 1996, 2005). In this dissertation, I look at shrimp pathogens and aquatic drug residues as "actants," "something that acts or to which activity is granted by others. It implies no special motivation of human individual actors,

nor of humans in general" (Latour 1996:370). Instead of viewing scientific theories as "black boxes" that are used as taken-for-granted knowledge, ANT scholars examine the inputs and outputs that go through the black boxes or follow the controversies that reopen them (Hassard and Law 1999; Latour 2005, 1987). ANT questions the oppositional relations between nature and culture exemplified in both the realist model of environmental determinism and the idealist model of social constructivism (Haraway 1991; Keller 1987; Latour 1992). The realist model takes nature as a ground for social action, as classical research on human-nature relationships explores "ethnoscience" in fields of ethnobiology, ethnozoology, or ethnoethology to demonstrate the rationality of "other" knowledge systems in terms of classification or animal behavior (Bulmer 1967; Blurton-Jones and Konner 1976; Conklin 1954). After decades of mid-century critique of anthropology, driven by the reflexive turn of postcolonial theory (Asad 1979; Harding 1998), anthropologists began to question the Eurocentric hegemony in the study of "other cultures" built upon the nature-culture divide. Feminist theorization of the malleable "facts of life" unveiled how the binary conceptualization of nature vs. culture could promote a sense of human exceptionalism that not only propelled the utilitarian function of nature, but also exacerbated intrahuman differences established along the lines of gender, race, sexuality, and ability (Franklin 1995; Haraway 1989, 1995; Strathern 1972, 1992, 1992).

Informed by a cohort of three strands of interdisciplinary inquiries including environmental studies, science and technology studies (STS), and animal studies, "multispecies ethnography" has emerged at the dawn of the 21st century to unveil "how a multitude of organisms' livelihoods shape and are shaped by political, economic, and cultural forces" (Kirksey and Helmreich 2010:545). The conceptualization of species as

"becoming" (Deleuze and Guattari 1988) rather than established, allows this new scholarship to trace discursive and material practices underlying the uncertainty of social and biological forms of lives (Franklin 2007; Helmreich 2009; Lowe 2010; Paxson 2008; Raffles 2002, 2010).

Lowe (2010), in her ethnography of a virus, H5N1, proposes the concept of "cloud," or "species multiple" to unveil the "unstable group boundaries" of biotic entities that surround the pandemic preparedness. The U.S.' action to label the threat as an "Indonesian responsibility" and thus try to "forestall something that turned out only to ever have existed as a potentiality," is no different from "the quasi-species cloud which also exists in a state of indeterminacy with respect to the future forms it may produce" (ibid:627). The logic of animals threatening the welfare of human beings should be forsaken as it premises on the idea of human exceptionalism, the deluded ambition to turn nature into privileged resources. Rather, considering how human being contributes to global disease pandemic through the flow of commodities as well as adverse treatment of animals through industrial production, we might need to recognize the uncertainty over life as well as multispecies' ability to remake life, as we try to understand how humans become with H5N1.

By exposing the "blind spots" of "ecological aquaculture" and food safety management, I do not seek to argue that there is a difference between perfect and imperfect science, but try to demonstrate how sustainability's avowal of transcending the growth of limits might generate new venues of risks and disasters. I engage with two Science and Technology Studies (STS) scholars to contemplate the limitation of aquaculture science. Drawing on Alison Wylie's (2002) notion of "theory-laden evidence," I speculate about an the epistemological conundrum in the science of disease control. As aquaculture

science derives its authority through observations, its potential to decrease risks might be mitigated by its disregard of the unobservables that engender new venues of risks when scientific and technological products and expertise travel. While science claims to deploy universal application, I moderate this argument by exploring how the "universalization" is achieved through objectification of observables but is contingent on overlooking unidentified variables.

In addition, I incorporate political theorist Jane Bennett's idea of "vibrant matter," as I speculate on the vitality of ecological products and drug residues to understand how they possess a power of action that defies human beings' instrumental control. The notion of "vitality" highlights the "capacity of things…not only to impede or block the will and design of humans but also to act as quasi agents or forces with trajectories, propensities, or tendencies of their own" (Bennett 2010:viii). The potential of SPF to exclude certain pathogens and introduce new pathogens through travel challenges the binary notion of pathogen exclusion hinged on desirable and undesirable pathogens. In addition, probiotic bacteria, which are used in shrimp aquaculture based on the principle of competitive exclusion and as immunostimulants (Nanawe and Selvin 2009), fail to deploy universal efficacy as favorable lab conditions conceal the limitations that are magnified in the actual process of shrimp production. Similarly, the exposure of drug residues reveals how the science of drug metabolism failed to enter the domain of veterinary pharmaceutical scientists who only conducted drug efficacy tests. The artifacts exemplify how the agency of things does not always fall under human intention. Human beings' attempt to objectify the natural world for the purpose of control will become problematic and even disastrous if we fail to take into account the agency of things themselves. Bennett proposes a

reconceptualization of the meaning of agency as ethical rather than purposive and a notion of causality as emergent rather than determinant.

Methods and Research Design

Entry into the Field

My bewilderment with Florida shrimpers' activism drove me to the study of shrimp farmers in China as I tried to understand how globalization fanned antagonism between the working-class across national borders. I soon found out that Leizhou Peninsula in Guangdong Province of southeast China was the largest shrimp production base in the country with annual productivity of 127,000 tons, accounting for 21% of China's production and 8% of global output. Over 70,000 farmers engaged in shrimp farming with 220,000 people employed in the whole commodity chain that includes hatcheries, supplies (shrimp feeds, plastic film and pharmaceuticals) and equipment (aeration machine and diesel engine), processing factory, logistics, etc. (Yang 2006). Although I was born and grew up in Guangdong Province, I have never been to the area and do not have any connection to any Leizhou person.

In June 2005, I returned to Guangzhou for summer vacation as well as searching for a fieldsite. That was the first time I returned to China after I left in 2001 to start my M.A. study at the University of South Florida. I was very eager to meet my parents, relatives, and old friends. On a gathering of high school alumni, I asked friends whether they could help me establish any connection in the Leizhou Peninsula. One person responded that his parents grew up there and he still has relatives living in the peninsula, but unfortunately they already migrated to the town and were no longer involving in any farming activities.

Despite of this, he still enthusiastically offered to help me, as he started to warn me to be extremely careful since that area was famous for the "dominance of gangsters" (*heibang shengxing*). Moreover, I need to be prepared for the language barrier as the Leizhou dialect, a variety of the *minnan* dialect, will be totally incomprehensible for me. In the end, he left me his cell phone number and asked me to call him in case of emergency.

Despite of his warnings, I took a shuttle bus to Zhanjing, the municipal capital of the peninsula by myself on July 9th 2005. After a few roundabouts, locals directed me to Dongli Town, a major shrimp farming area in the peninsula. I took a bus to Leizhou first, which was one hour away from Zhanjiang, and then a minibus to Dongli, another hour away. I still remembered feeling anxious and nervous on the minibus, which looked worn out with paints falling off. I was worrying the whole time whether it would be torn into pieces as it was roaring at a speed of over 50 miles per hour. The passengers were at ease, though. They packed the small space with chicken coops, linen bags of rice, and large baskets of sweet potatoes. The bus was lively choking with cigarette smoking and people's chatting and laughers. I felt such an outsider unable to comprehend what they said and was afraid of being asked what I would be doing here. I turned my head out of the window, the afternoon sun shone on the patches golden rice paddies, some already harvested, making me feel a little bit at ease. I hoped that the minibus could run more slowly, as the fear of not knowing where to go next was so daunting. Soon it stopped and everybody got off. I was soon swarmed by the motor paddlers who easily detected me as a non-native. I tried hard to meander out of their enclosure and walked straight. The township was soon at sight. I settled down with a motel nearby. Opposite the street, I saw the sign of an aquaculture technology extension center, but later found out that it was actually a feed and drug store.

It was 2pm and I was starving. I recalled that my friend who had relatives living in the peninsula jokingly warned me to beware not to be hit of jackfruit, a local specialty. I approached a vender and decided to buy some. Called Xiao Ai, the vender was a teenager wearing a tainted pink shirt pressed with the sign "Cornell Universcity." I tried to hide my laugh and ordered a small piece of jackfruit. To my surprise, he understood mandarin. I was so happy and bought a big piece of jackfruit and some wampee to take home. I then asked him where I could find people who farmed shrimp. He told me that their family did and invited me to visit. Later, his sister came and she was extremely nice to me. I went to have dinner with them and tried the local staple meal of sweet potato congee. They explained that Leizhou people used to be very poor and could not satiate their stomach. Therefore they invented a method by shedding the sweet potato into small pieces and cooked them with rice by adding a lot of water. In this way, a small portion of rice could feed a large family. We ate in the dark light as they told me that the shrimp farms consumed so that energy that residential use of electricity was reduced to minimum. Nobody would buy a washing machine or a refrigerator, simply because the low voltage could hardly power up these gigantic devices.

I learned that they started shrimp farming three years ago and already accrued a debt of over 50,000 *yuan*. They were not good at monitoring water quality and failed to raise shrimp to harvest size. They moved to live in the township from a village over a decade ago, forsaking their share of land. The sister, called Xiao Ming, explained that they were force to make the decision after receiving not a single drop of rainfall for three months and the rice plants all died out in the field. They moved to live in the township and started to sell fruit. Before finishing her middle school, she was lured to work as a

dagongmei, female migrant worker, in Dongguan, a hub of electronics and garment industries. She did not stay long as she could not stand the long hours of work and the humiliating working environment. Regretting that she dropped out of school so early, she saw me as a role model who pursued a high education and could move freely between the United States and China, as well as between Guangzhou and Dongli, while she was restricted to the fruit paddle. Everyday she rolled the paddler out in the street at 6:30am and finished at 11:30pm, with her mom rotating shift with her. At the age of 26, she was still unmarried, which was quite usual in the area. She said that she did not want to leave the paddler to her mom alone as they both worked hard to support his three younger brothers' education. Xiao Ai, who I met first, just returned home yesterday and was waiting for the result of the college entrance exam. Once admitted, the family would have to accumulate enough funds for his to get enrolled.

After dinner, Xiao Ai's friends all came over to chat. We went to the ceiling to enjoy the cool breeze. The ceiling was built flat for sun bathing rice, sweat potato slices, and peanuts. The houses are closed to each other as I saw his cousin jumping over to his house easily. I looked up and felt overwhelmed by the big sea of stars, signing, "There are not as many stars in the city." The cousin was dumbfounded, "under the same sky (*tongyi tiankong xia*), why don't you have stars?" I was silent, not knowing how to respond. "Under the same sky," why would people live so differerently?

Getting to know Xiao Ming's family opened up my access to the community in Leizhou and I no longer felt scared and lonely. Although Xiao Ming did not quite enjoy her *dagong* experience, she said that she learned the hardship of being outside (*chumenzaiwai*

de jianxin) and especially appreciated the help she received from her fellow (*tongxiang)* sisters. When I revealed my plan of visiting shrimp farms in the peninsula, she spent hours requesting her mom to allow her to accompany me. In the next week, Xiao Ming, Xiao Ai and I travelled to the west coast of the peninsula, visiting their relatives and shrimp farms, helping me set up local connections. When I began my fieldwork in 2008, they already abandoned shrimp farming completely, but they were still very supportive to my research.

That was my access to the grassroots community, but to study the science extension network, I also needed to approach the official community—extension workers and scientists. After leaving Leizhou Peninsula, I took a train to Hangzhou to visit my in-laws, the first time after getting married four years ago. Upon learning my research topic, my father-in-law prepared a big present for me. He is a retired engineer of metallurgy and also an amateur musician of saw violin, actively participating in an elderly troupe. Accidently he got to know a colleague who was a retired official from the Hangzhou Fisheries Bureau. Later, he referred me to local aquaculture extension center which welcomed me to join their field trip to local shrimp farms. Then, I met a renowned aquaculture scientist who referred me to Chen Aiping, the director of the Division of Aquaculture Disease Control of the National Fisheries Technology Extension Center (NFTEC). Soon I visited Director Chen in Beijing who kindly introduced to me the current status of shrimp farming in China and referred me to Director Chen Wen, her counterpart at the Guandong Province Fisheries Technology Extension Center (GDFTEC). I soon made acquaintance with Director Chen Wen and his colleagues as I found out that many of them were Hakka, which I was a member of. Although up to now I could not figure out why so many Hakka people who grew

up in inland, mountainous areas, would engage in aquaculture, I benefited from the Chinese custom of establishing *guanxi* (relation) through place-based ties.

In July 2006, I received funding from the department to begin my pilot research. By that time, I already took an introductory class on marine biology and one class on aquaculture. On July 27th, I visited Director Chen Wen and gave a presentation to their center on the aquaculture industry in Washington State, introducing to them my three fieldtrips including one on that collected samples of oyster infected with Denmen Island Disease near Olympia, one on salmon netpen farming near Bainbridge Island, and finally a shellfish hatchery at the Hook Canal. Director Chen was quite impressive that I even conducted a Polymer Chain Reaction (PCR) test to identify *Mikrocytos mackini*, the viral agent for the Denman Island disease. In the evening, he invited me for a banquet in which I met the director of the Zhanjiang aquaculture extension center. He told me that they were holding a job retraining program for fishermen in Beihe Town of Leizhou City and invited me to join. He gave me the contact information of Sister Ling, director of the Leizhou aquaculture extension center, who was organizing the program. I called Sister Ling immediately, but she was not very enthusiastic, considering me rather as a nuisance. I insisted on going and she gave me directions, telling me that she would arrange a taxi to pick me up at Leizhou City since the road to their site at Beihe was very complicated.

The next day, I returned to Leizhou the same way as I did one year ago and called her when I got to town. She still wanted to deter me, saying that they had only bunker beds with no bedding and the living condition was very crude. I said that was fine and she asked me to wait for the taxi. I immediately went to a store and bought a straw mattress, a small

pillow, and linen comforter, sticking them into a plastic bucket. Half an hour later, I still did not see the taxi driver and decided to go on my own. I took a minibus to Beihe town and it was pouring in darkness at 7pm. I got shelter at a watermelon vender and asked him how to reach the office of a natural reserve, the site of the job retraining program, but he did not understand mandarin. Then I approached a butcher who was packing to go home, but he did not understand me, either. Fortunately a customer heard our conversation as he was leaving and weaved to stop a three-wheel motorcycle to tell him my destination. I soon got afraid as the vehicle disappeared into darkness. With one hand holding an umbrella against the storm and another hand grabbing the motorcycle handrail, I could not see what we were passing with the dim headlight. Suddenly the motorcycle stopped. My heart sank. Was he going to rob me? I would not even know where to run. I reached my cell phone and found it soaked in the rain. Fortunately, he was just picking up another passenger who settled down on the seat adjacent to me. Now I felt more contented thinking that the two of us might be more powerful to fight with the driver if he decided to do something devious. Soon I was left alone again when the passage reached home. After he got off, I heard the driver asking the passenger's family something. The driver did not know the directions to my destination! Later, he stopped several times asking people and scared me to death. Finally, at about 9pm, he drove me into a big gate with the sign "natural reserve." Sister Ling immediately rushed out and shouted, "We were so worried about you. Where did you go?" I got off the motorcycle, shivering and panting.

That became the turning point of my rapport with Sister Ling and her colleagues. Every time when she introduced me to scientists affiliated with their center, she told that my motorcycle adventure, admiring me both my courage and luck. Although I was sent by

the upper level, the provincial center, I did not come with a ride in the office car, but on my own in such a dangerous situation. Even she expressed her doubt that I could be a spy sent by the U.S. government as I mentioned at the beginning, she later became a good friend of mine as she frankly shared her opinion on the dilemmas farmers faced. I valued this way of unofficial entry into the field, compared with my later experience of entry as a representative of official when I worked as a consultant for Director Chen Wen's center to collect information of trash fish/low value fish suppliers. Once I approached a fisherman and asked his livelihood including income. He told me that he never made any money and was living off loans from relatives. The next day, a friend told me that he was lying as he was living a prosperous life, but simply because he thought that I was a government agent, he was expecting aid.

Both my official and unofficial connections help me in different ways to approach the complex aquaculture science extension system.

Multi-sited Ethnography

My dissertation might be considered a multi-sited ethnography that examines the linkages between economy, ecology, and society. By the 1970s, anthropological research was conducted predominantly as single-sited ethnography that attended to "local" ramifications of a "global" Impact. Guided by the spirit of holism and a world system perspective, these methods have revealed community resistance and accommodation to the macro-processes associated with the capitalist political economy and contributed to an understanding of culture as not static but dynamic. However, the macro political and economic restructuring in the world since then has rendered the "world system"

fragmented if not dissolute. Informed by postmodernist thoughts, multi-sited ethnography began to gain its foothold in the 1980s by engaging an interdisciplinary perspective to take a more nuanced approach to contemporary time-space manifestations as they transform (Marcus 1995).

My research draws on Bruno Latour's (1987) method "science in action" as a guide for my multi-sited ethnography. Latour is concerned that when the process of making science is blackboxed, its ways of deriving its truth claims become opaque. Therefore, a division between lay public and expert professionals is solidified as science's truth acts as a self-evident knowledge are imposed top-down upon the former. In that way, science will lose its democratic character by disengaging public scrutiny. Therefore, Latour calls for a new methodology in the social study of science by shifting away from "ready-made" science to opening the blackbox of knowledge-making. He proposes that social scientists pay attention to how science gradually solidifies its truth and authority through rhetoric, social networking, and rendering certain ways of thinking and practice as irrational. His proposal has been helpful for me to select the topic of my research in the first place as I chose to study the making of "scientific aquaculture" in China rather than assuming that science was a static and closed-system. As I track how "scientific aquaculture" shifted its meaning from an emphasis of "high-yields" to "food safety," I criticize the view that science is always progressive and evolutionary, but understand how science changes in response to its own crisis and how its predication on visible observations sets the limits of its knowledge.

During my 18-month fieldwork in June-September 2006 and April 2008-August 2009 in Guangdong Province, China, I followed the network involved in the production of

scientific aquaculture. Since shrimp has always been a targeted export product, the agenda of scientific aquaculture promoted by the state is inevitably intertwined with the changing demands of the global market. While "scientific aquaculture" encouraged farmers to pursue unprecedented high-yields through disseminating knowledge and technology on disease control in the 1990s, the current science-savvy farmer is expected to produce healthy food that does not contain any banned drugs. The shift from food quantity to quality has caused the imposition of mandates for extension officials and biologists to prioritize drug use standardization in the promotion of scientific aquaculture knowledge.

My fieldwork was largely concentrated in the Leizhou Peninsula of Guangdong Province, now the largest shrimp production base in China.

I followed up with a series of activities that were centered on the promotion of scientific aquaculture. In May 2008, I attended the bi-annual meeting in which all grassroots level extension centers in Guangdong province participated and observed how policies on food safety control were disseminated. Later in the year, Guangdong Fishery Technology Extension Center (GDFTEC), the provincial management agency of aquaculture extension, carried out a pilot project that aimed to train the first ever licensed fish veterinarian in the world. In the veterinarian training workshop that I attended, I observed how participants were instructed to learn self-help and not use state resources but become enterprising veterinarians who know how to make their living by prescribing drugs that are not banned by importers.

The promotion of food safety knowledge not only entails education about standardized drug use, but also law enforcement campaigns that aim to crack down on violations. I

followed extension officials and drug testing scientists, observing how they carried out drug residue inspections and how officials dealt with issues of violation in a web of personal relations. Later, I visited a major drug residue testing center in the province and talked to a scientist to discuss ambivalent feelings that he had in working with the cutting-edge technology of chromatography. These fieldwork activities provided opportunities for me to learn how "scientific aquaculture" was produced "in action" (Latour 1987) as a result of friction among the state's neoliberal policies, experts' self aspirations, and farmers' conceptualization of risks.

I also conducted extensive fieldwork at the Dongli Township, located in the Leizhou Peninsula of Guangdong Province. While subsistence farming used to be the main activity for villages, starting in the mid- 1980s, shrimp farming began to gain momentum in the area as the state fishery bureau set up grassroots aquaculture extension centers to promote the technology of shrimp farming. From the aquaculture of Black Tiger shrimp (*Penaeus monodon*) in low-intensity polyculture settings in the 1990s to the farming of Pacific White shrimp (*L. vannamei*) in high-intensity monoculture settings after 2000, shrimp farmers experienced times of both mammoth gain as well as unexpected loss caused by rampant disease outbreaks. My fieldwork in Dongli Township has provided an opportunity to investigate ways that shrimp farmers conceptualize state development and science-promotion policies as well as how they view their own interests or shares in these undertakings.

In addition to my ethnographic research following the actions of officials, biologists, and farmers, I also conducted archival research to understand how the construction of

scientific aquaculture was not simply an outcome of top-down policy, but a process constantly negotiated and contested between elite experts and lay farmers. I collected historical files at the Leizhou Archival Bureau to learn how shrimp farming was started in one of the poorest areas in the province. Moreover, I downloaded documents from a marine research institute to learn about the changing trajectory in scientific research of aquaculture. Finally, I gathered official documents at the GDFTEC to study the implications of recent policies that promoted the establishment of "ecological aquaculture." The collections of materials at different institutions helped me rethink how science can be interpreted differently by various actors from the state to grassroots.

Becoming a Shrimp Farmer

In order to understand "scientific aquaculture" on both a rhetorical and a practical level, I leased a small shrimp farm (6 *mu,* 0.4 *ha*) and grew Pacific White Shrimp monoculture for one crop (3 months) in a village in Dongli Township in summer 2008. With the help and instruction of more experienced shrimp farmers and aquaculture extension officials, I participated in the whole process of grow-out, including the purchase of shrimp larvae, pond sterilization, seeds stocking, feeding, water quality regulation, and shrimp disease control. Before I started my fieldwork, I wrote in my NSF grant proposal that the experiment would have the following benefits:

> "With the help and instruction of both more experienced shrimp farmers and aquaculture extension officials, I will participate in the whole process of grow-out, including the purchase of shrimp larvae, pond sterilization, seeds stocking, feeding, water quality regulation, and shrimp disease control. This will not only give me a chance to establish rapport with other villagers and extension workers, but more importantly, allow me to live as a shrimp farmer in order to comprehend their understanding and practices of scientific aquaculture. Moreover, this practice will help me understand viscerally the experience of risk, similar to Caitlin Zaloom (2004)'s deployment of "penny portfolio" in her research of

> the Chicago Board of Trade (CBOT). At the same time, this experience will allow me to comprehend the interactions between human activity and the way the shrimp facilitate or limit what is possible."

The reviewers expressed their enthusiasm as followed: "This proposal is cutting edge in its approach to the practical construction of scientific knowledge." "A particularly innovative aspect of the proposed research is the incorporation of a 3-month period in which the applicant will 'become a shrimp farmer.'" However, given anthropology's tradition in studying the emic perspective of culture, why is "becoming a shrimp farmer" a unique practice? Probably the greatest difference lies in that participant observation, the landmark methodology of anthropology, has been transformed to participant action, reframed as "becoming a shrimp farmer" in my methodology section in the NSF proposal.

While the idea of a PhD student becoming a shrimp farmer seemed innovative in reform China, it was just a mundane part of life for my parents' generation who participated in the rustication movement of the late 60s and early 70s that commanded the urban educated youth to be reeducated by the proletarian peasantry. While the discipline of anthropology was banned as a bourgeois discipline[1], the method of immersion was highly promoted as tens of millions of "sent-down youth" went to the countryside to practice *santong* ("three together") with the peasants, meaning eating together (*tongchi*), dwelling together (*tongzhu*), and laboring together (*tonglaodong*) (Bernstein 1977; Pan 2002).

[1] Archaeology remained a vibrant discipline but was often considered a branch of history. Ethnicity study (*minzu xue*), a subject derived from the Soviet academic system, was supported by the government especially in the 1956 ethnicity identification (*minzu shibie*) movement that sought to recruit the non-Han ethnic minorities into socialist construction. See Harrell (2001).

I am certainly not the first anthropologist that engaged with "participant action." The urgency for anthropologists to change their method from "observation" to "action" reflects how observation, through a process of enframing, risks an essentializtion of culture through "othering." "Enframing," as used by Mitchell, works as the observer sees the world appearing as a picture in an exhibition, a picture whose "order occurs as the relationship between observer and picture, appearing and experienced in terms of the relationship between the picture and the plan or meaning it represents" (Mitchell 1991:60). The significance of "enframing" process as a way of representation is that it not only informs the colonial government knowledge about the Egyptians, but more importantly produces an object world susceptible for management.

The urge to overcome the subject-object relations between researcher and informant has propelled anthropologists to explore the notion of culture that delimits the temporal, physical, and even epistemological boundaries by "becoming" the culture. Boellstorff (2010) argues that anthropology should refrain from our intractable determination of grasping knowledge about the world (episteme), but should start to unveil the "techne" of human imaginings. "Techne refers to art or craft, to human action that engages with the world" (55), and it implies "a future orientation" in contrast to episteme that is "oriented toward the past" (56). In his study of the culture of virtual world, he invents the term "*homo cyber*," the virtual human as people who "can craft their lifeworlds through intentional creativity (25)," forsaking the anthropocentric term of *homo sapiens*, the "knowing man." As he insists on studying virtual worlds in their own terms rather than as a fabricated "form of escapism from the actual world," he gathers data through his avatar living in the virtual world "Second Life." While one of his informants

teases him for mixing up research and play, Boellstorff champions the priority of participant observation over elicitation methods like interviews and surveys as the former "does not require that aspects of culture be available for conscious reflection" (68). Similar to Boellstorff's "social immersion" through his own avatar, Stefan Helmreich participated in both research expedition thousands of meters under water and in the everyday life of the institutions and scientists, examining "how sentiment and science about the sea inflect on another" (Helmreich 2009). He traces the "symbiopolitical reconfigurations" (283) as laden in the connection between the biological—"life forms" (organisms)—and the social—"forms of life" (scientific, religious, economic, ethical ways of organizing human communities). In exploring alternative way of mapping life contextually, Helmreich joined a research expedition sampling the Sargasso Sea and volunteered to extract marine viruses from sea water. His corporeal experience with virus not only helped him understand the vast volume of virus in the sea, but also conceptualize the constant undertaking of lateral gene transfer that problematizes our anthropocentric conceptualization of virus as other to the body, debunking the Darwinian belief of common ancestor as exemplified in his tree of life.

In exploration of the new worker-subject, Pun Ngai (2005) became a full-time *dagongmei* (working girl), toiling with her fellow workers twelve hours each day in the assembly line and sleeping "like pigs" on occasional Sundays (2003). The appropriation of labor power rendered her too exhausted to write down field notes concurrently, but helped her emphatically see these schemes of pain and nightmare as sites of both domination and resistance. The importance of practice and experience in knowledge-making has been a central tenet for Marxist scholar György Lukács who proposes the term the standpoint of

proletariat. In contrast to the bourgeois who understand economy as guided by impersonal laws, the proletariat know the world through the reification process—by becoming aware of itself as a commodity, the proletariat recognizes itself as the object of the economic process, as the driving wheel in the capitalist machine (Lukacs 1971). Therefore, the proletariat would constitute a revolutionary force for social change by grasping both the perspective of the capital and labor, as Lukács argues that

> "By relating consciousness to the whole of society it becomes possible to infer the thoughts and feelings which men would have in a particular situation if they were *able* to assess both it and the interests arising from it in their impact on immediate action and on the whole structure of society" (1971:51).

My fieldwork component of "becoming a shrimp farmer" was inspired by the above-mentioned pioneers that seek to debunk the binary divide between nature and culture, between theory and practice, and between intellectuals and the proletarians. "Becoming a shrimp farmer" means that I do not take "scientific aquaculture" as a full characterized system of knowledge (episteme), but more as technology (techne) manifested in both play and creation (Boellstorff 2010). The open-ended orientation of technology is as liberating as frustrating. I had a hard time deciding what kinds of shrimp farmer I was supposed to become. In the coastal area of southeast China, there is a plethora of forms of shrimp aquaculture, from cottage farms to standardized factories, from rudimentary earthen ponds to well-equipped cement ponds, from polyculture with crab and/or fish to monoculture, from 1 *mu* (1/15 hectare) pool to 200*mu* lake-like pond, from family farm to state-owned farm, from farms located in poverty-stridden village to that in the prosperous suburban delta region. As Helmreich (Helmreich 2009) meticulous reveals the uncertainty of life in the alien ocean, I encountered the problem of how to become *a* shrimp farmer

when the limit of research funding and time forced me to settle on only one aquaculture form ("life form") and thus one way of farming life ("forms of life"). My deliberate decision to choose to become a shrimp farmer in a "poor" village in the Leizhou Peninsula reflects my effort to join Pun Ngai in exploring "*dagong*" (selling labor) subjectivity from below in the everyday "life tactics" living through exploitations and risks.

Chapter Breakdown

Chapter 1: Getting Rich Together and Its Aftermath: The Prehistory of Agrarian Capitalism

China is now the largest aquaculture producer of the world, contributing over 70 percent of the output annually. The debut of the "Blue Revolution" in the reform era in the 1980s propelled agriculture economists to draw the conclusion that the collapse of communes automatically cultivated entrepreneurial spirits of farmers. I argue, instead, that the development of shrimp aquaculture did not represent a turnover or denial of the Maoist collectivization, but actually relied on the extension of the socialist ethos of seeking mutual benefit and the common good.

Chapter 2 Contested Observations: The Science of Disease Control

In 1993, a disease epidemic called "White Spot Syndrom Virus (WSSV)" wiped out over 70 percent of shrimp production in China. Although some scientists argue that high-intensity stocking and the global transportation of wild broodstocks might contribute to the spread of the disease, the scientific world designated virus to be the culprit and started to experiment ways of pathogen exclusion. I examine how scientific knowledge is

developed through hypothesis testing and observations, but the disregard of "unobservables" engenders hotbed for new risks of disease outbreaks.

Chapter 3 The Curse of Overproduction: Tracing the Value Flow of Labor in Agrarian Capitalism

This chapter discusses the repercussions of overproduction after the year 2000 when Chinese farmers adopted new species and new farming methods to boost yield 3-5 times the previously levels. The overproduction triggered two consecutive events: an anti-dumping campaign launched by shrimpers in Florida and the rise of nouveau riche aquaculture conglomerate in China. I adopt Marx's labor theory of value to analyze whey shrimp producers in the United States and China ride the "treadmill" of overproduction. Next, I examine how agrarian capitalism in south China is built upon "semi-proletarization" in which communal relations are conducive to capitalist exploitation but also offer grounds of resistance.

Chapter 4 Vibrant Drug Residues: In the Attempt to Standardize Food Safety Regulation

A failure to see nature and risks as vibrant also characterizes the science of food safety control. I explore how drug residues should be attended to their vitality, as they embrace an agency that refuses to fall into the instrumental use of human beings. This conceptualization falls in line with Bruno Latour's notion of "actant" that emphasizes the kinship between the human and the nonhuman, positing a theorization of causality as emergent rather than linear and deterministic. I examine how the human-animal-chemical cluster—antibiotics, carcinogens, shrimp, tilapia, poultry, and finally, humans—combined

with one another, and with ongoing Chinese and international concerns over technoscientific hegemony, neoliberal governance, and labor subjectivity.

Chapter 5 Dialectic *Guanxi* (Relation): Neoliberal Logics in the Campaigns for Food Safety Control

Drawing from Althuseer's concept of overdetermination, Foucault's theorization of governmentality, as well as the Chinese concept of *guanxi*, I explore the dialectic relation between state and society in contemporary China. This chapter looks into two cases in the Chinese state's food safety regulation campaign: a fish veterinary training program and a drug residue detection trip. Food safety scandals expose market's inability of self-regulation, but the marketizing state feels reluctant to intervene. I explore the contradictions in which the state attempts to step back while encouraging the creation of market forces. This will help us understand the manifestation of neoliberal logics in reform China.

Chapter 1

Getting Rich Together and Its Aftermath: The Prehistory of Agrarian Capitalism

Introduction

Aquaculture frequently is touted as the "Blue Revolution," delivering possibilities for the Third World people to acquire both income growth and affordable protein diet, under the constraints of a growing population and declining marine stocks (Bardach 1997). However, the rosy view disregards the economic inequality laden in the global food regime. Shrimp, for example, is a highly valued commodity largely produced in developing countries for consumption in regions such as the United States, Japan, and Europe (Ahmed, Allison, and Muir 2010; Goss, Burch, and Rickson 1998; Islam 2008; Stonich and Bailey 2000; Vandergeest 2007). In China, shrimp aquaculture started in the early reform era in the 1980s as a cash crop in exchange for foreign currency (Feigon 2000). Before a devastating disease epidemic wiped out most of the shrimp production in 1993, China recorded a shrimp export value to hit $269.4 million US$, grabbing 15.0 percent of the world market share in 1990 (Cai, Leung, and Hishamunda 2009).

Agriculture economists often attribute the booming of aquaculture to state's policy in the deregulation of prices and prioritization of trade, allowing the "invisible hand" to operate (Li and Huang 2005). Championing the notion of *homo economicus* that classical economists proposed to view human beings as rational actors, these scholars hail the fast development of shrimp aquaculture as the automatic outcome of the collapse of communes, simply because the rational lever of the market could spontaneously motivate the

entrepreneurial spirit of farmers. I argue that this notion of market triumphalism appears too simplistic in explaining the transition of the rural economy in China, especially as it fails to take into account the state's essential role in facilitating the birth of the "market."

The Leizhou Peninsula of Guangdong Province, which used to depend on agricultural production, witnessed the rapid development of shrimp aquaculture in the mid- 1980s and has by now become the largest shrimp production base in China. This chapter gives an overview of the debut of the shrimp aquaculture industry in south China, tracing the historical continuities and changes in three aspects, including land development, class subjectivity formation, and science popularization. Through a critique of the "invisible hand" rationale, this chapter argues that in the transition from a "planned economy" to a "market economy," the Chinese state did not retreat, but only shifted its role from "government" to "governance." The development of shrimp aquaculture did not represent a denial of the Maoist collectivization, but actually relied on the extension of the Maoist policies of seeking mutual benefit and the common good.

The Green/Blue vs. Red Revolution

Although not many people have heard of the term "Blue Revolution," it might sound less puzzling if the more well-known predecessor "Green Revolution" is brought up. At first glance, both terms seem mundane when they use color to specify the feature of the agrarian transition. This type of literary representation is known as metonymy, referring to a principle of association between the signified (object) and signifier (word). When metonymy becomes common sense, just as Washington is used as the synonym of the U.S. government, we often take this indexical relation as natural and forget to question the artificial designation between word and world. Literary critic W.J.T. Mitchell reminds us that

we are the "representational animal," *homo symbolicum* for human beings' ability to create and manipulate signs (Mitchell 1995:11)." For metonym, a "stand-for" relation is often disguised when a part stands for the whole or a part stands for another part. The colors—blue for ocean and green for land crops—that stand for agrarian development are not just a portrayal, but act as proxy. W.J.T. Mitchell posits that the formula "let this stand for that to them" is a political process that is always mediated by power relations. Thus, the relationship between the two layers of meaning of "representation," in aesthetic or semiotic representation (speaking of) and political representation (speaking for), is an important issue that unveils social and political motivations. In this regard, the implications of blue or green might be better gauged by what they are opposed to: the red.

The Green Revolution's avowal of poverty and hunger relief should be understood in the historical context of the Cold War. In the 1960s, as famines struck the newly independent countries of India, the Philippines, Indonesia, and Mexico, before scholars could weigh the balance between natural disaster or man-made distribution of inequality, the World Bank decided to launch a "Green Revolution" in the above Asian and American countries for their geographical proximity to the new-born socialist countries of China and Cuba triggered alarm to the Western bloc who feared of the spread of the peasants' insurrections that once plagued the former colonial governments. After it was decided that a Green Revolution might stave off a red revolution through technologies that bolstered yield production, by the mid 1960s, high-yield varieties (HYV) of wheat and rice were developed, largely under the auspices of the Rockefeller and Ford Foundations, to be transported to the famine-stricken countries (Shiva 1992). The differences between HYV and traditional varieties are many, but most important is the formers' dwarf size with

stronger stems that could sustain the higher yield from fertilizer application (Cullather 2003; Shiva 1992). Cultivation of HYV crops relied on inputs and machinery and thus galvanized a process of turning small farmers into entrepreneurs who learned how to take loans and manage their farm (Blair 1971). Contradictory to its claimed mission of serving the poor, the Green Revolution no doubt privileged the rural elites. Despite of massive criticism for its impact on expanding social disparity and imposing environmental destruction, Norman Borlaug, the inventor of the HYV wheat in his lab in Mexico, won the Nobel Peace Prize in 1970 (Shiva 1992). The green and red contrast mirrors a shift in the rationale of development that takes a technocratic turn in the pursuit of high-yield production, contrasting with previous decades of development discourse that was predicated on a variety of political enfranchisement and economic redistribution policies (Gupta 1998)[2]. This debate has carried on until present as the United Nations Food and Agriculture Organization (FAO) sees a split between people supporting two divergent initiatives of rural development: those who promote a market-driven approach of increased production and consumption to meet "food security" and those who advocate a "food sovereignty" movement in which farmers do not need to be control by the "invisible hand"

[2] Although the Green Revolution was launched in a way to curb the spread of communism, China was not completely excluded from the introduction of dwarf varieties from abroad, especially the import of Mexican wheat. However, the imported seeds proved unsuited to Chinese growing condition and it was not until 1974 that the hybrid variety of rice was developed by the Chinese scientist Yuan Longping. Still, the Maoist development policy advocated both collective farming as well as the development of technology, emphasizing the importance of non-material incentives, an approach vastly different from the World Bank and Ford Foundation's technical-centered initiative. See Bramall 2009. Zhu pinpoints how the commune operation assisted with tens of thousands of agricultural technical stations was instrumental for Yuan's success in developing the HYV rice. Moreover, the new technology was able to get adopted by many farmers quickly because they were already familiar with the hybridization process as they were enlisted to participate in the experiment.

but can engage in collective decision-making in choosing what they want to produce and how to produce them (Jarosz 2009).

Born a decade later in late 1970s, modern shrimp aquaculture definitely inherits the mandate of the Green Revolution that advocated a production-oriented instead of distribution-centered development policy. However, at a time when the Cold War tension was dwindling and environmental concerns were gearing up, fish farming was developed as a just-in-time solution for the neoliberal food regime that scavenged for a quality protein supply when the issue of overfishing started to arouse public concerns. Shrimp at that time was still a deluxe food item and the absence of small bone made it a favored seafood.

Modern shrimp farming started as an export-oriented businesses in Asia and Latin America in late 1970s and this pattern of division between third-world producers and first-world consumers has remained much so ever since. In early 2000s, the three major shrimp export markets were Japan, the United States of America and the European Union, jointly consuming 90 per cent of the world frozen cultured shrimp exports with the US scouring up 48 percent of the share (FAO 2009). Compared with the Green Revolution's function during the Cold War, the "Blue Revolution" of shrimp farming, embedded in the neoliberal food regime, might have less of a goal of feeding the poor, as the industry is often featured as third-world laborers farming high-valued species for first-world consumption (Stonich and Bailey 2000).

Cultured fish started to attract the interests of agro-food businesses who constantly looked for new venues of capital accumulation. However, the post-Fordist economy environment determined that aquaculture development in the U.S. could only be minimal. Constrains to aquaculture growth included "the complex and diverse nature of the industry,

conflicts with other, traditional, uses of the nation's coastal and ocean waters, environmental concerns, and the existing legal and regulatory climate all contribute to this situation (DeVoe 1999:86)." Until now, total U.S. aquaculture production amounted to about $1 billion annually, compared to world production of about $70 billion (NOAA 2010). The gap between insufficient domestic supply and growing consumption led to great deficit in seafood trade. Already in early 1990s, seafood products were the nation's largest agricultural import (DeVoe 1999).

U.S. shrimp importers first searched for supplies from their neighbors in Latin America in the 1970s. However, the supply for wild shrimp dwindled in Mexico and wild shrimp fry dependent aquaculture collapsed in Ecuador in mid 1980s. Then Asian countries and regions such as Taiwan, mainland China, and Thailand took up the role to become main suppliers of shrimp to the U.S. market. This pattern might be termed what David Harvey identifies as the "spatial fix" whereby excessive capital and labor are rerouted into the production of new spaces within which capitalist production can proceed (1990). Specifically, transnational corporations seek to move production somewhere else where cheaper labor and production cost can still be drawn from pre-capitalist economic formations.

The history of shrimp aquaculture development in China more or less followed this route, as the reform government adopted an export-oriented economic policy. In just over a decade's time, from the establishment of modern shrimp farming in late 1970s, China already became the world's biggest producer. Total shrimp output increased by over 400 times, from 450 tons in 1978 to 200,000 tons in 1991 with the average yield increased from 350kg/ha to 1,500kg/ha. The skyrocketing development of the industry has often been

touted as evidence to show the advantage of a market economy over the planned economy in pushing up economic growth (Li and Huang 2005). Moreover, aquaculture development was acclaimed for creating "specialty households" (*zhuanye hu*), farmer entrepreneurs, who excelled in the Household Responsibility System that gradually replaced the collective commune production (Jiang 1985), echoing a discourse of *homo economicus* that ascribes human beings as rational individuals and a disavowal of the Maoist idea of peasants as revolutionary subjects. For the proponents of the "reform and opening up" policy, the postsocialist world encourage farmers to become entrepreneurs who took responsibility of their own profits and losses, rendering obsolete Mao's rendition of Marx that class struggle was the main feature as well as barrier to capitalism.

In this chapter, I will demonstrate how the emergence of capitalist relations in Southeast China conceals the construction of labor as a commodity. Inspired by Jason Read's notion of "micro-political" aspect of capitalist production, the process through which capitalist logic insert itself to forge a subject amenable to capitalist production, I examine the role of the state in not only legitimizing but also cultivating an entrepreneurial ethos, while leaving aside the issue of risks. The initiative to conceptualize the materiality of subjectivity that bridges the divide between economy (base) and consciousness (superstructure), is to be found in Althusser's theorization of "immanent causality" that attends to the mutual constitution of cause and effect (Read 2003).

Fig 1.1 Location of Guangdong Province in China (Source: Wikipedia)	Fig 1.2 Location of Zhanjiang city in Guangdong Province (Source: Wikipedia)

Fig 1.3 Location of Leizhou in the city of Zhanjiang

My dissertation research was mainly conducted in the Leizhou Peninsula, administered by the city of Zhanjiang in the Province of Guangdong (Fig 1 & 2). Reputed as the "Shrimp Capital of China," Zhanjiang is the largest shrimp production base in the country with an annual production of 250,000 tons, accounting for 1/5 of the national

production. Shrimp exports were estimated to reach 68,000 tons with a value of US$450 million, taking up 31.6% and 29.2% of the national total respectively (Bureau of Foreign Trade and Economic Cooperation of Zhanjiang 2011). It is believed that for every seven pieces of shrimp circulated globally, one comes from Zhanjiang. One out of four pieces of shrimp served at the U.S. dinner table comes from Zhanjiang (Li and Cen 2010). Located on the Leizhou Peninsula, the southern tip of mainland China, the prefecture-level city (*dijishi*) of Zhanjiang has an area of 13,200 square km with a population of 7.54 million, administering three county-level cities (*xianjishi*), including of Leizhou, Wuchuan and Lianjiang, two counties of Xuwen and Suixi as well as four districts of Chikan, Xiashan, Potou, and Mazhang. [3]The whole shrimp industry employs over 1 million workers, while farming alone occupies 400,000 people. Now it is celebrated as the world's largest shrimp post larvae production base, wholesale market, processing site, as well as feed production base (Bureau of Foreign Trade and Economic Cooperation of Zhanjiang 2011).

Within county-level cities and districts that Zhanjiang administered, Leizhou is the largest shrimp production area (Fig 1.3). It was known as Haikang County before it was upgraded to a county-level city in 1994. Legend has it that in the ninth year of Kaihuang under the rule of Suiyang Emperor (569-618), the area was plagued by floods (*haihuan*) and was named Haikang, which literary means "ocean serendipity" to protect the well-

[3] The city-leading-county system dated back to the 1950s to ensure that the industrialization-oriented urban cities would have assured supplies of fruit and vegetable produced in rural (county) areas. The system was suspended after the famine in early 1960s as development policy shifted from a Soviet model stressing rapid growth of heavy industry financed by large extractions from the countryside to one that prioritized on agricultural production. See Butler 1985. During the rest of Mao's time cities were condemned as evil hotbeds of capitalist inequalities and were not supposed to guide the development of rural areas. In the early 1980s, Deng Xiaoping encouraged cities to serve as prosperity centers so as to radiate prosperity to the rural peripheries. The prefecture-level cities soon thrived to subordinate county-level cities and districts creating a hierarchical administrative structure. See Chien 2011.

being of the residents (Leizhou Local History Compilation Committee 2005:1). The peninsula is located in a tropical region with arid climate, known as "arid in nine out of ten years." Moreover, the area also suffers from frequent typhoons , thus the name "Leizhou"— "thunder prefecture "— comes from this association. Before the reform, the main staple crops cultivated in the peninsula included rice, sugar cane, peanuts, and sweet potato. In mid 1980s, the local government began to launch a policy called "Two Water Crops and One Livestock" (*liangshui yimu*)" that promoted the development of fruit (*shuiguo*), aquaculture (*shuichan*), and livestock productions.

In Leizhou, shrimp farming has a short history that could trace back to 1985 when the first shrimp pond was constructed. In 2009, the county-level city has 85,215 *mu* (5，681 ha) of shrimp farms with an output of 19,319 tons (Zhanjiang Bureau of Ocean and Fisheries 2009). The numbers seem to present a picture of remarkable achievement, but abstracting the farmers' work into numbers eclipses the ups and downs of the industry as well as the risks producers encounter. From 1985 to 1988, the Leizhou government called upon the public to excavate over 30,000 *mu* (2,000 ha) of shrimp ponds and encouraged grain farmers to become shrimp farmers. However, for various reasons that I will address below, shrimp farming failed to take off. Farmers did not express their enthusiasm until 1989, after seeing the success from the government sent-down cadres who conducted exemplary farming. Shrimp productivity doubled from 1,200 tons to 3,175 tons in just one year. The momentum extended to 1992 as farmers witnessed harvests and economic gains. From year 1989 to 1992, shrimp production earned a profit of 6.46 million yuan, paying off the loss from 1985-1988 (Haikang County "Two Water Crops and One Livestock" Office 1993). However, in 1993, a shrimp epidemic later identified as White Spot Syndrome Virus

(WSSV) disease spread to the area as well as other parts of China, and later southeast Asia, causing productivity to shrink to less than half. The national production dropped from over 200,000 tons in 1992, to only 87,000 in 1993, to a further 55,000 tons in 1994, only a quarter of the top year. Why did shrimp aquaculture in both Leizhou and China experience such a dramatic fluctuation? Why did farmers' entrepreneurial dream fail to come true?

Constructing Shrimp Ponds upon "Waste" Land

In Western Europe, the liberal economists in the late 19th century contended that the transition from feudalism to capitalism was an inevitable evolutionary process. This reductivist thought might be termed "economism," a view that "the guarantee of the adequacy of the economy to its own reproduction without the necessary implication of other factors, or elements, such as the state, ideology, law, or subjectivity (Read 2003:29)." They termed the prehistory of capitalism as "primitive accumulation" in which thrifty proto-capitalists diligently accumulated wealth and became entrepreneurs. Marx criticizes this idea by showing how the emergence of capitalism is both ideological and historical by highlighting this process as "so-called primitive accumulation" to incorporate the following processes: 1) expropriation or destruction of the previous mode of production especially through land dispossession, 2) violent legislation to establish the legitimacy of private property and control the working class, 3) normalization of class subjectivities (Read 2003:36). The triple processes of violence, law, and normalization work together to create the idea of capitalism as a mode of production that is centered on cooperation.

Useful as Marx's conceptualization in helping me think of the issue of capitalism as both an economic and ideological system, I find it hard to use it to explain the situation in southeast China, especially when the start of shrimp aquaculture was not built upon the

bloody process of land dispossession.[4] In the mid-1980s, at a time when China was believed to feature a large population with insufficient farmland and hunger still remained a major issue for many farmers, the construction of shrimp ponds did not begin by a destruction of farmland. Feigon (2000) suggests that the initiation of shrimp aquaculture in China did not experience much violence as other countries such as Bangladesh where farmers protested against turning farmland into shrimp ponds.

In Leizhou, the policy of "two water crops and one livestock" advocated the excavation of shrimp ponds in "waste" land. In July 1985, the Zhanjiang municipal government decided that "on the premise of managing well existent farmland and steadily improving the production of grain, sugar, and oil," fruit and aquaculture crops and the livestock industry should be promoted by developing in large scale "five kinds of waste resources" (*wuhuang ziyuan*), including waste hills, waste land, waste slope, waste water, and waste beach. Chen Guangbao, then the Party secretary of Haikang County, applauded the upper leaders' instruction to state that "with 405km of coastline and over 100,000 *mu* of tidal zone, Leizhou is an excellent place for developing shrimp aquaculture" (Zhang 1992:105).

[4] This is not to downplay the widespread activities of land dispossession going on in the China largely as a consequence of urban sprawl. See Li and Sato 2006, Nonini 2008, and Li & Sato 2006.

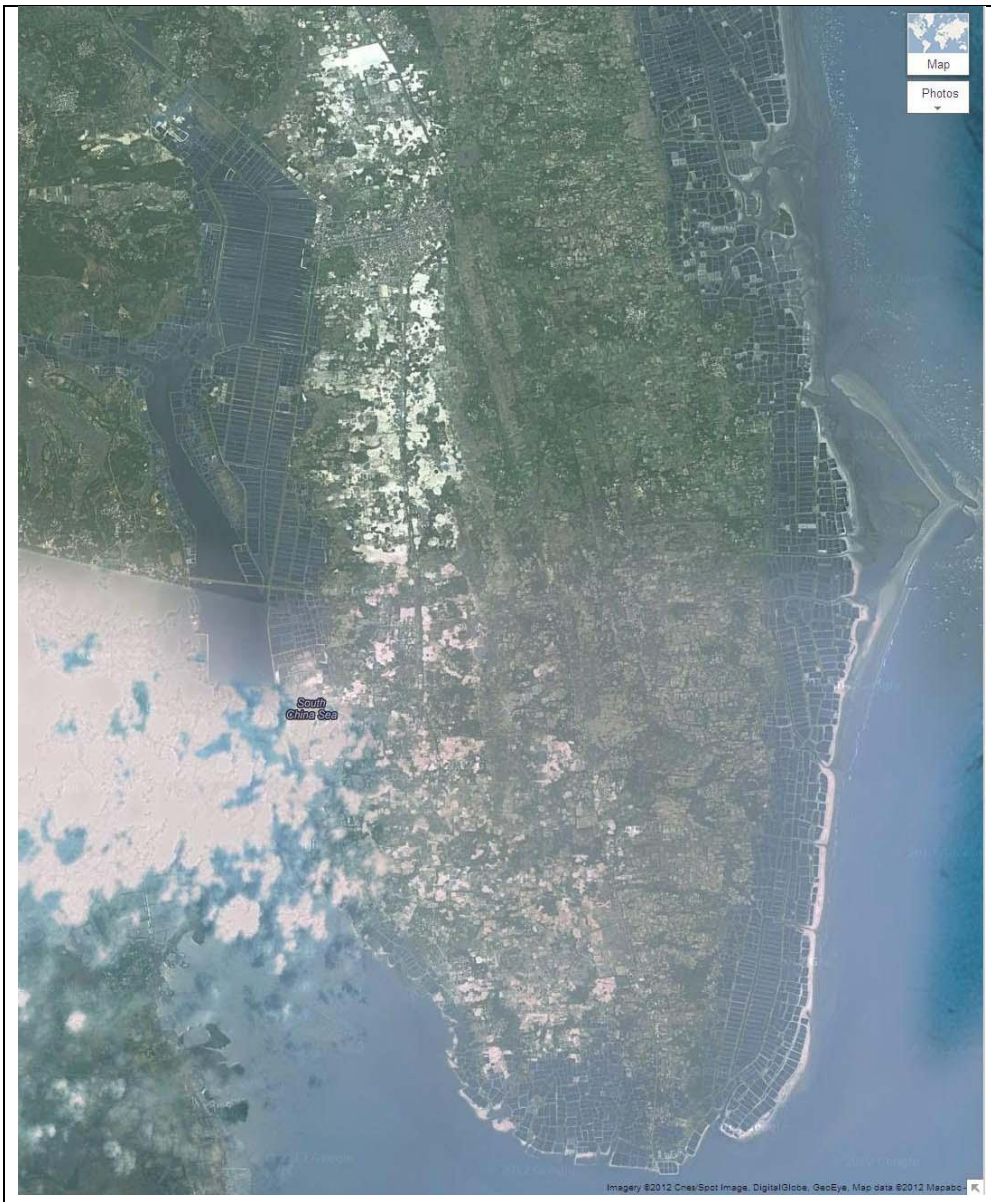

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Fig 1.4 Map of south Dongli Town with shrimp ponds lying up the coast
(Source: Google Map)

In Dongli Town (Fig 1.4), shrimp ponds constructed in the earliest phase, now called "reclamation shrimp pond" (*duhai xiatang*), came from land created during the movement of reclaiming seashore in the 1960s. Uncle Li, a retired township official, who participated in the movement in 1961, told me about his harsh experience:

"We started to build land by reclaiming seashore in winter 1961, when the "Four Cleanups

> (*siqing*)" work team came to Dongli to command work. The workload was divided and assigned to the 20 brigades. The labor was very intensive and many people could not stand it, running away. Later, they were caught and sent back to work. Some even got scolded and beaten. Three people formed a group and worked 10 days consecutively. Another group rotated afterwards. Everybody over 10 years old, men or women needed to participate. They lived at the work site. One cubic meter of soil could be exchanged for up to 1 *jin* (0.5kg) quota of rice, equivalent to 14.2 cents. If the rice ran out, people would be compensated with money to buy rice. "

Although the work was very demanding, Uncle Li was not completely opposed to it. After the reclamation project was finished, the new land was distributed to the brigade.[5] Later, a ditch was built to introduce water from the nearby Xinan Reservoir. Each brigade decided on what crop they wanted to plant, though most chose to grow sweet potato and rice. There were some areas that were too salty to grow anything, but fields with soil or field in the lower elevation had a low salinity and could grow crops. The yield was quite good. After the hybrid rice was introduced in mid-1970s, rice productivity could reach 400-500 *jin* (200-250 kgs) per *mu* (1/15 ha*)*.

However, if the land reclamation proved successful, how did the fields become "waste land" ready for shrimp pond construction? Uncle Li resolved this conundrum. In 1980, when the local government decided to remodel the dike, the officials squandered the money by changing the width from 7.5 meters to 6.5 meters. Soon a typhoon arrived and destroyed the dike. The reclaimed land was flooded and turned into a "waste beach" (*huang tan*). When the commune was dissolved in 1983, the reclaimed land was distributed to the 11 brigade-turned-village committees. However, the decollectivization made it difficult for the various village committees to cooperate, pool funds together, or mobilize people to do

[5] Collective farming started in a variety of forms from 1955 and experienced a period of experimentation during 1960 and 1963. Then collective farms took a systemic form made up with a three-tier structure comprising commune, production brigade (a group of villages), and production team (a village). The communes were initially very large during the Great Leap Forward (1958-1961) era to include around 24,000 people, but they were reduced after the famine to a more manageable size of 7,000. See Bramall 2010, pp216-217.

maintenance work. Therefore, the dike and reclaimed land retained their "waste" status until the "two water crops and one livestock" policy started to turn it into shrimp ponds.

The other case of reclamation shrimp pond happened in the Shayuan village committee where "waste" land came from a former forest. After the Korean War in 1953, Mao realized that modern warfare was dependent on steel, for tanks, canons, and artillery, rather than what he previous took pride in the "millet and rifles." Therefore, steel production was put as a prioritized issue during the Great Leap Forward (1958-1960). "Backyard furnaces" soon sprouted all over the country, even in areas where coal was unavailable. Massive deforestation was initiated to supply fuel for smelting (Shapiro 2001:82-83). Forested area between 1957 and 1964 dropped sharply, with reforestation declining from 4,355,000 to 2,911.000 hectares (Richardson 1966). Moreover, farmers were busily occupied in smelting and had to abandon farming. At the same time, exaggerated and boasted reports of record grain harvests were issued to demonstrate the superiority of communal farming (Smil 1999). All these led to the decrease of agricultural production and the subsequent Great Famine during 1959-61. After the famine, Mao launched another deforestation campaign as he claimed "to open the wilderness to plant grain (*kaihuang zhong liangshi*)." At the same time, the state initiated the "forest support for agriculture" program to promote various regimes of reforestation (FAO 1978).

The Shayuan Brigade established a tree farm in the coastal zones after the "Four Cleanups" movement in 1966. Horsetail pine was planted at first and palm trees were added later. Over 5,000 *mu* land was forested during 1966-1968 to prevent soil erosion and typhoon damage. In 1980, a massive typhoon blew over many trees, but the officials soon mobilized people to do reforestation. In 1984, the village committee passed the

reforestation assessment. However, when the local government planned to construct shrimp ponds, they designated the forested coast as "waste beach" (*huangtan*) and logged the trees. One of the retired township officials who were in charge of the forestation in the 1960s talked about his observation: "There seemed to be more rainfall when the coast was forested. After logging, it became drier." When I conducted my fieldwork in the village, I experienced several typhoons with shrimp ponds damaged and houses flooded.

The above two cases show that the fast development of shrimp aquaculture might have benefited from the resources developed during Mao's time. The prehistory of agrarian capitalism in China does not fit Marx's extrapolation of the "so-called primitive accumulation," which resorted to bloody transformation of communal land into private hand, followed by discriminatory legal system to consolidate private property, and a process of normalization that legitimated the subjectivities of capitalist and labor. In short, Marx painted a picture on how "capital comes dripping from head to foot, from every pore, with blood and dirt (Marx 1992 [1867]:926)." However, this bloody process did not feature the debut of shrimp aquaculture in China, symptomatic of the transition from the planned, commune economy to market-mediated economy. Most of the shrimp ponds were built upon land reclaimed in the 1960s. When communes were ended in early 1980s, the land ownership was still collective. However, the Household Responsibility System had just been established, and new land use rights were unclear. Local government could designate certain land as "waste" and use it at minimum cost. The debut of shrimp ponds did not initiate a privatization of property, but continued the operation of a collective economy. However, I do not want to draw the conclusion that this quasi-collective form of economy was unproblematic. The speedy development of shrimp ponds was facilitated by the lack of

environmental assessment –-a notion not within the developmentalist worldview--requirement that gave rise to several "10,000 mu" (*wanmu*) shrimp ponds in just one or two years. I will explore in Chapter 2 how a developmentalist mindset of seeking "high-yields" contributes to the disease disasters that cut short the period of prosperity.

"Reform began from the countryside" (Pun, Lu, and Zhang 2010:5). In 1978, when most Chinese farmers still worked at communes, 18 farmers at the Xiaogang Village of Fengyang County, Anhui Province signed a secret agreement to divide communally owned farmland into individual plots called household contracts. In 1980, Deng Xiaoping affirmed the Xiaogang Village contract system and decided to promote it to the whole country. The No.1 Document in 1982 officially confirmed that Household Responsibility System (HRS) in which families contracted collective land for individual management was still part of the socialist collective economy, foreshadowing the overall termination of the system of collective farming.

Agricultural economists argue that after the reform, the decollectivization of production drove up farm produce prices, pushed forward trade liberalization, and galvanized economic growth. From 1978 to 1984, grain productivity recorded an annual growth of 4.7%, with fruit, livestock, and fish increasing 7.2%, 9.1%, and 7.9% respectively. Although the growth slow slowed down after 1985, overall the pace of agriculture development exceeded the growth of population (Huang and Rozelle 2003).

Pun et al. (2010) recognize the HRS' contribution in elevating grain productivity and improving farmers' livelihood, but at the same time, they pinpoint how small-scale peasant economy featuring scattered family management (*fensan jingyi*) soon encountered growth bottleneck as farmers lacked incentives to participate in managing collective affairs such as

the maintenance of irrigation system constructed during Maoist era of collective economy. The authors offer a salient critique to the agricultural economists who celebrate market triumphalism by unveiling how the HRS also decollectivized labor production, pushing forward farmers' transition into peasant-workers (*nongmin gong*) who were to become an urban underclass. As they delineate the liminal status of peasant-workers, half rural peasant and half urban worker, who migrate to the city to work in sweatshops and back-breaking construction sites despite of the lack of land dispossession process, a pre-condition for labor migrations in many other third-world countries, Pun et al. critique the notion that the "invisible hand" automatically orchestrates the movement of labor, but alert us to see the emergence of peasants-turned-workers as a process of class subject formation.

In analyzing the rapid development of shrimp aquaculture in late 1980s, agricultural economists tend to give credit to market liberalization and considers the birth of a farmer rationality an autonomous process (Li and Huang 2005). The history of shrimp aquaculture development in the Leizhou Peninsula contests to the truth of this argument. I will demonstrate how the liberal economists' belief in rational, self-interested and autonomous actors fails to apply in southeast China, but farmers' participation in market activities was driven by the state initiative to cultivate self-enterprising subjects. However, I hesitate to say that this serves as a manifestation of the authoritarian state that suppresses grassroots agency. I would rather see it as a process of mutual interests both to the state and to the farmers.

Phase 1: Lack of "Self-Motivation" and Top-Down Development Aid (1985-1988)

Aquaculture was the first sector of agriculture to start market reforms. In 1985,

concerning the dwindling marine resources, the central government began to promote aquaculture as the key means to increase the supply of aquatic products, as they stipulated in the principle to "take aquaculture as the key, let aquaculture, fishing and processing develop together, make different emphases according to local conditions," signaling a shift in policy that prioritized the development of aquaculture over capture fisheries (Wang 2001). In May of the same year, Chen Guangbao, Haikang County secretary organized some officials and technicians to visit shrimp farms that cultured Chinese shrimp (*Penaneus chinesis*) in Liaoning and Shangdong Provinces. In an interview, he further emphasized to me that he developed shrimp aquaculture to help Leizhou people escape poverty by utilizing waste lands. After his return from the north to Leizhou, he led officials and farmers in excavating a 20-*mu* shrimp pond in Dongli Town to start cultivating native shrimp species. He picked Dongli Town as the trial site for its sandy environment favorable to shrimp growth. Moreover, the Leizhou Bay where Dongli Town was located, was home to native species of shrimp such as alcock (*Penaeus penicillatus*) and banana brown (*Penaeus merguiensis*), which were used as broodstock to produce juveniles for farming. In addition, Dongli Town was the hometown for the director of the fisheries bureau, adding convenience for management. The first trial crop turned up a yield of 101kg/*mu* with a value of over 2,000 *yuan* (Wang 1986). Therefore, the county and township governments decided immediately to develop shrimp ponds on a large scale for export. In March 1986, the Dongli Town government urged local residents to develop the first phase of "reclamation shrimp pond," turning the 2,000 *mu* of "waste" land that was used to grow rice and sweet potatoes into shrimp ponds.

However, the availability of shrimp ponds did not automatically drive farmers into

the side-line business. At a time when farmers still could not satiate their hunger, where could they find money to buy supplies for shrimp farming? By the end of the 1970s, Dongli Commune was the poorest commune in Haikang County, witnessing thousands of people fleeing for hunger every year after the Chinese New Year (Du 1985). Without capital, the "*Homo economicus*" became an illusion.

The local governments were prepared, however, when they designed a plan to issue development aid to the prospective shrimp farmers. From June 22 to June 26, 1986, a provincial meeting on aquatic production was held in Zhanjiang to make plans for promoting mariculture and overseas fishing. The meeting decided to develop 200,000 *mu* of shrimp production bases in the Leizhou Peninsula. For each *mu* of shrimp pond, the Provincial Economic and Trade Committee requested a loan from foreign banks for 1,000 *yuan* and asked farmers to pay back 75kg of shrimp in three years for repayment. At that time, one kg of shrimp was worth about 40 *yuan*, compared with only 60 *yuan* per month salary for government officials. Therefore, the Haikang county government decided to take this chance to develop shrimp aquaculture. In 1987, the county worked with the Guangdong Province Foreign Trade Development Company as well as Guangdong Province Food Import and Export Company to sign a contract to develop 47,000 *mu* of ponds to grow shrimp for export, with a total investment of 51.7 million *yuan*, including 4 million *yuan* for investment in a shrimp hatchery in Dongli Town and 47.78 million *yuan* for pond excavation.

To ensure loan repayment, the Haikang County government issued to prospective farmers the policy of "five unifications," including "unification of fund allocation, shrimp juveniles distribution, feed distribution, harvest and sales, and price," reminiscent of the

planned economy (Zhang 1992). The newly formed "two water crops and one livestock" office was responsible for the supervision of farming, while the new Shrimp Export Base Company would collect shrimp through a local freezing plant. However, as the three-year repayment term was approaching, the hope of shrimp harvest seemed vague. Farmers blamed the typhoon in 1986 that washed away their shrimp stocks, the cold front in 1987 that chilled shrimp to death, and the 1988 contraction of financial investment that severely reduced their funds to purchase supplies. The success of the trial pond in 1985 failed to expand to a large scale. One of the former officials working with the "two water crops and one livestock" complained about farmers' lack of self-motivation (*zifa xing*):

> "At that time, a lot of absurd events happened. For example, some township leaders used the shrimp loans to distribute salary and build new offices. Some of the officials were put in jail for their corruption. A lot of farmers also used the funds for miscellaneous purposes. At the beginning, we asked farmers to sign a letter of guarantee, promising that they would sell shrimp and pay us back the loan. However, many farmers had never done shrimp farming before and did not know whether that was profitable or not. They got the loan and happily used it to build their houses. Instead of using the loan to exchange for feed, they used sweet potatoes as a substitute. Later, we changed our strategy to give farmers feed instead of cash, but some farmers resold feed to others. At that time, however, it was not the case that nobody was motivated. There were some officials who wanted to do shrimp farming seriously, both to earn money and to establish their political capital (*shu zhengji*). Therefore, farmers resold their allocated feed to them. For example, if a bag of feed cost 100 yuan, farmers could resell it for 50 yuan. The law could not punish mass violators (*fa bu zezong*). When everybody did it, they were not afraid of punishment. There were other farmers who sold shrimp secretly. They should have submitted shrimp to the freezing plant, but instead, they stealthily sold shrimp to private middlemen and put the money into their own pockets. We often dispatched guards at the intersection of roads to stop farmers selling shrimp on their own. I personally acted as a guard many times. (Huang: How did you guard against so many shrimp ponds?) If they wanted to do harvest, they would make some noise through draining the pond or pulling the net. Once we heard something, we immediately set up a barrier at the main road to force farmers to sell shrimp to the freezing plant."

Another official talked about the thrill of distributing cash:

> "At that time, I was carrying a big linen bag, a big linen bag full of money, to distribute to the farmers for shrimp farming. All they needed to do was to sign the paperwork. A lot of farmers were afraid and did not care to take the cash. Some farmers who were bolder took the money away. Many people spent the money secretly without ever using it for shrimp farming."

There were some grassroots officials who were jailed for their fraudulence. One official who used to work at a village committee told me:

> "There were tens of households who wanted to participate in shrimp farming. Every household received a loan of 2,400 *yuan* for buying pumps, shrimp juveniles and feed. They were supposed to sell shrimp to the freezing plant upon harvest. The freezing plant did not give farmers cash immediately, but issued them an IOU and promised to pay farmers after all procedures were finished. I personally harvested 2,500 kg of shrimp, but received no cash. A that time some people used the loan to build houses and some sold shrimp to private *laoban* (middleman). It was considered illegal for the *laoban* to buy shrimp. Therefore, they often came by boat in the evening to collect shrimp. I didn't know where they sold shrimp to. Few farmers paid attention to shrimp farming. The technology and supplies fell short. When farmers failed to submit shrimp for loan repayment, the bank and credit union put them into confinement. I was detained for eight hours because I signed the farmers' loan application on their behalf. Until now, there are still some farmers who have not paid off the loan."

Phase II: Model-Making and Self-seeking Development (1988-1989)

Officials from county government ascribed the "failure" of the first-phase shrimp aquaculture to the peasants' lack of "self-motivation". With massive default loans in the bank, the state realized that top-down injection of development aid might not work. Instead, rural economic growth should be sustained by "self-seeking" development (*ziwo mouqiu fazhan)* in which the "enterprising" peasants were expected to take initiative to conduct business. The rhetoric of "self-*seeking* development" galvanizes a process of consciousness transformation that inculcates poor, "backward" peasants to withdraw from demanding top-down development aid, but act on their own to "discard" poverty (*woyao tuopin*) (Yan 2003).

In the second half of 1988, the "Two water crops and one livestock" Office changed their management policy from "five unifications" to "four freedoms" that allowed farmers "voluntary contract (*ziyuan chengbao*)," "freedom in choosing the mode of farming (*ziyou yangzhi*)," "flexible sales (*zizhu xiaoshou*)," and "self-determined price (*ziding jiage*)."

However, since it might not seem realistic to teach many illiterate farmers the complexity of market influx, local officials in Leizhou decided to resuscitate the socialist strategy of "model-making" to mobilize mass participation. However, officials were cautious about the risk of draining state money into private hands and decided that the exemplary role should be taken by officials instead of by local peasants. Every administrative unit, be it the Youth's League, CCP's Organization Department, or women's federation, needed to dispatch two to three "sent down" officials—usually people without any knowledge or experience of aquaculture—to build and promote "demonstration farms" (*shifan chang*) in most of the coastal villages. Therefore, the new development policy, although designed as a scheme of empowerment by overcoming the faults of top-down development aid, nevertheless re-inscribed the party's avant garde leadership that sidestepped farmers' autonomy. The subjects for "voluntary contract" excluded farmers and remained restricted to government officials only. The strategy of "freedom in choosing the mode of farming" tried to avoid the previous "one-cut" (*yidiaoqie*) policy to allow flexibility of farming shrimp, fish, or crab either in low-intensity or semi-intensity way. The funds for supplies did not come from bank loans this time, but officials in various government agents made donations to pool funds together, making "flexible sales" possible. Finally, with the obligation of selling shrimp to the freezing plant disappearing, producers could sell shrimp at "self-determined price." In 1989, the "two water crops and one livestock" office worked with various government agencies to manage 102 *mu* of shrimp farms to sell shrimp at the price of 38 *yuan* per kg, earning a profit of 280,000 *yuan*. While the "sent-down" shrimp farming officials were dispatched for different reasons from those in the 1957 Anti-Rightist Movement, the idea of changing consciousness through physical labor seemed to penetrate

the two movements. “The fact has proved that when shrimp aquaculture encountered setbacks, the government’s collective contract of shrimp ponds served not only to mobilize the masses to improve farming efficiency, but also acted as a way of changing the bureaucratic behavior to establish intimacy with the masses. A lot of the shrimp farming cadres absorbed fresh air at the forefront of production. The transformation of the objective world will help cadres to transform their subjective world, by learning knowledge and improving leadership” (Zhang 1992).

The second phase of shrimp farming development seems to feature a somewhat contradictory process in which “self-seeking development” needed to be ushered by the state. I would argue that this accusation assumes a binary divide between state and market as well as between state and society that failed to historicize the two sets of relations. Wang attributes the increase of farmers’ initiative during the period of agricultural reform, known as the Household Responsibility System (HRS), between 1978 and 1985, the very beginning phase of reform as “small farmer socialism,” emphasizing how development still preached on “the experience of traditional Chinese land distribution and the principle of equality” (2003:49). As the rural society was not incorporated into an urban-based system of market relations, farmers’ income surge created only a small discrepancy between the rich and poor. Anagnost describes how in the early years of the HRS, a moral discourse that advocated reciprocity and generosity circulated alongside with the ideological call for “liberation of the productive forces (1989:212).” These egalitarian sentiments did not arise from “essential” peasant morality, but were carefully cultivated by the party that still claimed to serve for the “common good” of the society. Many newspaper reports recounted how wealthy peasants performed “potlatch” social rituals in the name of the party to

generate a moral of sharing to "trickle down" individual success in the larger community. These publications circulated in the countryside widely to transform the images of wealthy peasants as selfless individuals, while the party "appropriates for itself the charisma of the gift" (Anagnost 1989:223). The prehistory of agrarian capitalism in Leizhou reveals how farmers remained credulous of the notion of getting rich individually and expressed lukewarm interests in farming. However, a distribution of development aid through offering cash or shrimp feed did not quite violate the mentality of collective wealth, when people saw their neighbors receiving equal shares. Later, when the "sent-down" officials conducted model-making farming, farmers began to see that the engagement into sideline business would not be considered as an exploitative activity. However, once the zest for maximizing individual interests came to manifest itself, people forgot about the importance of making common good and soon fell into disasters.

Phase III Climax (1989-1993)

Farmers were finally motivated to participate in shrimp farming after the government agents' "model-making" project. However, the momentum lasted only a few years and farmers soon suffered great losses in 1993 when a scary epidemic wiped out most of the production in China. Why did entrepreneurial farmers fail to sustain long-term success? I will explore how the "high-yield" mentality drove farmers' to encounter the bottleneck of ecology.

Starting in 1990, Black Tiger Shrimp (*P. monodon*) gradually replaced the local species of alcock and banana brown shrimp as the dominant species, thanks to the influx of Taiwanese technicians that introduced improved hatchery technologies to mainland after

the two regions established trade ties in 1988. Taiwan started shrimp farming in 1968 under the auspices of the Rockefeller Foundation and successfully accomplished artificial breeding. Although Black Tiger Shrimp is present in a large marine zone, the shallow-water shrimp broodstock in the South China Sea near the Taiwan Strait were fewer and did not perform as well as the deep-water variety in the Indian Ocean. Before the deep-water broodstocks were imported from Southeast Asia in 1975, shrimp farming was conducted in low-intensity polyculture farms. Later, the new source of deep-water broodstock supply encouraged people to increase yields. When an artificial pellet feed was developed in 1977, farming immediately turned to semi-intensive monoculture with yield 560-1000 kg/mu. The success of eyestalk removal technology in 1982 improved the frequency of seeds production, further driving up the supply of shrimp juveniles. However, a shrimp disease outbreak began to spread around the island at the end of 1987, resulting in a mortality of 70% in the origin area in the south and 40-50% in the north. While scientists identified the etiology as virus-induced, it is agreed that the pursuit of high-yield production increased stress in the pond and made shrimp vulnerable (Song, He, and Weng 2006). Afterwards, many Taiwanese technicians were invited to the mainland to help with the improvement of hatchery technology. In addition to the introduction of eyestalk removal technology, shrimp larvae pellet feed were also introduced to reduce water contamination associated with feeding soymilk and egg yolk.

After government officials finished their mobilization work, shrimp aquaculture gradually shifted from a state-directed project to a market-oriented one. Now, the state no longer issued free larvae, feed, and other supplies to farmers who were supposed to become the autonomous subjects of the market. But how did farmers have enough money

to buy the supplies? The development of the artificial pellet feed solved this problem. Previously, farmers fed shrimp natural feed of minced feed and clam meat. These materials were not expensive, but the seasonal availability of the natural feed posed an obstacle of expanding shrimp production. In early 1990s, Chinese fisheries nutritionists developed the formula for pellet feed and turned it into commercial production. At an intuitive thought, farmers might not want to switch to the more expensive pellet feed. However, the feed manufacturers thought of a method to engage farmers—by loaning the feed on credit. Farmers wrote an IOU when they got the feed and paid back the loan upon harvest. When shrimp disease did not pose a threat, the feed companies promoted this method to expand their business. Even until now, when disease has become an everyday problem, this credit mechanism is still the dominant method of payment in the Leizhou Peninsula.

Unlike industrial capitalism, agrarian capitalism does not set up a factory wall where the hierarchy between capitalist and workers is salient. When farmers enthusiastically engaged in the sideline business of shrimp aquaculture, they were named a "specialty household" (*zhuanye hu*), an entrepreneurial subject different from grain farmers. However, what they failed to see was that they were forced to be incorporated into the food chain as a kind of wage labor. The feed loan was issued to them as a credit, but the obligation to repay the loan and the inability to bargain with the feed company "proletarianized" them in a sense by forcing them to sell their labor to the food conglomerates. This process of might be called "formal subsumption," the imposition of wage labor when which the old political ties and relations are dissolved into economic form of subordination. This differentiates from the later stage of "real subsumption," in which "subjectivity is not reproduced but it made directly productive, not in the form of an abstract potentiality but in the form of knowledge,

desires, and affects" (Read 2003:10). I will explore this more advanced form of capitalistic subordination in Chapter 2 when I speculate on how the development of scientific knowledge in shrimp disease control cultivates farmers who desire to pursue "high-yields."

After farmers were motivated in early 1990s, shrimp production increased mostly by the expansion of farming areas, compared with the growth driven by pharmaceutical inputs and aeration machine in early 2000s that I discuss in Chapter 2. In 1990s, the semi-intensive mode of monoculture boosted yield to 80.1kg mu. The whole county had 14,637 *mu* of shrimp ponds, with 11,710 *mu* of semi-intensive farming and only 2,927 *mu* of low-intensity farming. More and more farmers participated, more than doubling the number of producer households from 189 in 1990 to 427 to 1991, while shrimp farming area expanded to 21,409 *mu*. Deng Xiaoping's speech on his the Southern Excursion in 1992 inaugurated another round of shrimp farming heat to witness farming households increase to 937 with an area of 43,721 *mu* (Haikang Two Water Crops and One Livestock Policy Office 1992).

Then in 1993, most of the shrimp were wiped out by a disease epidemic that the entrepreneurial farmers had not expected. I will continue this topic in Chapter 2.

Chapter 2

Contested Observations: The Science of Disease Control

The 1993 WSSV Disease Outbreak

White Spot Syndrome Virus (WSSV) disease is an acute shrimp disease that can induce 100% mortality in infected shrimp within 3-5 days (Chang, Chen, and Wang 1998). Its causative agent is WSSV, a large double-stranded DNA nimavirus (Mayo 2002) that causes the shrimp to display gross acute signs of reddish pigmentation and chronic gross signs of cuticular "white spots," on which the viral disease was named (Lightner 1999; Briggs et al. 2005). WSSV can spread to a new hosts through a variety of modes of transmission, including but not limited to reproduction (transmission from broodstocks to larvae), consumption of disease infested food, or cohabitation with diseased or latent carriers (Briggs et al. 2005). The disease was believed to first break out in Taiwan in 1988, spreading across the strait to the coast of southern China and then to northern China in 1992-1994 (Xu and Wang 2001). Later, the disease spread rapidly across Asia and eventually to the Americas first in 1996 and later with devastating losses from 1999 onwards (Flegel et al. 2005). It is estimated that total losses for this virus alone to reach US$1 billion per year since 1994 (Briggs et al. 2005; Flegel et al. 2005). In China, shrimp production reduced from 240,000 tons in 1992 to only 40,000 tons in 1994 (Song et al.

2006: 3), [6] and the disease is often referred as the 1993 WSSV disease to commemorate the severe losses in year 1993.

SPF as the Objectification of Pathogen Exclusion

While it is believed that the huge losses associated with the WSSV outbreaks were caused by the regional spread of the environmental contamination resulting from intensified Post Larvae (PL, juveniles) stocking (Wang, Cai, and Li 1997) and regional transportation of live PL of Black Tiger Shrimp (*P. monodon*) (Briggs et al. 2005), in China, many scientists and extension officials embraced a developmentalist mindset that sought to maintain high-yields unencumbered by environmental constraints. In the aftermath of the disease outbreak, instead of calling for a change in aquaculture practice that scaled back its intensity and cut off the international trading of live species, the scientists and officials ironically encouraged both practices as they considered that only the virus, and not the culture environment, to have caused WSSV disease.

The viral etiology of WSSV disease advocate methods of virus exclusion for disease control. In China, the introduction foreign species Pacific White Shrimp (*Litopenaeus vannamei*) in 1999 was hailed as the magic bullet to finally end the WSSV affliction. The Chinese aquaculture community periodized the years of the 1990s subsequent to the disease outbreaks as a periods of either "recession" (Cai and Wang 1996) or "recovery" (Xie and Yu 2007), sandwiched between the early 1990s when China topped the world in shrimp production and the following phase when the introduction of the SPF broodstocks

[6] Mai et al. state that domestic supply dropped from 200,000 tons in early 1993 to 878,000 tons at years end, and further to 639,000 in 1994 (2009: 6).

of Pacific White Shrimp boosted the country's shrimp production to historical heights and eventually regained the laurel of the world's top producer.

Dr. Lightner, a marine biologist at the University of Arizona, as well as collaborator with the Oceanic Institute (OI) at the University of Hawaii through the US Marine Shrimp Farming Program (USMSFP), is one of the founders of SPF broodstocks. He highlights the importance of "biosecurity" for disease control. "Biosecurity" is "the practice of exclusion of specific pathogens from cultured aquatic stocks in broodstock facilities, hatcheries, and farms, or from entire regions or countries for countries for the purpose of disease prevention" (Lightner 2005).

In a manual that was designed to assist small and medium scale shrimp farmers in central America recover from the attack of Hurricane Mitch in 1998, Dr. Lightner and his colleague alerted readers to the risks associated with their old practice of using wild animals. "The use of wild broodstock… leaves the farms that rely on this source of seed stock particularly vulnerable to the introduction of pathogens of concern" (Lightner and Pantoja 2001:125). By linking the notion of "wild" to "vulnerable," the two authors set the stage to bring up a parallel connection between "domestication" and "biosecurity," as they postulate "The use of only domesticated shrimp stocks that have a known history of being free of pathogens of concern can help to mitigate this risk" (Lightner and Pantoja 2001:125). Lightner and Pantoja add a graph to help readers visually understand the concept of pathogen exclusion as self-evident.

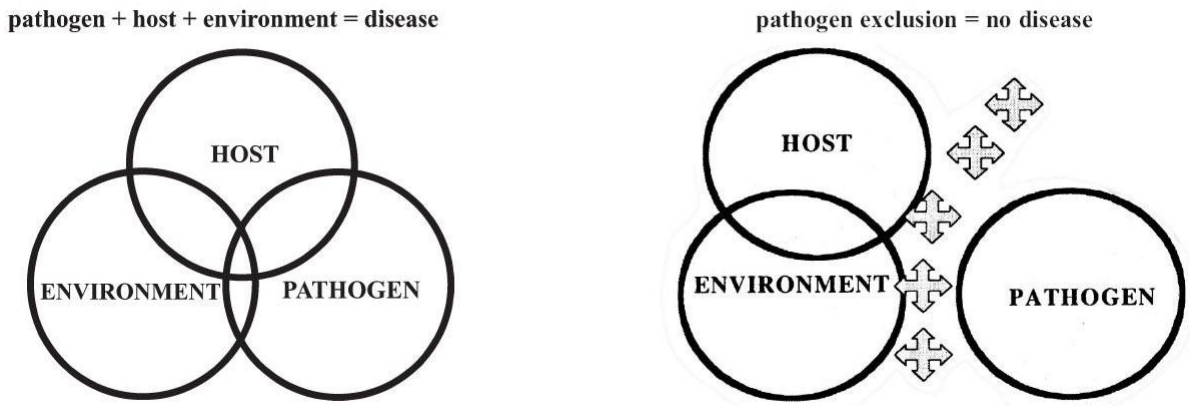

Fig 2.1 Pathogen Exclusion. Source: (Lightner and Pantoja 2001:127).

Of course, the authors are aware of the impossibility and impracticability of excluding all pathogens and they acknowledge the benefits of some pathogenic microbes such as some *Vibrio* species in forming a normal environment for shrimp. The pathogens they refer to are the "pathogens of concern" (Lightner and Pantoja 2001:124), namely the pathogens that pose a significant threat to aquaculture internationally and are placed on a list managed by the International Office of Epizootics (OIE), the administrative arm of the World Animal Health Organization. This organization, with over 50 member countries, has several goals including the reduction of pathogen spread in wild and cultured animal populations to "safeguard world trade" through improved animal health and diagnostics.

The idea of excluding specific pathogens gave rise to a product called Specific Pathogen Free (SPF) shrimp. In the late 1980s, as the increasing incidence of runt-deformity syndrome (RDS) began to threaten commercial aquaculture in America, marine biologists started to do research to develop SPF broodstock. The founder population (F0) were

introduced by Dr. Lightner from a commercial hatchery in Mexico that contained no certifiable pathogens. Then they were shipped to the biosecure lab in the Oceanic Institute (OI) at the University of Hawaii for producing SPF offspring (F1) (Wyban et al. 1992). Later, the offspring underwent numerous screening and quarantine procedures to be chosen as the candidate for SPF shrimp. Once the candidates pass another round of testing and screenings, they became the SPF F1 generation where they are transferred to a nucleus breeding center (NBC) When the SPF broodstocks leave NBC are transferred to a medium-biosecurity facility, they lose the SPF designation but will be labeled as "High Health" (HH) (Moss 2005; Lightner and Pantoja 2001; Lightner 2005; Wyban et al. 1992).

A much-cited article by Wyban et al. (1992) demonstrate the advantage of SPF broodstocks over the conventional ones as it described experiments conducted between high health postlarvae produced from high health broodstocks and non-high health regular postlarvae in nine shrimp farms located in Hawaii, South Carolina, and Texas in 1991. Most of the farms had previously experienced significant RDS problems. The author recorded better performance of high health shrimp than the control group in terms of yields, survival rate, food conversion ratio (FCR) and uniformity of size distribution. Soon many U.S. farmers started to stock the SPF shrimp and experienced tremendous profitability in 1992.

However, before they launched a plan to massively duplicate their silver bullet, they encountered a bottleneck. In less than three years, the Texas shrimp farming was largely wiped out by a new virus called Taura Syndrome Virus (TSV) that was believed to have initially appeared in Ecuador in 1991. Soon, the epizootic spread to other states, causing massive mortality. Average annual production during the Taura Era (1995-1998) fell 44

percent from the SPF Era (1992-1994), only slightly higher than the pre-SPF era that was plagued by RDS.

Were the inventors, some of the most renowned marine biologists in the world, not doing real science? I would not refute the conclusion from Wyban et al.'s experiment in 1992 that was designed to test the hypothesis whether High Health shrimp performed better than the conventional ones or vice versa. They followed standard procedures of scientific experiment to collect observable evidence to support their argument and yet fail to deal with the threat of unobservables.

The experimental method, through the production of "matters of fact," assumes the absence of human bias and thereby deploys power to yield proper knowledge, often understood as the laws of nature. Science and Technology studies can help us to understand some of the contradictions between the lab and the world. For example, Ian Hacking states: "Few things that work in the laboratory work very well in a thoroughly unmodified world—in a world which has not been bent toward the laboratory(1999:59)." While the experimental method established its authoritative position over natural philosophy in mid 17th century England, Shapin and Schaffer (1989) caution us not to take for granted the "victory" of Boyle's experimentalism over Hobbes' demonstrative philosophy, but should unveil how "facts" themselves are social productions. "[T]he matter of fact is to be seen as both an epistemological and a social category. The foundational item of experimental knowledge, and of what counted as properly grounded knowledge generally, was an artifact of communication and whatever social forms were deemed necessary to sustain and enhance communication" (Shapin and Shaffer 1989:25). Latour

(1988), following Pasteur's discovery of the microbe, reveals that heroic scientific achievements stem less from the genius of the scientist than from his mediation among diverse material and living allies. "Scientists engage in the various practices of mediation required to create representations of nature, but when the representations are complete, they humbly declare that they have done nothing but let the facts speak for themselves" (Brown 2009). As scientists demonstrate their finding as objective, devoid of any subjectivity, they fail to conceptualize the blindspot in experimentation – the inability to deal with unobservables.

The work of philosopher of archaeology Alison Wylie, can help us to see a middle path between imagining Wyban's science as either socially constructed, or simply bad and incomplete science. While acknowledging social constructionism's contribution in highlighting the importance of contextual/sociological factors in the acceptance of one hypothesis over another, Wylie posits that "(I)f science is reduced to the play of (nonrational) sociopolitical and ideological factors, growth and its successes become inexplicable" (Wylie 2002:15). She tries to promote a "middle-range theory" that bridges the gap between "the extremes of a strict deductivism" and "radical constructivism (Wylie 2002:18)." As both an archaeologist and philosopher, she unveils the limits of hypothesis testing and reductive reasoning in her elaboration on how New Archaeology strived to become a scientific discipline. In the 1970s, "New Archaeologists" insisted that their objective should be to produce not just richer, more accurate *description* of culture history and past lifeways but rather an *explanatory* understanding of the underlying structure and dynamics of cultural systems—the cultural processes—that are responsible for the forms of life and trajectories of development documented by culture historians" (Wylie 2002:3,

emphasis original). However, soon New Archaeology encountered an internal crisis as the advocates felt reluctant to embrace fully positivist tenets. While most people championed an empiricist foundation that condemned speculative reasoning, few were prepared to renounce the practice of "speculation after unobservables" or to agree that "theoretical claims must be reducible to the observables that they systematize" (Wylie 2002:4). As advocates tried to scienticize the discipline, they still debated whether "observation" necessarily yields authority or, vice versa, whether "unobservables" should be excluded from natural scientific understanding.

The Wyban et al. SPF experiment was definitely grounded in a positivist logic arguing that "meaningful ('cognitively significant') knowledge claims must be held accountable to observation" (Wylie 2002:4)." However, problems arise when they did not know how to deal with the unobservables. As other scientists later pointed out, they were not able to rule out new and hidden viruses that were not recognized as important at the time (Briggs et al. 2005).

Without a formal announcement that pathogen exclusion proved to be a wrong goal to pursue, scientists at the OI at the University of Hawaii decided to take on a completely different concept. They called their new invention "Specific Pathogen *Resistant*" or SPR. Although only one letter different from its predecessor SPF, SPR was grounded in an opposite concept. Survivors of "specific-pathogen-infected" (by pathogens like IHHNV, TSV, or WSSV) stocks were selected to develop SPR stocks. The SPR stocks were experimentally challenged with specific viruses to prove themselves to be disease resistant. After the TS outbreak, a Venezuela stock of *L. stylirostris* was found to be TSV resistant and were

selected and marketed as "Super Shrimp™" in the Americas. However, the use of Super Shrimp declined in 1999-2000 after the WSSV epizootic hit Mexico. Moreover, as TS is an RNA virus that copies itself unfaithfully, Super Shrimp could not resist the attack of a new strain of TSV that emerged later (Lightner and Pantoja 2001). Though it is based on a concept opposite to specific pathogen exclusion, the SPR option was also ruled out when it failed to reduce losses to latent pathogens.

The above examples show that if aquaculture virology endows unlimited authority to experiential observables and denies any values of unobservables, it will be vulnerable. Kuhn (1970) seeks to contextualize and historicize scientific knowledge by showing that "observations are theory-laden and richly dependent on extended networks of theoretical claims and assumptions" (Wylie 2002:6).

The bumps that SPF encountered domestically did not taint its fame as a silver bullet for the problem of shrimp disease globally. In the middle of 1990s, American scientists were fully confident that "the successes achieved with High Health shrimp in the U.S. could be duplicated elsewhere" (Wyban 2009:15). SPF shrimp started to turn into a universal concept that guaranteed success in the virus prevalent world. In a few years, with the dwindling of public funding support, the Oceanic Institute (OI) at the University of Hawaii started to patent the SPF broodstock, while venture capital flocked to the lucrative potential of biotechnology.

At a glance, the speculative characteristics of venture capital seem at odds with the positivist ground of shrimp aquaculture. However, if we look closely, we will see the rationale behind their collaboration. If venture capital is grounded in a universal concept of

profitability, the SPF will serve a monetary purpose. If venture capital considers the observable success as outweighing the unobservable risks, SPF appear to be a good investment. In 1994, Dr. James Wyban, a former scientist at OI, left academia and opened a start-up company called "High Health Aquaculture (HHA), Inc." The company's name literally reflected its operation and linkage with OI. As mentioned earlier, after the SPF shrimp left the OI NBC facility and entered into a mid-range biosecurity facility, their designation was changed to "High Health." HHA purchased the patented High Health shrimp from OI in order to market the broodstock to other parts of the world, mostly third-world aquaculture producers. Soon, other OI researchers followed suit and right now Hawaii boasts seven SPF broodstock farms (Hawaii Department of Aquaculture).

The reason for venture capital to invest in broodstock supply instead of shrimp grow-out is obvious. In 2006, the hatcheries in Zhanjiang needed to pay CNY 750 *yuan* ($100) for one pair of broodstock (about 1 kg). In contrast, farmers were selling at only CNY 60 per kg (size 17g/pc) (Yang 2006). When shrimp are sold as broodstock, their price is more than ten-fold higher than food shrimp.

The United States has been very successful in marketing SPF broodstock. In the early 1990s, Asian shrimp farmers made up more than 90 percent of total world production with the farming of predominantly the local species of Black Tiger Shrimp (*P. monodon*), while farmers in the Western Hemisphere contributed less than 10 percent of the total with the species Pacific White Shrimp (*L. vannamei*). However, since late 1990s, the introduction of the domesticated non-native SPF *L. vannamei* species to Asia gained momentum. In 2007, world shrimp production was dominated by the farming *L. vannamei* that accounted for 75

percent of the output and the non-native species became the dominant species farmed in Thailand, China and Indonesia -- the world's top three production countries (Wyban 2009).

Only when the life cycle of the shrimp was closed, meaning each step of shrimp's life was under cultivation and thus the tie to wild nature was cut off, could the idea of pathogen exclusion become imaginable. The rationale behind *L. vannamei*'s advantage over the Asian native *P. monondon* is often cited as a scientific one. Pacific White Shrimp perform better than the Black Tiger Shrimp in several respects, ranging from growth rate, stocking density, salinity tolerance, even to the desirable taste for the U.S. market (Briggs et al. 2005). Among these, one decisive element made the introduced species stand out --the special propagation factor that enabled aquaculturalists to close the life cycle of the shrimp. Different from the previous crop of Black Tiger Shrimp (*P. monodon*), Pacific White Shrimp are an "open female thelycum" species, where mating takes place after ovarian maturation, enabling them to be induced to mate and spawn easily in captivity (Briggs et al. 2005).

The virus-centered conceptualization of disease that designates the pathogen as the culprit of disease, reflects a kind of thinking about nature which resembles a battleground fought between good and evil, friends and foe. By now, this has become a normalized view for many of us as we seldom question its legitimacy in instances such as when we use hand sanitizers to wash hands or when we can buy only pasteurized milk from the grocery. Patricia Ward (2008) cautions us to unsettle the normalcy of the notion of contagion by tracing the genealogy of the term. It was not until the early 20th century when the field of bacteriology began to gain influence. She contends that science's authority did not derive so much from the esoteric lab discovery of invisible microbes in nature as from its

popularization process, via acts of social narrative (Wald 2008). The threat of bacteria did not become tangible until the concept of healthy human carrier was conceptualized and personalized in an Irish immigrant as "Typhoid Mary." The notion of the "healthy human carrier" operated through stigmatization through gender and class lines as Mary was singled out for her status as an Irish "fallen woman" immigrant threatening the integrity of the U.S. productive force. However, the more pertinent causes for the contagion – excessive speed of industrialization and urbanization contaminating the sewage systems and causing human ingestion of fecal matter—went unquestioned. Before the vogue of environmentalist movement in the 1960s and 1970s, the idea that the environment had a limit, and its destruction might be possible, would have been unfamiliar to the public health workers who, despite their selection of the city as the major space for their campaigns, directed people to view epidemiology as a social issue not so much emanating from industrializing a nation's inability to absorb its waste, but from the "population's" failed task of managing their own medical welfare.

Shrimp Growth-Out Changes

Despite the potential to serve as a universal silver bullet, SPF's status is highly contexualized. SPF is not a permanent quality but highly depends on environmental conditions. The SPF status is linked to the biosecurity conditions of the facility in which they live. If SPF shrimp are transferred into a low biosecurity facility, they are not even termed High Health shrimp, but lose their SPF status entirely. Moreover, if the SPF PL are stocked into a pond with high viral loads, substantial mortality could result (Briggs et al.

2005; Moss 2005). Therefore, scientists who considered viruses as the culprit in shrimp mortality recommended a new farming process that took pathogen exclusion as the target.

The fate of SPF shrimp in China did not differ much from its application in America. In a job retraining class for fishermen in 2006, Prof. Song, an expert of water chemistry and microbiology, developed the following chart (Table 2.1) to illustrate the future for shrimp farmers. I later confirmed with Sister Ling, director from the Leizhou Aquaculture Science and Technology Extension Center (LASTEC) that the glory of SPF shrimp lasted only 3 years from 2000-2002 before disease started to creep into the second crop of 2002. Why did SPF fail to fulfill its disease prevention potential? In the following section, I argue that as SPF was fetishized for its pathogen control ability, it motivated farmers to increase their stocking intensity, thereby leading to environmental deterioration of the pond and causing stress in shrimp.

Table 2.1 Disease Outbreak and Farming Technology Change in the Leizhou Peninsula

	2000 and before	2001	2002	2003	2004	2005
*Technology	Low-lying ponds	High-lying ponds; Aeration machine; Pharma-ceuticals		Plastic liner		
PL stocking density (10,000 pcs/mu)	3-5	6-8	6-12	10-20	15-20	12-18
Frequency of Disease outbreaks	Low	Low	Moderate	Severe	Severe	More severe
Harvest size (pcs/0.5kg)	20-30	20-30	30-40	35-60	35-60	35-60
Yield (0.5kg/mu)	800-1,000	1,000-1,200	1,000-1,500	1,000-1,500	1,000-1,500	1,000-1,500

Crop duration (days)	90-100	90-100	100-120	110-130	110-130	110-130

(* I inserted a row of technology to highlight how the introduction of new technologies changed the potential of achieving higher intensity.)

Fig 2.2 Low-lying pond for Black Tiger Shrimp farming

Fig 2.3 High-lying pond for Pacific White Shrimp Farming

In the late 1990s, before SPF shrimp became popular in the area, Chinese scientists were also conceptualizing applications of pathogen control. In 1994, Prof. Zeng Weibin from the Guangdong University of Oceanography, introduced the Thailand model of inland farming through "high-lying ponds," that were built above sea level (Luo 2010). In the past, when farming was conducted in low-lying earthen ponds at the coast, below the sea level, shrimp farmers could exchange their pond water with ocean water at each high tide. After the 1993 WSSV disease outbreak, scientists conceived of the ocean as contaminated with virus and tried to search for a way to get rid of undesirable pathogens in the pond. After the harvest of shrimp, the low-lying ponds could not be dried up, making the bottom soil disinfection difficult to clean up. Moreover, the frequent exchange of sea water often introduced the fry of shrimp, fish, and crabs from the ocean, which were considered potential carriers of bacteria (Sun 2010). However, at that time, many farmers had not

internalized the concept of "pathogen exclusion" and the adoption of "high-lying ponds" was slow.

The year 2000 was a landmark in the shrimp farming history in the Leizhou Peninsula as it witnessed the success of SPF Pacific White Shrimp juveniles in commercial production. Afterwards, Pacific White Shrimp gradually replaced Black Tiger Shrimp whose broodstock were imported from Southeast Asia, to become the dominant species within a few years.

When the hatcheries tried to market the new species to farmers, they highlighted the promise of SPF: the imported species did not carry the WSSV and thus were suitable for high-intensity farming. With the introduction of aeration machines that mix upper and bottom layers of water thereby improving the dissolved oxygen (DO) supply for the bottom-dwelling shrimp, farmers began to compete with each other to create the record of high-yield. PL stocking intensity more than doubled from 30,000-50,000 pcs/*mu* to 60,000-120,000 pcs/*mu* to see yield increasing from 800-1,000 jin (0.5kg)/*mu* to 1,000-1,500 jin/*mu*. Farmers quickly began to believe in the promise of pathogen exclusion. If the animals did not carry undesirable pathogens, and if viruses and bacteria could be cut off from soil and water through disinfection, there would not be any chances of disease. However, their enthusiasm was soon curtailed when a new round of disease outbreak loomed in at the second crop of 2002.

When I asked extension officials the cause of the disease revival, they did not question the promise of SPF, but alluded to the misconduct of the Chinese hatcheries. After the first batch of SPF shrimp was introduced from Hawaii to the Leizhou Peninsula, local

hatcheries stopped reimporting the broodstock until year 2005 and purchased the F2 (second generation of broodstock) from farmers as broodstocks. In addition to saving money and circumventing the daunting process of completing applications for importing live shrimp, hatchery owners probably did not consider one major downfall of using F2 as broodstock: inbreeding. Now the Chinese believed that it might have been a trick designed by the Americans to make them return customers to the purchase of SPF from the U.S. However, at the initial import, none of the buyers in Leizhou got a chance to visit Hawaii to see the process of SPF production, but relied on Hong Kong and Taiwanese traders to prepare import documentations for them. The Chinese hatchery owners might not expect the U.S. SPF suppliers to sell related individuals so as to preempt the importers' effort of producing SPF themselves.

From year 2000-2002, local hatcheries were no longer crippled by the limit of broodstock supply as they were in the era of Black Tiger Shrimp that relied on wild caught broodstock. In contrast, shrimp aquaculture in Southeast China expanded dramatically. From 2000 to 2003, shrimp PL production rose from only 1.8 billion pcs to 30 billion pcs (Wu 2010; Chen 2010), triggering a new shrimp farming craze. For example, in Shayuan Village in Dongli Town, the village head led farmers to convert 50 *mu* of farmland and over 40 *mu* of barren land in 2003 into an area of 100 *mu* of high-lying ponds. When the coastline was already dotted with shrimp ponds, they dug the new ponds in an area that was about half a mile away from the coast and constructed water channels to connect the tide.

The abundance of PL supply drove the price down and lured farmers to increase stocking intensity. Although the aeration machine was adopted to help alleviate oxygen deficiency, the low water level restricted farmers' ambition and ascribed as part of the cause that triggered the sporadic disease outbreaks that plagued farmers. Sister Ling introduced to me how people responded to the problems with the introduction of plastic lining:

> "Pond liners began to come to the area in 2003-2004. Director Zhang's (the former director of the LASTEC) factory made it. The idea at that time was, firstly to prevent the pathogen from the old ponds from infecting the shrimp (in the new pond), and secondly to prevent water seeping."

However, the plastic liners have both pros and cons. While it segregates pathogens, its smooth surface also works against the growth of microalgae. Sister Ling continued her description of the new technology.

> "Now, farmers do not want the pond bottom to be plastic, but cover it with a layer of sand 20-30cm. Therefore, the plastic liner only served the second purpose. They didn't see it good to have a plastic-lined bottom because there was nowhere the microalgae could attach."

"The second purpose"—prevention of water leakage—proved crucial, as we can see from Table 2.1 that farmers challenged the stocking threshold by further increasing stocking intensity from only 60,000-120,000 pcs/*mu* to 100,000-200,000 pcs/*mu* as the plastic liner miraculously enabled the water surface to rise from 1 meter to 2.5-3 meters. Prof. Song's table vividly demonstrates how the increased stocking intensity hampered shrimp growth as exemplified in the prolonged crop duration and smaller harvest size. At the same time, disease outbreak frequency changed from low in 2001, moderate in 2002, and severe to 2003.

In the same job training class in 2006, Prof. Song warned farmers not to be oblivious of environmental conditions of the pond and reducing the water depth should be the first step. Different from some professors who dozed farmers off with technical terminologies, Prof. Song always tried to use lay language to explain scientific concepts. In this class, at first, he laid out the scientific explanation. The sun can only penetrate up to 50cm depth, meaning that only the top 50cm layer of water can produce oxygen from the phytoplankton photosynthesis. The lower levels of water do not generate oxygen by itself but get oxygen as the aeration machine mixes the bottom and top water. Then he used an analogy to help farmers better conceptualize the process.

> "If your pond is only 50cm deep, that is similar to the situation that a family consists of and is supported by one person. If your water is 100cm deep, that is a family of two, one person works but the other feeds on him. If your water is 200cm deep, that is a family of four, one person works, but three don't."

The analogy clearly showed how deep water, metaphorized as a bulky, low-income family, could create a stressful environment for living. What Prof. Song just did was a process of translation, the mediation of meaning from one language to another, this time, from expert to lay language. Latour (1987) highlights that scientific ideas did not turn into a fact simply due to the genius of the scientist, but rather the building of interested allies remained crucial. "The versatility and heterogeneity of the alliances is precisely what makes it possible for the researchers to get over the quandary of the fact-builder: how to interest people and to control their behavior" (Latour 1987:143). Therefore, translation is an important skill for scientists to successfully garner support both from their peers and from the public as well. Latour clarifies the meaning of translation as follows: "In addition to its linguistic meaning (relating versions in one language to versions in another one) it

has also a geometric meaning (moving from one place to another). Translating interests means at once offering new interpretations of these interests and channeling people in different directions" (Latour 1987:117).

Choy (2011), emphasizes not only the function of "transportation" in the act of translation, but "articulation, or contingent unification across difference." He discusses an example of how translation enables the movement of knowledge and the construction of expertise. "Truth must scale down—particularize—at the same time as it scales up—universalize (2011:87)." To mobilize local people to resist the building of an incinerator in their village in Hong Kong, a Greenpeace campaigner invited an internationally renowned chemist and environment lobbyist to introduce to villagers the toxic effects of incinerations. They translated the abstract notion of mercury contamination into everyday language by describing how mercury coming out of the incinerator can become organic mercury that is attachable to another molecule before it accumulates in the seabed and enters into the food train, eventually retaining in the human body." This translation work not only informed respondents about the effects of incineration, but more importantly mobilized them into campaigns, especially in contrast to the village head of a nearby village who felt reluctant to speak against the incinerator project due to lacking data.

Environment Control, Probiotics, and Limitations

After the 1993 disease outbreak, aquaculture scientists in China, in their efforts to approach disease control, were divided up into two camps: one on disease (virus) and the other on environment (water and soil quality regulation). In Leizhou, although Prof. Song remained one of the few scientists who worked closely with farmers, academically, he

belonged to a less favored camp. I was curious and asked him why his field did not get as popular as the virological camp in an interview.

> "Huang: Now aquaculture researchers mostly focus on the virus.
>
> Prof. Song: If I make a comment on this, other people will say I am ignorant. Why does everybody want to do research on viruses? (He took a look at the fake flower bouquet on the table of the conference room.) If you randomly pick a flower, you can find viruses and can get a publication out of it. It is very easy to get publications on viruses. I feel that people who work on viruses are trying to avoid the heavy by picking the light (*bizhong jiuqing*). What does it mean? I mean they intentionally pick an easy way. If you ask them to do farming, ask them to face the farmers, they will feel it is too difficult."

While he accentuates the importance for scientists of recruiting allies in their fact-making projects, Latour defines the allies as other members of the scientific community and has been criticized for fixing the border between scientists and non-scientists too rigidly (Martin 1998). Prof. Song pinpoints an important issue. What counts as a good scientist? Is it scientific recognition by intellectual peers or is it farmers' endorsement? Prof. Song obviously inclines to the latter as he is unabashed about his lackluster publication record when he is able to build up a good reputation with farmers.

Scientific research and extension work in the field seem to be built upon two quite different ideologies. If research adopts a hypothetico-deductive model of reasoning, extension work can be viewed as inductive. Sister Ling befittingly summarized this feature of extension work as "summarizing (*zhongjie*) grassroot (*minjian*) experiences and promoting them." This inductive way of gathering knowledge is expansive and takes away the sole propriety of knowledge in the hands of academic scientists. While hypothesis testing will never confuse the proprietor of research, extension work cannot claim ownership or patterns if the goal is to popularize it as quickly as possible. While farmers might offer gratuities to extension officials and scientists to express thanks, they are never

supposed to pay a patent fee for learning ideas, methods, or technologies. Deprived of an ownership of knowledge, scientists who engage in extension work can hardly prove their expertise to the academic community. Prof. Song recognized this dilemma and described his service as "Learning from Lei Feng," a eulogistic slogan that Mao Zedong announced On March 5, 1963 in memory of a PLA youth solider who died in an accident at work, calling the nation to learn from his unselfish devotion to the party and the people. Even after Mao died in 1976, I remembered that my primary school launched campaigns calling students to do volunteer services for the school and the neighborhood, especially in the month of March, designated as the Month of Learning from Lei Feng.

As our conversation continued, Professor Song pointed out that research on shrimp viruses dramatically declined from 2003-2004. "Why? People work so many years and get no avail. It is meaningless to continue it. You see Prof. Zeng work on it for so many years and even try to treat viruses with herbal medicine. He wasted so much money, but what did he get?"

I tried to calm him down by mobilizing my limited knowledge: "Might the reason why they don't achieve anything on viruses be an issue of the biological characteristics of shrimp? Shrimp cannot generate specific antibodies and therefore make vaccine production futile."

Unsatisfied, Prof. Song continued to demystify the threat of viruses to me, "There are many diseases that should not be attributed to a virus. Let me give you an example: cold. You ask someone to sit in the sun and sweat. Then you ask that person to go inside a room and get blown by air-conditioning for two hours. Ok. He gets a cold (*ganmao*). The expert

will diagnose his symptom as caused by cold virus. Do you think this is virus? If the environment is bad, it would be odd if one does not get sick."

He continued: "shrimp farming includes no more than three aspects: organism, environment, and nutrition. Now nutrition is fine and the feeds have reached standards. The main thing is the environment, including soil, oxygen, and toxic materials. Oxygen is this (he picked up a leaf from the fake bouquet). This is the most important aspect. If this dies, shrimp cannot live."

I followed up with the tension between the virological and environmental camps of scientists and asked whether he belonged to the same camp with Prof. Lu, a famous marine microbiologist who pioneered the research of probiotics and introduced it to shrimp farming. During my fieldwork, I observed farmers regularly used probiotics that are popular for aquaculture in China, such as antagonistic bacteria (*Bacillus sp*.), photosynthetic bacteria (PSB), microorganisms for nutritional and enzymatic contribution to the digestion (lactic acid bacteria, yeast, etc.), bacteria for improving water quality (nitrifying bacteria, denitrifiers, etc) (Qi et al. 2009). Shrimp farmers know *Bacillus sp*. as "*lishengsu*," a Chinese rendition of the original Japanese term "Effective Microorganisms (EM)," which Prof. Lu coined for the Chinese farmers "for easy memorization" (*weile haoji*). In an interview, Prof. Lu revealed to me how she shifted her interests from feed nutrition to EM after the 1993 WSSV disease outbreak. As she prepared herself to launch into the new arena of disease control in aquaculture, she read some literature on how Japanese scientist, led by Dr. Teruo Higa from the Department of Agriculture Sciences at the Byukyu University, developed microbes to treat the pollution of shellfish farmed in Japan's Seto

Inland Sea after industrialization turned the body of water into an almost dead sea in the 1960s to 1970s. In addition to insights from Japan, Prof. Lu also consulted work by Chinese scientists who conducted research on cleaning up sediments in reservoirs. She could claim herself as the inventor instead of translator of *lishengsu*, because the *Bacillus sp*. she made was diluted from Chinese shrimp ponds rather as EM imports from Japan. However, tracing the trajectory of her work unveils how environmental pollution has left its footprint as it moved place and time from a nuisance "by-product" of Fordist industrialization in the 1960s and 1970s to a built-in threat that plagued the rural coast of China from the 1990s.

Prof. Lu has contributed greatly to the promotion of probiotics in shrimp aquaculture, helping science extension teams to move the focus from disease control to disease prevention. In 1998, spurred by the state's urge of "transformation of scientific and technological advancements" (*keji chengguo zhuanhuan*), Prof. Lu helped the research institute where she worked to set up a factory to produce probiotics. After the first food safety scandal in aquaculture took place when the EU banned the imports of all animal-source products because antibiotic residues from Chinese seafood were detected in 2002, the state fisheries management prioritized the regulation of drug use as a priority. Probiotics gained more popularity as a safe and environment-friendly replacement over the notorious antibiotics. Sister Ling also witnessed the subsiding interests of disease combat for shrimp farmers and the growing interests in prevention, "In the past, people used drugs crazily. They tried anything. Starting from 2004, people discovered that drugs could not solve the problem. Now they change to bottom soil improvement materials, probiotics, and immuno-enhancing nutrients."

As our conversation turned to the topic of disease control through improving the pond environment, to my surprise, Prof. Song refused to considered himself to be aligning with Prof. Lu, but problematized the essentialization of an environmental approach.

> Prof. Song: (It is good that) Prof. Lu advocates water regulation with microbes. However, her problem occurs when she tries to market her own product.
>
> Huang: But doesn't technology need a carrier? When you ask farmers to use *Bacillus sp*., they will ask you which kind.
>
> Prof. Song: Yes, that's right. You can sell your products, but you need to tell people when they can't be used. You shall not do harm to people. For example, when it is gloomy and in typhoon, (your shrimp) will die faster if you use them. She might not even know when these microbes should not be used.
>
> Huang: How could she not know if she herself has done research on them?
> Prof. Song: The lab is very different from the practical situation (*shiji qingkuang*).
> Huang: Yes. I have not seen anyone who chooses to do their research in a gloomy and rainy day.
>
> Prof. Song: You will get 100% success in the lab, but it is another situation in practical production (*shiji shengchan*).

While he considers the environmental management to be more salient than the virus-centered approach of disease control, Prof. Song refuses to view the differences between the two approaches as simply a dichotomy between a trial-and-error form of science and a research-based science, or between inductive or deductive model of confirmation. While environmental management seems to have the potential to become a more contextualized form of knowledge, it can be compromised by its own contradictions if it still disregards the unobserverbles – conditions when the products should not be used. Later, I realized that I was wrong saying that nobody chose to do research on a gloomy day when I recently found out a publication on the effect of stormy rain on the microbial groups in a shrimp pond (Hu et al. 2010). However, by omitting probiotics' "side effect" of oxygen

depletion, the research still aims to confirm the beneficial effect of probiotics rather than trying to probe its limits.

Farmers' Experience

While scientists can dismiss unobserverables like hidden virus or unfavorable weather conditions as of secondary importance, farmers do not have this luxury as they are the ones that directly bear the costs of the risks. However, we should not see farmers as passive, vulnerable subjects who succumb to new technologies helplessly. In the next section, I will recount two cases in order to analyze the complicated scenarios in which farmers' conceptualize and apply science and technology.

Seeing through the Microscope

On a summer day in 2006, in my pilot research, I went to have breakfast with my foster family, but was surprised that Uncle Sheng, my foster father had not returned home from his shrimp pond yet. The evening is usually a risky moment for shrimp as dissolved oxygen level can drop when the sunset stops the photosynthesis of phytoplankton. Since shrimp like to reside at the pond bottom, aeration machines need to be turned on to help the bottom water get more oxygen from the surface.

The village shrimp farmers have faced a set of modern and seemingly unrelated problems in trying to keep their ponds aerated, however. In recent years, opium has started to circulate in the villages and the addicts sometimes try to steal the electric cables that connect the aeration machines. Moreover, the supply of electricity is unstable and farmers also have to prepare a backup diesel power generator in case of power outages.

Many farmers build a small hut next to their shrimp ponds which they use to store shrimp feed, power generators, as well as for lodging. In this way, they protect their equipment and their shrimp.

After 8am, Uncle Sheng came home with a little bit of sadness. His shrimp PL were farmed for only 20 days and already seemed to be suffering from disease. He had just spent some time clearing the dead shrimp. I immediately went there and still saw some red, dead shrimp floating on the water. However, Uncle Sheng obviously did not plan to take action of disease treatment as he was termed a "backward" person by his son for his reluctance in learning new technologies. For example, he still considered sun bleach as better than chlorine bleach, the standardized practice recommended by experts. When I was renting his pond for my experimental shrimp farming in 2008, he tried to discourage me from adopting the textbook approach of disinfection. He said: "I never used any chemicals to clean water. My pond was bathed in the sun for three days. The sun did the best sterilization work. The tide water is living water. If you apply bleach powder, the water becomes dead as the chlorine kills all the organic matter (*shengji wu*). It is no good." Uncle Sheng seemed to forget his troubles easily. The following day, he was enthusiastic to help me gather more information on various dimensions of rural life and took me on his motorcycle to visit his friend working in a banana plantation in the adjacent town. When he was away, he asked Ming, my foster brother to apply feed for him. Ming himself was running two shrimp ponds. He got into shrimp farming much later than his father, but was learning quickly. In 2006, he was trying to learn various kinds of scientific concepts and technologies to manage his shrimp. When we returned home with two big boxes of bananas, Ming talked to Uncle Sheng about the serious situation of his shrimp, urging him to "do

something." And worse yet, my foster mother's pond also experienced some problems when the water suddenly turned red with large amount of green foam floating on top.

The next morning, Uncle Sheng took two bottles of water sample to a shrimp drug store in the township. This is a popular drug store because the technician was one of the few that had a bachelor's degree in aquaculture and could speak the local Lei dialect. He simply tested the pH value, salinity, and nitrite in the water and found the results of the two samples to be normal. I was very curious and took notes of the numbers. Afterwards, Uncle Sheng said, "It seems that you are interested in shrimp farming technologies. Let me take you to visit Uncle Cong. He has done farming for five years for 10 crops, but has never failed one. You should go to learn his technology." I was very excited.

After we got there, Uncle Cong was very nice to tell me the whole procedure of farming. He even boasted of his expertise in observing the water change only with his eyes without the need of any equipment (*yiqi*), meaning the conventional testing kits used in the drugs stores to verify pH, DO, and nitrite values, as well the microscope that reveals shrimp and water bacteria as well as microalgae conditions . At the end, to help me write a high-quality dissertation, he released his secret prescription on how to deal with the common disease known as "red-body disease" (*hongti bing*), symptoms similar to Uncle Sheng's current problem. I took good notes and returned home happily for lunch. Right after our arrival, Ming told us that the situation had deteriorated for the two ponds from which we had tested water samples this morning. Uncle Sheng started to worry now and drove his motorcycle to pick up Uncle Cong for instructions.

Uncle Cong inspected the two ponds. He diagnosed my foster mother's pond as plagued by the death of two harmful microalgae that gained dominance in the water and suppressed the growth of phytoplankton. Dinoflagellates turned the water reddish and should be eliminated with chlorine bleach. Cyanobacteria (blue-green algae) made water blue and could be wiped out by the intake of sea water. Then he started to write down a prescription, similar to the one he told me earlier today. He told Ming to get not only the chlorine bleach, but four other drugs for enhancing the growth of beneficiary microalgae, including: "Soil Cleaner with Water Disinfectant" (*jingshui xing digai*), "Oxygen Enhancer" (*zengyang ji*), photosynthetic bacteria, and "Potency for Stress Response" (*yingji ling*).

We went to the town and I suggested to Ming that he visit a drug store where I recently made the acquaintance of the technician. I greeted him as this was my third visit to this store. As we entered, Niu, the technician who recently graduated with a degree in marine biology from college and did not understand the local Lei dialect, responded to Ming's request with contempt: "I don't randomly write prescriptions here. You need to tell me the details first." Ming did not respond to him and just looked at the shelf. After a while, Ming asked again if he had "Soil Cleaner with Water Disinfectant." Niu got impatient, saying "If you don't give me the water sample, I can't prescribe the drug to you. I can't let go my responsibility." Ming then left to check with other stores. However, we inquired two more stores and the drugs were sold out. Later, we returned to Niu's store. I wanted to cool down the atmosphere and told Niu the pond condition, but he insisted on checking the water sample with his microscope. Ming still disregarded his request. Finally, as he noticed that Ming was about to leave with anger, Niu gave in: "Ok. You can buy the drugs without my prescription, but I won't guarantee that the shrimp will be saved." Ming quickly paid for the

drugs and left. On our way out, I asked him why he felt reluctant to tell Niu the pond condition or give him a water sample. Ming said that he did not want Niu's prescription, because, "They always say that their drugs are effective. However, they have not tried them in the pond and don't know the results."

Fig 2.4 Uncle Cong shared his experience with my foster family.	Fig 2.5 Niu's Drug Store

Niu's microscope acts as a "non-human delegate," what Latour defines as technologies that perform tasks that people would otherwise fulfill themselves (1992). In his effort to demonstrate the symmetrical relations between humans and things, Latour highlights the ways that human beings and technology shape each other. For example, an automatic door is the delegate of a porter, while traffic lights and speed bumps are delegates of police officers. In Niu's case, the microscope performs a delegated task that "sees" the quality of water through variables. Moreover, non-human delegates are more reliable than human delegates as the former have a "built-in-inertia" that make them operate in consistency, in contrast to the need of ongoing supervision and discipline of human beings (156). However, as Brown pinpoints, Latour's theory prevents him from

seeing instances of asymmetry, when "(t)hese technologies both magnify and transform human capacities, and they cannot be sensibly understood as performing tasks that people could otherwise do themselves" (Brown 2009). The microscope definitely exceeds the capacity of the human eyes as it adopts a microscopic view to come up with the variables of water quality. Believing in the super power of instruments to analyze water, Niu tried to abort Ming's attempt to purchase drugs without testing water sample at first.

Actually it was totally my fault to suggest Ming to buy drugs at Niu's store. I accidentally came to know Niu when I was staying with a friend at the township. On our meeting, my friend introduced me to him as a Ph.D. student who studied the environment. I further explained that I majored in humanities and social science (*wenke*) and wanted to understand how shrimp aquaculture changed rural society. He immediately sounded arrogant: "A *wenke* student definitely does not know shrimp drugs." I felt a little bit shocked, but did not want to defend myself. He continued, "for a doctoral research, this topic might seem to be superficial (*fuqian*)." I tried to suppress my anger and asked, "what kind of topic do you consider to be superficial?" He paused a minute and suggested a topic on how to reduce the nitrite accumulation in the pond.

Though feeling irritated, I told myself not to be bothered by such trivial matters. I gathered up enough courage and patience as I paid my second visit to Niu's store four days later. This time, he shifted the target of his self-conceit by stopping humiliating me but despising the farmers. "The people here have very low educational quality (*wenhua suzhi*). They only have primary school education. You see, they have the longest history of shrimp farming (in Leizhou Peninsula), but their technology is the most backward." Then he gave

an example that the nearby town of Wuyang hired many of his classmates as technicians, but here in Dongli Town, only three or five technicians have a bachelor degree. Then he started to demonstrate his expertise by spending over an hour, introducing the various types of shrimp pharmaceuticals as well as their usages all the way from pond disinfection, to water fertilization. He was well versed in the knowledge to tell me the suitable drugs ranging from increasing shrimp's appetite to herbal compounds for virus disease. At that time, I soon forgot about his earlier contempt of me as I returned home with pages of valuable fieldnotes.

Although I disagreed with Niu's contempt for farmers, I believed in his qualification and wanted to persuade Ming to go home and gather the water sample. Now in retrospect, I saw myself to be not much different from Niu. The college education has normalized the authority of institutions in generating and disseminating knowledge. For Niu, knowledge, or science, is more tied to institutional training and theories than to practice and social relations. Just freshly graduated from college, he already considered himself a more qualified veterinary than the experienced farmers. Although farmers now learn to adopt a microscopic gaze in understanding water quality, they are still perceived as lacking educational qualifications because they make judgments from their eyes but not from the microscope. He even ascribed the cause of his language barrier to the farmers' low quality—they do not speak Mandarin, the official language of China—rather than his unwillingness to learn the local dialect. For Ming and Uncle Cong, however, knowledge needs to be proved through application. The local idiom calls it "cleverness is not as good as experience (精不如经 *jing buru jing*). Niu's credential did not endow him more authority

because he lacked the practical knowledge. He had just graduated from college and had never conducted farming. As Uncle Cong boasted that he did not need to see the water from instruments, he was indicating that only the inexperienced people needed an instrument as they did not know how to see the water and shrimp conditions. While Niu believed in microscope as yielding objectivity and transcendence, "a conquering gaze from nowhere," (Haraway 1991), Ming and Uncle Cong preferred to trust their own vision built from experience. When Ming insisted that "they have not tried them in the pond and don't know the results," he was worrying about the unknown effects of drugs, in a way challenging the microscope's inability to deal with unobservables. He later became a successful feed and drug seller as he always marketed his drugs by telling farmers both the effects and side-effects. For example, he knew that lime could neutralize the acidity of the bottom soil and create a more alkaline environment favorable for shrimp growth, but the sudden and rapid change of water condition in a high-temperature day could cause stress in shrimp and lead to mortality. Disinfection might kill bacteria and virus, but too frequent application will also eliminate bacteria that help discompose toxic ingredients such as nitrite and slow down the growth rate of shrimp. His vision differs from a hyperthetico-deductive research that focuses on the observables, but is more holistic as it also speculates on the unobservables.

Although both Ming and Cong adopt similar approaches in learning, they end up differently. In summer 2008, Uncle Cong had a less fortunate experience and experienced the first case of failure when the prolonged rain led to high mortality rate in the area. In that crop, he already bought probiotics of EM and photobacteria, but did not have a chance to apply them as he waited day after day for the rain to stop. Like Prof. Song said, he knew

that he could not use the microbes to enhance the growth of microalgae which was definitely in trouble as the rain crippled their function of photosynthesis. Uncle Cong candidly told me: "I expected it (shrimp death) early. This is not an accident." Despite the potential of shrimp farming to move into an industrial mode of production with the assistance of machinery and inputs, it cannot shed its agricultural foundation. For Uncle Cong and others, agriculture means "relying on the *tian* (heaven/weather) for sustenance" (*kaotian chifan*). Like most of other shrimp farmers, he borrowed shrimp feed on credit from a feed supplier. In 2009, when he still had default loan, the supplier refused to offer feed credit to him any longer. At that time, his two sons were both enrolled in college and he had a hard time saving enough money for their tuition. In early 2009, he was busy hopping from one feed supplier to the next, trying to persuade them to loan feed to him. In comparison, Ming was doing better financially and was on his way of becoming an entrepreneur. He had realized that doing shrimp grow-out by itself could not make him a fortune. In 2007, he bought a used truck and worked as a shrimp PL middle man, distributing PL to farmers in the adjacent villages. From this work, he expanded his network and established good relations with shrimp farmers in the area. In 2008, he started to work as a feed supplier and also sold drugs. However, he did not give up shrimp grow-out, but continued his semi-farming and semi-experiment practice. He knew that if he wanted to see his clients pay back the feed loans, he would have to instruct them on how to combat disease and risks. However, although he offered some good advice to farmers, including myself in my experimental shrimp farming, the adverse weather made his business risky.

Case 2: Killing Tilapia

One day, Ming came home and fretted that he saw several tilapia in the feed tray. One week ago, he put a few small tilapia that he caught from the canal into his shrimp pond just for fun. However, he underestimated tilapia's capacity of propagation. He was worried that tilapia might compete with shrimp for feed, but the price of tilapia was too low to be worth raising. I called Sister Ling and asked for her advice. She told me to use tea seed cake (Fig 2.6), extracts from the seeds of Camellia plant that contains the toxic ingredient of saponin. The Chinese fish farmers have used it as a traditional practice to eradicate undesirable species of fish before stocking. In the 1960s, with the dwindling of supply of shrimp from trawling capture, fisheries scientists began to conceptualize ways to overcome the obstacle of shrimp farming and the control of predator fish in shrimp ponds appeared to be a major issue to reduce the high mortality of shrimp. Taiwanese researchers discovered that saponin could kill fish without injury to shrimp as shrimp demonstrated 50 times higher resistant to the toxicant than fish (Tang 1961).

Fig 2.6 Tea seed cake	Fig 2.7 Children fishing at Ming's Pond

Sister gave me the instructions for eliminating tilapia:

1) Prepare tea seed cake with the dosage of 1.5 ppm (10kg per *mu* per meter depth). Crumble the tea seed cake and soak it in fresh water for one day. Remove the tea seed cake and keep the solution.
2) Apply the solution in the morning. Drain some water from the pond to save the amount of tea seed cake.
3) Spread the solution evenly across the pond. Fish will die in two hours.
4) Remove the dead fish immediately.
5) Refill sea water into the pond.

The final two steps were important, she cautioned, to dilute the bacteria level associated with the demise of tilapia. I forwarded Sister Ling's advice to Ming, but he seemed hesitant and said the tide day just passed but he did not want to wait for another two weeks for the next tide to come. Moreover, his pond was constructed quite far away from the water canal and it was not easy to pump new water in. I thought that he might just get by and waste his feed, as he did not seem to take any action in the next couple of days.

However, on the third day, I saw many children carrying fishing rods and marching to his pond. When I arrived, there were already 5 or 6 fishing happily and their bucket was already half filled up with the small tilapia (Fig 2.7). Ming took out a seine net to sample his shrimp and found out that between the two ponds, shrimp grew faster in the pond filled with tilapia than the one that did not. “It seems that tilapia is doing a good job here. I will let the kids catch some for dinner and keep the rest here to accelerate shrimp growth,” he said with a smile. Twenty days later, he had to do an emergency harvest of shrimp. He had applied lime on a hot day and caused the microalgae to die. The surface water turned green as the microalgae was floating on it. However, this crop was not a failure at all. After catching a big basin of tilapia (Fig 2.9), Ming got 2,000 kgs shrimp and the food conversion rate (FCR) was 1:1, much better than the average rate of 1.5:1. Tilapia not only did not waste food, but increased the ratio. He explained the function of tilapia as: 1) clean up the shrimp feces and reduce the toxic contamination in the water; 2) swim and accelerate water flow, working as a natural aeration machine; 3) increase shrimp’s appetite by forcing shrimp to fight for food.

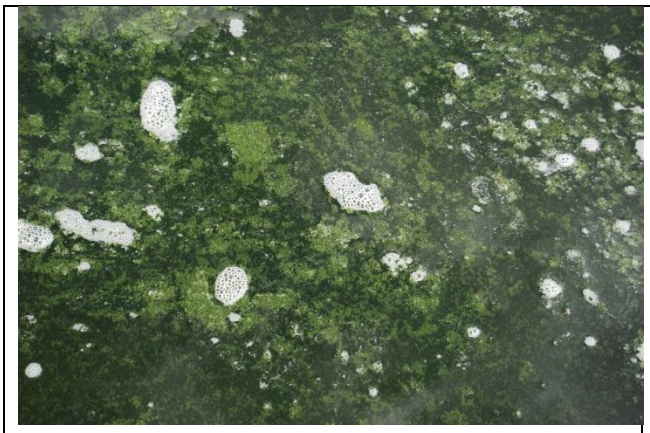	
Fig. 2.8 Microalgae dead and floating on Surface	Fig. 2.9 Tilapia harvested from Pond

Fig. 2.10 Ming's shrimp harvest

How should we analyze the difference dealing with tilapia in this case? Sister Ling insisted on killing tilapia with tea seed cake, while Ming finally adopted a "manual" method of inviting children to fish in his pond. Returning to Latour's concept of the symmetry of between human and technology in the concept of representation as delegation, saponin and the kids performed similar tasks here (Latour 1992). We might say that scientists delegate saponin to do work that human could otherwise do themselves. However, this simple explanation might commit the fault of technology determinism, when we judge things and events only based on their instrumental function. One big element is missing there. The fishing method is not only instrumental, but also social. It is conceivable due to the close relations between villagers. If shrimp farms are private properties that compete with each other, this option will not even become thinkable.

When I applied for my Human Subject Review at my university, the reviewer who held a degree in social science, was concerned with my proposal of doing experimental shrimp farming and asked if my participation would intensify competition in the area. This kind of imagination is normal, reflecting how discourse such as the "The Tragedy of the Commons" (Hardin 1968) has internalized into social science to become a common sense. The reviewer perceived Chinese shrimp farmers to be rational individuals who were always competing with each other and my entry would be similar to adding one more sheep on the common pasture, catalyzing its ever degraded condition.

In contrast, the shrimp farming community in Leizhou has not internalized either the Malthus or Hardin ideology to see the tension between each other. Human beings are not viewed as competitors, but collaborators who can share knowledge and help each other. I have not encountered one shrimp farmer who considers his or her technology as a secret and thus refuses to share it.[7] Going back to the first case in which Ming trusted Uncle Cong rather than Niu despite of the latter's possession of credentials and instruments, it clearly shows that subjective knowledge based on experienced observation worked better than objective knowledge derived from an instrumental vision. Fei Xiaotong, one of the founders of anthropology in China, refuted the charge that farmers' low literacy rate should be attributed to their foolishness (*yu*) (Fei 1992 [1947]). Instead, he directed readers to understand how oral communication of life experience was sufficient for people to communicate and memory made address books and notebooks redundant in a society of

[7] I am not saying that there is no conflict between villagers, but they lack the perception to link technology with proprietorship.

familiar faces. Although his comments seem to be essentializing the rural society a bit, we recognize the importance of social relations in transmitting knowledge.

Finally, in the control of tilapia, Ming and Sister Ling adopt different approaches that might approximate the difference between indigenous knowledge and cosmopolitan science. In the early 1990s, the term of indigenous knowledge started to enter into development discourse as a response to the issue of sustainability (Gupta 1998). "The term 'indigenous knowledge' (IK) is used synonymously with 'traditional' and 'local knowledge' to differentiate the knowledge developed by a given community from the international knowledge system, sometimes also called the 'Western' system, generated through universities, government research centres and private industry. IK refers to knowledge of indigenous peoples as well as any other defined community" (Manthias-Mundy 1993 cited in Gupta 1998). Soon scholars were enthusiastic to embrace the conservationist potential of indigenous knowledge by polarizing it with Western science. Berkes pinpoints that emphasizes unification of nature and culture as well as embeddednes in the local cultural milieu, defying the western dichotomy between mind and body, subject and object, past and present, nature and culture (Berkes 1999). Gupta reveals how this kind of essentialization is an Eurocentric idea as he argues "the act of bringing a congerie of culturally specific knowledges into the singular category "indigenous knowledge" itself grows out of the homogenizing and universalizing tendencies of Western science (Gupta 1998). Specifically, he portrays how this naming reflects both an orientalist and modernist mindset. Instead, in his ethnography on the epidemiology condition of the Green Revolution, he seeks to deconstruct the omnipotent power of Western science by identifying the "hybridity" of indigenous humoral and "scientific" explanations. "Through

mimicry and mockery, parody and protest, riots and rebellion, the 'non-quite-indigenous' and 'not-quite-modern' disrupt the complacent march of continuous progress implicit in discourses of growth and development" (Gupta 1998:233).

In the tilapia case, it is actually problematic to essentialize the difference between indigenous knowledge and western science. While the tea seed cakes have been used for many years in China's history of aquaculture, the knowledge became "scientific" after the Taiwanese scientist conducted control experiment to unveil that shrimp had a tolerance to it 50 times over fish. Afterwards, the ingredient has become a universal technology in the removal of undesirable fish in the pond (Chaicharoenpong and Petsom 2009; Song 2004). Invoking tea seed cake as a functional tool, Sister Ling advocates a universal method to eradicate a predator, while Ming's approach was more moderate and localized as he did not adopt a binary view of the zero-sum game between predator and prey. By reducing instead of eliminating tilapia, Ming believed in the ecological balance between the two species. This divergence might parallel how the use of a scarecrow was replaced by chemical pesticides when the notion of pests became a solidified category outside the sphere of crop. Raffles (2010) discusses how the outbreak of famine disasters in Niger since the 1980s is highly tied to international scientific teams' effort of pest control. The recommendation of using pesticide to kill pests reflects scientists' perception of human-pests relations as a zero sum game. However, the use of pesticide has proved not only inefficient, but actually harmful, as the "use of pesticides to control insect outbreaks has increased grasshopper populations by removing their predators" (Raffles 2010:218). Pesticide use could not wipe out pests but exacerbated the dire situation on the poor who received more pests forced onto their farm because the neighbor rich farmers used chemicals. Moreover, pesticide use

proves harmful to human beings as the chemicals contaminate the community's food chain and water supply. In contrast to the scientific view that sees nature and humans as separate entities, the Nigerians adopt a more holistic view as epitomized in Achebe's paradox: "How could these animals bring both feast and famine? How could they be harbingers of both life and death, bearers of both pleasure and pain?" (Raffles 2010:215). They control pests not by killing them with chemicals, but eating them as food and also by strategies such as delaying the planting of the first of the two annual crops of millet.

Conclusion

In this chapter, I explore how the disease outbreak helped propagate a pathological view of nature and how this geared up a blossom of technologies on disease control. One problem with the aquaculture science I examined is that its knowledge derives from vision and observations, but puts aside unobservables, thereby increasing the potential of hidden risk. Secondly, these technologies are designed to reduce the risk of disease by improving the condition of farming. However, each time a technology debuts, it often leads to more risk of disease as farmers capitalize on the technology's potential of overcoming the threshold and increase stocking intensity. I argue that the designer needs to take consideration of the users' agency and cannot only remain satisfied with the favorable results coming from controlled experiments. This might also be a blind spot for scientific research to be based only observables only. Finally, the science dissemination process does not work as a top-down sender-receiver mode of reception in which scientists create knowledge and farmers passively accept them. On the other hand, we should neither adopt another essentialist view to consider farmers as resistant to science because they value

their indigenous knowledge. I present how farmers adopt a different view of visibility and risk and hope to illuminate on possibilities that scientific research might incorporate unobservables into their investigation.

Chapter 3

The Curse of Overproduction:
Tracing the Value Flow of Labor in Agrarian Capitalism

Overproduction and "Anti-Dumping" Case

Year 2000 was a water-shed moment for shrimp farmers in south China who welcomed the end of disease disturbance since the 1993 WSSV disease attack, when the SPF Pacific White Shrimp imported from the U.S. carried the promise of a healthy shrimp production. As farmers began to improve their farming technologies by using water disinfectants, aeration machines, and probiotics, they saw yields reaching 3-5 times the level of Black Tiger Shrimp, a species that they cultured in the 1990s (see Chapter 2).

When farmers still dwelled on the joy of big harvests, they failed to see that the old sayings "more labor, more gain" (*duolao duode*) was now an anachronistic slogan although once popular during the Maoist commune era. Shrimp, as an export-oriented product, is subject to the ups and downs of international trade condition that Chinese farmers might exert little control over. In the early 2000, the three major shrimp importers, European Union (EU), the United States, and Japan were not prepared for the sudden surge of farmed shrimp supply. Japan was entering recession after the 1997 Asian financial crisis and could not absorb the increased production (Keithly and Pousel 2008). The door to EU was also closed unexpected in 2002 when EU levied a ban of shrimp imports from China –and soon to Thailand, the major shrimp exporter to the U.S. -- at the detection of antibiotic residues. The trade ban immediately forced a lot of shrimp from Asia to be redirected to the U.S. market, as the United States maintained a lower standard in antibiotic detection (Keithly

and Pousel 2008). From 2000 to 2003, exports of shrimp to the U.S. increased from 740 million pounds (product weight) to 1.1 billion pounds, or by almost 50 percent, while the Southeast U.S. deflated dockside price fell 40% from $2.10 per pound (headless, shell-on weight) to $1.26 per pound (Keithly and Pousel 2008).

Soon after the imports started to influx the U.S. market, shrimpers in eight states formed Southern Shrimp Alliance (SSA) and hired the law firm Dewey Ballentine LLP which just successfully won a case imposing tariff on imported steel from China to collect evidence that major farmed shrimp producers--China as the major target--conducted "dumping." This incident triggered my interest in studying the value flow of shrimp in the global food regime, which I recounted in the beginning of my dissertation. Anti-dumping represented an unfair trade practice as "an act of selling excess production of a certain product at a lower price in an importing country than it would otherwise be sold for in the exporting country" (Beaulieu 2006:222). The bases of anti-dumping law are drawn from Title 19 of U.S. Code as well as World Trade Organization's (WTO) deliberation in promoting free trade by reducing protectionism (Beaulieu 2006).

SSA's effort soon took effect. On December 1, 2004, the US Department of Commerce (DOC) expressed that there was a reasonable indication that the US shrimp industry is threatened by imports, alleged at less than fair value, and decided to levy a duty to six countries who was to pay an anti-dumping tax from 27.9 percent to 112.8 percent (Bhattarcharyya 2005). China received a rate ranging from 27.9% to 84.9% among named exporters found to be selling in the U.S. market at less than fair market value (except one

company that was granted exemption which I would discuss later) and from 55.2% to 112.8 percent among non-named exporters (Keithly and Pousel 2008).

Like the Florida fishermen, Chinese shrimp farmers could viscerally feel the pain of food globalization. However, unlike their cosmopolitan counterparts overseas, they are not able to understand how and why this happened. When I approached the Chinese shrimp in my pilot research in summer 2006, more than one year after the dumping tariff started to take effect, they had not heard of the unionization of U.S. shrimpers. Instead, they pointed fingers to G Group, a processing company that was exempted from the tariff penalty and took monopolized control of the market, suppressing shrimp price below the production costs.

In China, Shrimp price already started to drop after DOC announced the preliminary decision of levying antidumping duty in July 2004. One year later, when I first entered the shrimp farming area at the Leizhou Peninsula, the largest shrimp production base in China, I met many farmers who complained about the dramatic slash of shrimp prices as they knew that some problems occurred with exports. Shrimp price (40pcs/0.5kg) was as high as 70 *yuan*/kg in 2000, dropping to 32 *yuan*/kg in 2002, and to only 8 *yuan*/kg in early 2004 (Liu and Li 2004). At that time, even without counting the investment of human labor, the material cost of shrimp ranged at least 16 *yuan*/kg. Many farmers fell into debt to the feed suppliers as they used the feed on credit, but could not repay it back upon harvest.

Racialized Division of Labor

After I left the Florida shrimp docks, I was still pondering the on the question. Was it really my fanatic patriotism that prevented me from comprehending the labor activism of

the Florida shrimpers? Their unionization definitely voiced the subaltern demand not to be dictated by market laws, but it was not the fault of Chinese shrimp farmers either. As I did more research on the U.S. history, I could see that American laborers' exclusion of Chinese laborers is nothing new.

Lisa Lowe, in her book chapter entitled "The Intimacies of Four Continents," cautions us not to deem labor's national origin or citizenship as essentialized or predetermined, but pay attention to how the 'new world' of Africans, natives, and Asians in the Americas was intimately related to the rise of European modernity" (Lowe 2006). While the Chinese indentured labors were brought to the British colonies in the West Indies in 1807, they were often fantasied as a "free race" to provide a new source of labor to British's need to "suppress black slave rebellion and its desire to expand production" (ibid:194). In contrast, the Chinese were portrayed as "unfree" when they were brought to the United States, as a liminal figure, "midway between slavery and free labor, used both to define and to obscure the boundary between enslavement and freedom" (202). The allegation of Chinese coolies as remnants of slavery helped set up the 1882 Chinese Exclusion Act, which banned the import of coolies which were replaced by white immigrants from European as the urge of reconstructing a White Nation was perceived to be prominent (Jung 2006). The ambivalent figure of Chinese coolie caught between the liberal ideology and racial exclusion proves that capital's need of not just labor, but disposable labor constructed along racial lines.

A century later, the labor exclusion was reenacted in a new manner. In the 1980s, with the development of container shipment, what got shipped in the boat across the sea

were no longer laborers, but commodities directly. At the end of post-Fordist era featuring by mass consumption, Japanese automobiles swamped to the U.S. market, forcing the massive layoff of workers. In a hot summer night in 1982, a young Chinese-American called Vincent Chin was killed by two white men in a bar in Detroit. Ron Ebens, an unemployed auto worker, thought Chin was Japanese and beat him up to death with a baseball bat. After that, Ebens, along with his stepson, walked out of the bar and was later fined a mere $3,000 and three years of probation(Choy and Tajima 1988). The tragedy of the Vincent Chin case awakened the consciousness of Asian immigrants who used to purchase on the colonial legacy of racial segregation that did not believe that Chinese needed to associate with the Japanese. After the wave of Civil Rights Movement, of the 1960s the term "Asian American" was coined and a coalition formed to galvanize the solidarity of the discriminated people.

After the 1970s, a discourse of multiculturalism started to replace the hegemonic term of "melting pot" that started to circulate in early 1900s to persuade immigrants to shed their cultural background and adopt the American way of life.[8] Multiculturalism's potential to cherish ethic difference also ends up solidifying racial boundary. In the 1980s, Asian Americans were frequently portrayed by the media as "model minorities." "Model" for whom? In the processing of Othering blacks and Latinos, Asians replaced white to become the "self." The message driven by the media is that if Koreans can become successful Americans, why can't members of other minority populations? This kind of racially-motivated thinking has intensified confrontations especially in areas of poverty and limited resources. In analyzing the African Americans' rampage of Korean shops in the

[8] Henry Ford built a big pot and asked workers to walk over it upon their graduation from the English training class. See Freese 2008.

L.A. riot in 1992, filmmaker Dai Sil Kim-Gibson (2002) asked the audience to pause if they wanted to champion the black people's subaltern martyrdom in response to the unjust treatment of Rodney King, but recognized how a discourse of multiculturalism helped maintain ethic separations of the city and prevent collective efforts to redress economic exploitation.

If the above cases reveal how race is motivated as the ground for labor exclusion, U.S. shrimpers' resistance against Chinese shrimp farming might reflect new factors in the age of neoliberalism. With the development of ocean container shipping, it is now more economical to ship commodities instead of human laborers from the Third World to the First World. The SSA framed their action as an act of nationalism. "We cannot become a disposable ground given to third-world countries, "said Eddie Gordon, president of SSA. By reducing farmed shrimp as a purely "third-world" product, he inscribed a spirit of nationalism to mobilize public support. This allegation of third-world doing harm to first-world was soon challenged as the U.S. Soybean Association urged the public not to boycott farmed shrimp which use pellet feed with soy imports from the U.S. Soon after the SSA filed the anti-dumping petition, Thailand threatened to ban soybean imports from the U.S. SSA then angrily charged Thailand's reaction as "economic terrorism," hoping to appeal to the public emotionally by shouting the word "terrorism" in the post-911 climate.

Powerful Losers and Weak Winners

Shrimpers' ability to organize and act could not materialize without their great economic power. During my fieldwork, Nancy (pseudonym), one of the SSA officials attributed shrimpers' success in unionization to their big investment (Fig 3.1 & 3.2). In

2003, a new boat cost about $160,000 with annual insurance $24,000, prohibiting small shrimpers to resume their career if their old boats were sunken. I was invited to go on board to see a new boat 86-foot in length with upscale furniture, a GPS device for tracking shrimp movement, and mechanized trawl net operation. The captain hired only 3 crew in this boat. They went out 70 miles to the federal water at the Gulf of Mexico and stayed for 17-25 days in a trip, catching on average 5,000 lbs (50 boxes) of shrimp per trip. The mechanization of trawlers accrues high expenses. Haby, et al. (2000) finds in his study that between 1986 and 1997, every $1.00 of gross revenue generated incurred a cost of $0.98. Among the costs, fuel, maintenance, and insurance were the three largest cost items confronting vessel operators in the Gulf of Mexico (Ward, Jr., and Griffin 1995).

Fig 3.1 Shrimp trawlers in a port in the Gulf coast of Florida

Fig 3.2 Shrimpers unloading shrimp to a fish house in Florida.

Rather than seeing shrimpers' activism as derived automatically from their working-class identity, Nancy complained how hard it was to get fishermen together, because they are self-centered and could not accept others easily. Their independent "nature" was part of the reason for commercial fishermen to lose in a battle with recreational fishermen in the "net ban" in 1994 when an amendment to the Florida

constitution was approved by voter referendum to prohibit the use of gill nets. The key issue in the debate was the protection of mullet, which were almost entirely a commercial fish but which also played an important role in the fisheries food chain for recreational fishermen. Before the referendum, recreation fishermen launched extravagant TV commercials and pamphlets to show the public how gill nets killed sea turtles and other marine species, portraying commercial fishermen as merciless destroyers of natural resources. Commercial fishermen could identify how recreational fishermen manipulated the "science" as they maintained that the mullet was not overfished and gill nets could not kill turtles. They criticized recreational fishermen for using environmental protection as a ploy to maneuver the public but in fact trying to grab Florida's marine resources for themselves and for the lucrative sport fishing industry (Barnes 1995; Salz 1998). However, the power imbalance between the two groups finally saw the passing of a net ban that forced a lot of commercial fishermen out of business (Smith et al. 2003).[9] Later, when I interviewed an activist who worked at Organized Fishermen of Florida (OFF), an organization that represented the commercial fishermen in the anti-net-ban campaign, she complained about the independent nature of fishermen who "just like to fish." The unsatisfactory participation of fishermen in OFF might affect her regret in failing to accept the help from a local law firm that charged $300,000 for lobbying. The "weak" small-scaled inshore mullet fishermen who lost in the net ban represent a dire contrast with the powerful large-scaled offshore shrimpers who were able to pay over $3 million in lawsuit

[9] Research conducted upon 44 commercial fishing families with children in 1997-98 revealed that the percentage of fishers fishing full-time dropped from 90 percent at 1991-1993 to 70 percent in 1997-1998, while family income from fishing declined from 80 percent to 55 percent (Adams, Jacob and Smith 1999).

fees in the anti-dumping case, problematizing the notion that "working-class" represents a homogenous and ideal group.

Unlike the labor activism in the 1960s and 1970s in which workers took on "illegal" acts of strikes or refusal of work, U.S. shrimpers launched their resistance exactly through the power of law in defense of the market. By charging the third-world countries "dumping," SSA valorized the notion of free market that was not supposed to be interfered by the state. This discourse of "free trade" echoes WTO's assumption that competition creates a level playing field where only the strongest survive, thus producing a stronger global economy (Beaulieu 2006). In the petition, China and Vietnam became the two countries that fared worst as their communist legacy put them as "non-market" economies where government manipulated prices and controlled costs. Therefore, the information provided by these countries was considered unreliable and a surrogate country needed to be selected to develop constructed value indices. For China, the USDOC used India to determine the dumping margin, the difference between the normal value and the price sold in the United States. For Vietnam, it was Bangladesh (Keithly and Pousel 2008:471). The SSA's "anti-dumping" petition became an act of safeguarding the sacredness of the market, as Eddie Gordon, president of SSA said thank you to the USDOC after they announced the final ruling on China and Vietnam in late 2004. **"**The United States is the most open market for shrimp in the world, but we cannot let Chinese and Vietnamese shrimpers violate the rules of free trade to get ahead of their competition (Southern Shrimp Alliance 2004)."

Therefore, U.S. fishermen's confrontation with Chinese can be understood as what Kabeer (2002) calls labor exclusion between powerful losers and weak winners. She

criticizes the conventional framework of improving working conditions through imposing universal labor standards and reveals that how such a scheme ends up enhancing the power imbalance between the powerful western workers and the weak third world counterparts. The anti-dumping tariff is considered to offset the government subsidy by bringing the price up to their fair value, thus imposing a universal price on commodity, similarly to Kabeer's case of enacting universal labor standards.

The limitation of law in creating equality is questioned by Marx (2000) in his essay entitled "On the Jewish Question," as he shows how the avenues of law actually jeopardizes the terrain of protecting rights, responding to Bruno Bauer's contemplation on what was the way to help the minority Jews obtain freedom when they were oppressed by the Christian majorities in Germany. Bauer drafted the solution for the emancipation of Jews as the secularization of the Christian state. However, in analyzing the example of the French Revolution and the American Revolution, Marx reveals that in the former, the replacement of theological state by political state did not free the Jew as the constitutionalism retained the appearance of a state religion. In the case of North American states, the secularization of the state did not bring emancipation either as religious prejudice switched to the private domain. Marx thus pinpoints the limitation of political emancipation as that "a state can liberate itself from a limitation without man himself being truly free of it and the state can be a free state without man himself being a free man" (Marx 2000:51). The simple act of passing a law to abolish the religious state could not end discrimination, if economic inequality continued to be encouraged. The limitation of law emerges exactly because political right is grounded upon the right of man to private property as in the division between political state and civil society. The perfected political citizen enjoying freedom is

just an idealist facade when the civil individual become egoistic and independent, immersed in the economic war of all against all and lost his communal, species-being. In a similar vein, the passing of the anti-dumping law has a limited effect improving the living of U.S. fishermen, as countries that are not included in the petition expanded their imports to drive U.S. imports up to the pre-filling level in 2006. Although Florida shrimpers could happily enjoy the fruit from the Byrd Amendment that let them share the anti-dumping tax revenues, they soon received a recommendation issued from NOAA, the official fisheries management, to eliminate overcapacity by substantially reducing the number of vessels (Kirkley et al. 2006).[10] By upholding the legitimacy of the market as a level playing field, U.S. fishermen cannot stop the Sisyphus rock that forever drags them down, as they see their labor value depreciated with the increase of productivity, the capitalist law of labor value.

"The Treadmill Effect"

Although SSA claimed their anti-dumping petition as a legitimate act of defending the market, the shrimpers I interviewed acknowledged that it was exactly the free market that induced their plight. Actually, the world development of shrimp aquaculture started as a response to the concern of dwindling marine resources (Tang 1961; Stonich and Bailey 2000). U.S. shrimp importers first searched for supplies from their neighbors in Latin America in the 1970s. However, the supply for wild shrimp dwindled in Mexico and wild shrimp fry dependent aquaculture collapsed in Ecuador in the mid 1980s. Since the 1990s, Asian countries took up the role to become main suppliers of shrimp to the U.S. market. While U.S. shrimp harvest maintained a steady level of about 160 million *lbs*, farmed

[10] The Gulf of Mexico was required to remove 875 out of the total 2,159 vessels. The total cost of reducing overcapacity for the U.S. shrimp fleet was estimated to equal approximately $1.0 billion.

shrimp imports exploded since late 1990s to account for 85 percent of total consumption in 2003. Farmed shrimp's marginalization of captured wild shrimp epitomized the conflict between machine and hand looms in the 19th century, as Marx observed:

> "The introduction of power looms in England, for example, probably reduced by one half the labour required to transform a given quantity of yarn into woven fabric. The English hand-loom weaver in fact needed the same amount of labour-time as before to effect this transformation; but the product of his individual hour of labour now only represented half of a social labour-hour, and consequently fell to one half its former value" (Marx 1976 [1867]:129) .

The example did not aim to valorize the supremacy of power looms over hand looms, but unveiled how the improvement of technology worked against the interests of those who produced slower.

Marx proposes his "scientific discovery" of capitalism that the measure of value is the socially necessary labor time expenditure. Socially necessary abstract labor time (SNALT) is the average time required to produce a commodity under normal conditions. Marx observes the dialectic tendency of the SNALT:

> "The law of the determination of value by labour-time makes itself felt to the individual capitalist who applies the new method of production by compelling him to sell his goods under their social value; this same law, acting as a coercive law of competition, forces his competitors to adopt the new method. The general rate of surplus-value is therefore ultimately affected by the whole process only when the increase in the productivity of labour has seized upon those branches of production and cheapened those commodities that contribute towards the necessary means of subsistence, and are therefore elements of the value of labour-power (Marx 1976 [1867]:436)."

Sociologist Moishe Postone call this dialectic relation between labor and time the "treadmill effect" (1993:289). The introduction of new technology leads to a short-term increase in value. However, once the increases in productivity become socially general, the amount of value produced per unit time falls back to its original "base level." Producers who have not adopted new technologies are compelled to do so. This explains why U.S.

shrimpers were "dragged" into the treadmill as well as why Chinese shrimp farmers always sought to pursue high-yields.

While the magnitude of value of a certain commodity is given by the SNALT, since this commodity needs to be continuously produced, its value magnitude necessarily refers to a given period of time required to produce it on one side and to the ability of a worker to reproduce it the next day. The real wage corresponding to the value of labor power must be such as to secure the normal production and reproduction of labor power. Therefore, the different wages between the U.S. and Chinese workers reside not so much in the technology of producing shrimp, but in the condition of the reproduction of labor power. In the following section, I would shift the focus of my analysis to the Chinese shrimp farmers, going back to the aftermath of the anti-dumping lawsuit that saw shrimp price falling below the production costs even discounting any labor value. Why are shrimp farmers manipulated by the G Group? Under circumstances where land dispossession rarely takes place and a wage labor is missing, how are farmers constituted as labors for capital exploitation? By doing an analysis of the class stratification in agrarian capitalism in reform China, I hope to be able to shed light on the process of surplus value appropriation and seek ways of resistance.

The Issue of Class in the Agrarian China

Nowadays, the word "class" seems anachronistic and can hardly be found in mainstream discourse. One remarkable change in state subject identity since the reform era starting late 1970s is the shift from "class" (*jieji*) to "social strata" (*jiecen*) (Anagnost 2008). After the Cultural Revolution, class was repudiated as an inappropriate category

both for its unpleasing political connotation associated with sectoral fighting (Wortzel 1987:115) and for its ultraleft equalitarian ideology that deprived peasants of enterprising spirit (Anagnost 1989). The new language of "social strata" is a depoliticized one as it seeks to dislodge social inequality from an economic basis, but relegates poverty to the individualized domain of human capital.

The 1989 movement known as the "Tiananmen Incident" might be last political event which scholars still wanted to wrench a class analysis from. Wang Hui (2006) calls this event the landmark of neoliberalism's encroachment in China. In his seminal work entitled "China's New Order: Society, Politics, and Economy in Transition," Wang criticizes against a simple characterization of this movement as anti-democracy, but argues for a reinterpretation of the definition of democracy that deviates from the Cold War perspective which posits a binary between market and authoritarianism. He shows how the movement itself represented different social classes' protest to special interests groups, plutocrats, and the elites, but the state's use of violence actually dissolved the popular resistance and legitimated social inequality. The aftermath of the movement actually legitimated the sprawl of market economy in China as neoliberalism colluded with forces of neo-authoritarianism and neo-conservatism. Wang is more concerned with how urban reform starting in 1984 legitimated social stratification and reflects on intellectuals' failure to constitute a critical force for society, but his analysis on rural society remains marginal. Resnick and Wolff (1990) also remain unsatisfied that a Marxian class analysis is absent in the movement, as they unveil how the party and state were caught in the dilemma of upholding a communist process towards class equality and nonclass initiative that encourages social disparity. Despite of their insistence on how class analysis might be

essential in understanding social change in China, the two works have not paid sufficient attention to the class changes in rural areas, where the majority of Chinese population reside and where economic marginalization is most poignant. They argue that the class confrontation at the dawn of the movement erupted as a change away from communism not to a change to capitalist class structures, but to an "ancient" one in Marx term, because the newly emergent businesses were predominantly individual self-employed production deprived of exploitative employment relations. While Resnick and Wolff's critique carries the possibility of helping readers understand the marginalized condition of the small farmers, their labeling of the "ancient" class struggle does little to illuminate the condition of Chinese labors in the global market.

In this section, I would like to adopt a dialectical analysis of the family farm production of shrimp in south China, revealing how examination of exploitation should not be limited to whether farmers employ workers or not, but to analyzing farmers' position in the global food regime that secretly sucks the surplus value from them. Drawing on Althusser's notion of "overdetermination" and Balibar's "mode of production," I look at family and village as overdetermined sites where pre-capitalist and capitalist modes of production work together to conceal the issue of exploitation.

To eschew a reductionist interpretation of Marxism, Althusser (2005[1965]) argues that the contradiction between the economic base (force of production and relations of production) and superstructure (the State and all legal, political, and ideological forms) is "overdetermined," rather than one leading another automatically (See Chapter 5). Balibar (2009)further expands Althusser's concept by dislodging it from a Eurocentric mooring as

he proposes to theorize various economic formations as "mode of production" instead of periodization. This dialectic way of conceptualizing base and superstructure can help us discern the complex mode of production in reform China that seems to eerily blend elements of pre-capitalist relations and post-Fordist capital together.

Agrarian Capitalism

In Capital I, Marx delineates the law of industrial capitalist accumulation as the dialectic contradiction between capital and labor. Capital's desire for surplus value, known as the valorization process is achieved through two means: the production of absolution surplus-value through the extension of surplus labor time and the increase of productivity by reducing necessary labor time. With the workers' protest in mid-19th century, the length of the working day could not be extended vociferously and thus triggered capital to accelerate the development of science and technology to improve efficiency to extract relative surplus value, arising from "curtailment of the necessary labour-time, and from the corresponding alternation in the respective lengths of the two components of the working day" (432). The growth of industrial capitalism started from manufacture, which operates as a dual process by combining multiple handicrafts together but dividing up labor into partial operations. Then comes the development of machinery to standard and speed up production of manual labor, resulting in the incorporation of women and children into the labor force, the prolongation of the working day, and intensification of labour (517-543). The "mechanical monster" acted as an external force that confronted the worker, by extraction of his surplus value, by speeding up the worn out of labor power, and by producing a redundant industrial reserve army. Moreover, "(t)he separation of the

intellectual faculties of the production process from manual labour, and the transformation of those faculties into powers exercised by capital over labour, is, as we have already shown, finally completed by large-scale industry erected on the foundation of machinery" (548-549). The increasing accumulation and centralization forge an accelerated diminution of the capital's variable component, as compared with its constant one, manifested as the contradiction in which "the absolute increase of capital is not accompanied by a corresponding rise in the general demand for labour" (793). From the standpoint of labor, Marx's apocalyptic statement reveals a picture in which the workers work harder and harder to find themselves more and more redundant.

Despite of Marx's dialectic approach delineating the law as well as the crisis of industrial capitalism, he nevertheless depicts a somewhat simplistic picture of the development of capitalist production as moving towards a linear process of increased productivity, scale, and centralization. Moreover, due to his focus on industrial capitalism, Marx does not elaborated extensively the mechanism under agrarian capitalism, which he finds importance as setting up the precondition of capitalism through what he terms "primitive accumulation." Part Eight "So-called Primitive Accumulation" further reveals how the necessary conditions of capitalist production—availability of considerable masses of capital and labour-power—were realized through "extra-economic" means of violence, coercion, and law, different from the economic means of surplus extraction through abstraction.

To counter the argument that agriculture remains only a transitory stage to be displace by industry in two stages—by the industrial revolution in late nineteen century,

and as a result of the rise of agribusiness system in the mid-twentieth century, scholars have called for the need to, firstly, look closely the contradiction of and resistance to agrarian capitalism (Bernstein 2010; Friedman 1993; Magdoff, Foster, and Buttel 2000; McMichael 2009), secondly, pay attention to the transition of agrarian societies in non-Western settings to counter the notion of city-centered capitalism (Lin 1997; Patel 2006; Shiva 1992).

Bernstein takes up the notion of "uneven development of capitalism" and pinpoints that capitalist agriculture does not follow the path of industrial capitalism that moves towards centralization as small capital merge to form large corporations, but ensures the persistence of family farmers (Bernstein 2010). This is mainly due to the different technical conditions of agriculture production from industrial manufacture, posting "obstacles" to the capitalist investment in farming. From the aspect of production, farming promises less guarantee of profit than manufacturing as the former has to deal with the uncertain natural environments and ecological process, while the latter transforms materials already appropriated from nature. Moreover, under industrial production, production time equals labor time and the extraction of surplus value/time can be realized through the control of production time. In contrast, for farming, production time lasts longer than labor time as labor intensification cannot necessarily speed up the natural growth cycle of plants and animals. Modern capitalist agriculture tries to overcome these obstacles by bringing agriculture more in line with industrial manufacturing through changing the environment and organism for improvement of productivity.

Capital's desire to exert dogmatic control of production might explain why agrarian capitalism prefers to invest in upstream –conditions that facilitate production such as supply of inputs and markets for land, labor, and credit--- and downstream (marketing, processing, and distribution) of farming, than in farming itself.

In China, the degree of capitalization is currently very high in terms of the production of shrimp feed and shrimp processing in that the industries are monopolized by a few conglomerates that marginalize small business. For example, the shrimp feed industry is largely controlled by three manufacturers, while one single processor now gobbles up about 45% of exports to the United States. The attached figure I made reveals the sandwiched condition of Chinese shrimp farmers.

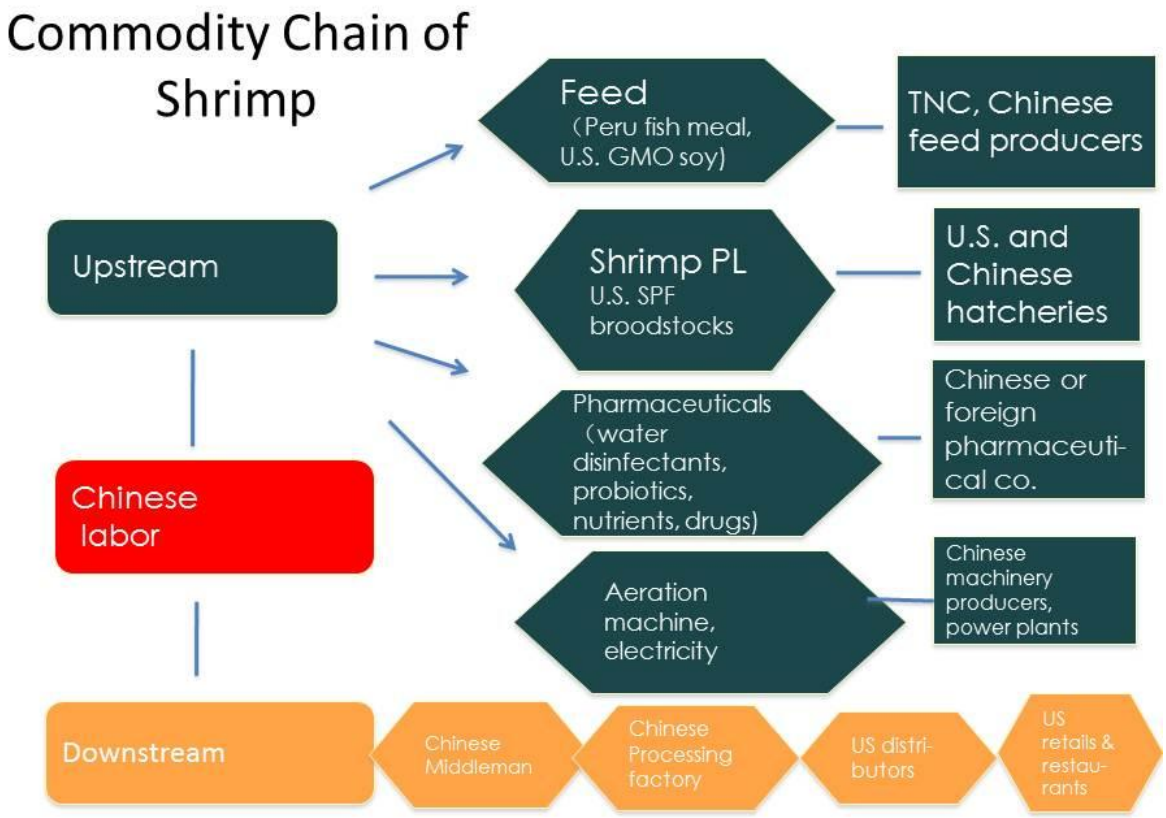

Fig 3.3 Commodity Chain of Shrimp

Dialectics of Family Farms

The development of shrimp aquaculture in China echoes many of the features that Bernstein illuminates. Right now, after about thirty years of development in shrimp aquaculture, most of the shrimp farms in the Leizhou Peninsula are small (less than 1 hectare) and family-operated. The history of U.S. agriculture which moved towards more and more mechanization and scale expansion did not happen here. After the dissolution of communes in mid-1980s, land was redistributed back to the brigade-turned administrative village (*xinzheng cun*) and natural village (*ziran chun*) used to be called production team. In

the Shayuan Village where I conducted my fieldwork, the natural village has a population of 826 with 168 households with only about 200 people working outside. Ninety percent of the population share the same last name, meaning most of the villagers are related. The village owes 268 (*mu*, 1 hectare=15 *mu*) shrimp farm, divided into 174.3 *mu* low-lying shrimp farm and 93.3 *mu* high-lying farm. The average size of the 29 low-lying farm is 6 mu, while that of the 16 high-lying farm is 5.49 mu. The farms have always been rented mostly to villagers or occasionally farmers from nearby villages for a term of three years. During 2006-2008, the average rent was 2,000 *yuan*/*mu* (1 US$=7 *yuan*) and the village gathered an income of 878,711 *yuan*, of which 367,600 were redistributed as cash to individual village members while the remaining funds were allocated for village administration, road construction, shrimp farm sluice gate maintenance, ethic opera performance, legal litigation and cooperative health insurance. The collective ownership as well as the short-term lease might play an important role discouraging urban investors to take over the farms and turn farmers as wage labors. However, the biggest obstacles might be the frequent disease outbreaks and corporations would rather let farmers absorb the costs by themselves.

However, capital's reluctance to invest in shrimp grow-out does not mean that farmers are saved for exploitation. Farmers use the word "balancing the costs" (*pingben*) to describe a common situation under disease outbreak in that they sell the small shrimp to earn enough to cover the costs of inputs and raw material, but discounting the value of labor expenditure in the farming process. One important feature of the labor condition is the "self-exploitation" of family labor as their products are partly used for their subsistence and therefore labor's value is not totally abstracted as wage labor in industrial settings. The

household usually does not calculate the costs of its own labor in farming (Bernstein 2010). If we use Marx's formula of the calculating of rate of surplus value (s/v= surplus labor/necessary labor), when necessary labor approaches zero, the result will be unlimited.

Village's ownership of land obviates a process of proletarianization, helping to absorb the costs of food and lodging internally and therefore suppressing the real value for the reproduction of labor. Each household is assigned a plot of housing land (*zhajidi*) on which they build their dwellings. Although there is a discrepancy in terms of the quality of houses, at lease even the poorest people do not need to pay for housing. Recently, with the expansion of population, the young couples want to move away from a three- or four-generations cohabitation environment and request land to build their own houses. However, due to the limit of spaces, their requests can hardly be addressed, generating many disputes. The expenses of food have been subsidized by villagers' own farming plot. There are 380 *mu* farmland allocated to the households for growing rice, sweet potato, and peanuts, although the small area of land seems insufficient to provide sustenance and most families still need to pay for grain and definitely meat. Shrimp has not become the main source of protein as the unstable power supply renders a refrigerator obsolete, posing difficulties for shrimp storage. During my fieldwork, I experienced blackouts almost every ten days during the shrimp farming season from April to November. My host family was the only family that had a fridge but they still did grocery shopping every day. The main source of protein is the wild caught small fish from the ocean. The price was only 1/3 to ¼ to that of pork, but the availability is not stable. For example, in the summer, when hurricane attack is frequent and fishing boats cannot go fishing. Almost every household raises chicken, ducks, and geese in their yard. However, they still raise the local variety in a free-

range method. The poultry is mostly served for guests or celebrations. For example, every time I left or came back the village, my host family would kill a chicken or duck. It could be from them or from the warm-hearted neighbors. It seems to me that the poultry is raised more to clean up food waste than as source of protein.

The expenses for child care have been minimized as moms can carry the infant on her back when she does housework or farmwork. Breastfeeding is still the norm in the village, obviating the expenses for formula milk. Most importantly, the elder children help take care of younger children. There is a large vacant space in the village for children to play around. You can see children often play together in a group and do not need any attention from parents nor do they need computer games to occupy children's time. I have not heard of anybody hiring a babysitter, since the kinship network is large and it is easy to find help if the parents need to go out for a few days for business. However, children's education is not necessarily free. The first day care center was built in 2000 in a nearby village and now many parents begin to send their children over to at least learn how to get seated. Primary school and middle school education are still compulsory, but students are occasionally asked to pay miscellaneous fees. Many shrimp farmers are also saving to support children's high school and college education. Health care is a contradictory field. The rural cooperative system was introduced to the village in mid-2000s, but did not cover all expenses. Farmers need to save money for emergency. Another source of expenses is to pay for the lucky money attending various banquets from son's anniversary, wedding, birthday party for the elderly, and funerals. The family farm and communal relations both reduce labor costs and generates new avenues for expenses.

Dialectics of Communal Economy

To understand class composition in shrimp aquaculture, it is also important to not only examine the family unit, but the broader social relations in the larger community, the village and township.

Marx argues that capitalism is both a system of technology and organization. Drawing from Feuerbach's critique of the role of religion in alienating human relations, he proposes the notion "commodity fetishism" to show how commodity acts in the same way as religion to mediate social relations. In his critique of political economists, he reveals how commodity conceals the unequal relations between labor and capital as the two are considered to engage in exchange based on equivalence. Also, he demonstrates how in capitalism, economy replaces religion and politics to become the determinant factor in organizing society. "To the producers, the social relations between their private labours appear as what they are, i.e., they do not appear as direct social relations between persons in their work, but rather as material [*dinglich*] relations between persons and social relations between thing" (Marx 1992 [1867]:165-166).

The notion that economy is itself social has inspired scholars to debunk the binary divide between economy and society. Gibson-Graham alert us to conceptualize economy as "a space for negotiated interdependence rather than a function (or dysfunctional) growth machine" (2009:335). An feminist approach to understand economy will enable us to see it as "an iceberg with formal market transactions, wage labor and capitalist enterprise at the tip, underpinned by a myriad of submerged but sustaining alternative and non-market transactions, alternatively paid and unpaid labor, alternative capitalist and non-capitalist

enterprises" (Gibson-Graham 2009:329). In this section, I will explore how community is an overdetermined site where social reciprocity and monetary exchange work together to defy the small-scaled family farms as either pre-capitalist or capitalist. I hope that by sorting out the muddled relation between economy and society can we identify ways of disarticulation, practices that are dislodged from the lawful motion of exchange and subjects who are liberated from the "individualization that is linked to economy" (Foucault 1983:216).

Feed Credit System

Currently, shrimp farmers in the Leizhou Peninsula farm two crops of shrimp each year, with the first crop lasting from April to June/July, and the second crop from July to October. Ideally, a successful crop lasts 120 days to grow shrimp to harvest size. However, in recent years, due to the frequent disease outbreak, the growth cycle has shorted and farmers have to stock juveniles three or four times or even more in a year. Since, the temperature in late fall and winter is low and not susceptible to shrimp growth, farmers usually harvest shrimp by November. If a farmer earns money by then, he or she will have to support household expenses from December to March when farming is not in season. The Chinese New Year lasts fifteen days from lunar calendar the 1st to 15th of the first month (falling on January or February) and sees mounting expenses on festive activities. Farmers will not get cash until they sell the first crop of shrimp around June/July.

Therefore, a credit system needs to operate to ensure that farmers can still conduct shrimp farming when they are short of cash. Among all the inputs including shrimp post larvae (PL), shrimp feed, drugs, electricity, diesel, aeration machine, shrimp feed takes up

70% of the expenses. A typical shrimp feed has the formula with protein, fat, fiber, calcium and others. Among them, protein takes up the greatest cost and is usually made from fish meal and soy bean. The global craze for meat consumption has forged a high demand on fish meal and depleted marine fish resources. For example, Peru, the largest fishmeal producer in the world that accounts for 30% of global production, had to reduce its catches of anchovies despite of the growing demand, triggering fish meal price to double after year 2006. Shrimp farmers in China have been plagued by the ever increasing shrimp feed price.

The credit system runs to enable farmers to continue shrimp farming despite of the growing prices of raw materials. It operates through the mediation of a feed agent who represents a specific manufacturer. It works like this: the farmer loan feed from the agent on the promise that the loan will be repaid upon shrimp harvest. The agent maintains a similar credit relation with the feed manufacturer. When I was doing experiment shrimp farming in 2008, the size #3 feed[11] cost 136 *yuan* per bag (20kgs) if I bought it on credit, or 126 *yuan* if I paid cash to Ming, my foster brother. Among the 30 clients he had, he told me that only two were able to pay cash, while the rest used loan. The credit system renders a feed agent more than a sales person, but as coordinator and monitor for the farming process, corresponding to the foreman on the shop floor. If a farmer fails in a crop and thus cannot repay the feed loan, the punishment will be that the agent refuses to loan feed to him in the future, as happened in the case of Uncle Cong in Chapter 2. In that case, the agent, transferring the default loan to the feed manufacturer, might also face difficulty getting

[11] In China, shrimp feed usually contains different sizes ranging from 0 to 4 to fit shrimp growth in different phases. In my own experimental shrimp farming, I fed size #0 in the first 10 days, size #1 from 11 to 20 days, size #2 from 20 to 50 days, and size #3 from 51 days on. As shrimp grow larger, they consume more feed. Therefore, farmers' usually spend more money on size #3 feed.

loan from the manufacturer next year. Therefore, it works to the feed agent's interest to ensure that farmers can overcome the threat of disease and be able to repay the loan. The feed agent is often a shrimp farmer himself or herself, as he or she needs to give farmers suggestions on how to handle shrimp disease when their shrimp is under threat. In that case, it if often common for a shrimp agent to also sell shrimp drugs and other inputs to regulate water quality or improve shrimp nutrition. The feed loan credit system is quite informal as it is built upon personal trust and credibility without a formal credit system in place. Usually, a feed agent only recruit clients who he or she know to be trustworthy and will not expand his clientele randomly. That might also explain why unlike other areas of Guangdong, like my mom's hometown in Puning, Guangdong Province, where locals often rent their land to migrant workers to earn the rental fee, in Leizhou, almost all shrimp farms are managed by locals.

Ming, my foster brother offered a vivid account on how the networking remained central to the entrepreneurial skills. He worked as a shrimp farmer for a few years, but the disease outbreak turned his profit unstable and small. When I started fieldwork in 2008, he already turned his home into a warehouse and marketed feed to his fellow villagers. He earned a small fortune and decided to expand his business. In 2010, he rented an office space in the township and wanted to expand his clientele to all shrimp farmers in the town. When I returned to the village in March 2012, I asked how his business was going. He laughed that he was being too ambitious. Within just one year from the opening of his feed and drug store, he already developed 60 clients with a record of over 100 tons of feed. However, he was able to get back only 70 percent of the loan repayment. Partly it was due to the frequent disease outbreak that made farmers default on loans, but partly it was

because of his remote relation (*guanxi*) with the clients. He explained, "Some people lie to you that they fail (in shrimp farming) and do not want to pay back the loan. The clients come from different villages in the town. Unlike the case when I was doing business within my own village, I can't see whether he is harvesting or not. It is very hard for me to manage (that large pool of clients)." The feed credit system acted to lure cash deficient farmers into shrimp farming, but also offered them ways to cushion their loss.

Middleman for Processing Factories

If feed manufacturers act as the main agent to rid farmers' surplus value in the upstream, the processing factory might play the corresponding role in the downstream. Until the anti-dumping case that facilitated one processor to dominate the market and slashed shrimp prices below the production costs in 2004, the exploitative nature of the processor was concealed as it did not employ farmers directly and farmers had the freedom to decide who they wanted to sell shrimp to. The market looked an unbiased place that moved goods around. Next, I will demonstrate how the "just-in-time" production of shrimp works against the farmers' interests.

Harvey describes neoliberalism as a way of "flexible accumulation," when industrial production shifts away from the Fordist mass production in factories to subcontractual, small-scaled, and highly specialized production for niche markets (1989) . An exemplification of the "flexible accumulation" is "just-in-time" production that features shrimp aquaculture in China. Since there is no contractual relation between a farmer and a processor, all production and sales are contingent. This kind of arrangement might look mutually beneficial to both parties. A processor does not give advance orders to a farmer

telling him or her how much shrimp will be collected upon harvest. Therefore, if the farmer fails in the crop due to disease or hurricane attack, the processor does not need to bear the loss. Moreover, the processor only buys in accords to international market influx and does not buy extra to save storage expenses. A farmer might also prefer to be free of control from the processor since the former can decide who to sell shrimp to and does not have to be bonded to one buyer. In reality, the farmer and processor do not meet directly, but conduct transactions through a middleman. The majority of shrimp farms are located in villages, while the processor factories are built in the cities (most in Zhanjiang). Although the peninsula is only 80 *kms* long, driving distance from a village to the city can be as long as four hours due to poor road conditions. Factors such as gas and ice need to be considered for shipping such a long distance. A middleman usually has a small collecting station in the township that has ice machines. Every day, the middleman collects shrimp from different villages in the town, hires workers to sort shrimp into different sizes, and ships them to the processing factory later in the day or the next day.

In the reform era, farmers know that shrimp prices are determined by the market instead of the state, but the market is embodied by the middleman, called *laoban* (boss). Upon harvest, a farmer can call several *laoban* and see who offers a higher price. The *laoban* usually calls a processing factory to inquire the market price and then charges one *yuan* higher per *jin* (0.5 kg) to farmers. Many farmers think that *laoban* collude with each other to keep the price firm. Moreover, the middlemen might adopt some exploitative methods to take advantage of farmers, such as gauging the shrimp size smaller, or reducing shrimp weight. For example, when I was selling the shrimp from my experimental farm, the middleman saw that I was an outsider and tried to apply his trick. It was raining badly that

day and the weight stone was wet. Ming, my foster brother, stepped up and tried to wipe the weight stone. He was yelling "*siliang bo qian jin*" to the *laoban*, who not only dismissed his request but even mocked him as "stupid." Ming would have gotten into a fight with the *laoban*, had he not been stopped by other villagers. For farmers, the *laoban* is the immediate exploiter.

It is not right, however, to generalize that the laoban is more powerful than a farmer. The power balance between them is not set, but is contingent on whether the shrimp are healthy (desirable) or not. I will tell two cases to illustrate this point.

On June 5, as I walked in the shrimp pond area, I met Brother Xiaoqi again and felt very surprised because his shrimp should have been already harvested yesterday and he should have been resting at home. When I had met him the day before, he was calling a middle man to come and gauge the price after he saw some dead shrimp floating on the water. The middle man said that he could offer only 3.80 *yuan/jin*[12] because the market was saturated with small shrimp after the chilling rain. He knew that he could not even cover the production cost, not to mention his labor, but had to yield to the middleman because he could not afford to spend more time bargaining the price. The longer he waited the more dead shrimp he would get. "Didn't you already sell your shrimp yesterday?" I asked with surprise. He replied gloomily, "Yesterday morning, I already did all the preparation work for the emergency harvest and paid 300 *yuan* deposit to the middle man. However, I waited and waited, but the middle man didn't come. Later, he called me that the market price dropped 0.60 *yuan* in just a few hours, from 3.80 yuan/jin to 3.20 yuan/jin. He

[12] The regular harvest size shrimp is usually priced over 10 yuan/jin.

could not pay me at the agreed price and even promised to return the deposit." In the afternoon, I finally saw his shrimp harvested and sold to another middle man for the price of 3.20 yuan/jin. His loss accrued to over 3,000 yuan.

A few weeks later, I encountered an opposite case to see how farmers "manipulated" the *laoban*. I was taken to the shrimp pond operated by Kaimin, who raised shrimp in three earthern farms by the sea and was selling his shrimp in the size of 33 pc/jin and 40 pc/jin. He estimated one 10 *mu* (1 mu=1/15 hectare) pond to have a harvest of 12,000 kgs. When my foster brother took me there, I saw five to six middlemen gathered around and arguing with each other. Kaimin, relaxed and contented, sat back in the hut to wait to see which middlemen would pay him the highest price. The frequent disease outbreak had caused the market to be flooded with shrimp smaller than 50 pc/jin. Kaimin's big shrimp became a cherished good that the middlemen all craved for. Finally he sold the 40 pc/jin shrimp for 11 *yuan* and 33 pc/jin shrimp for 13 yuan. If we use the 7 yuan/jin as the basis of material cost, his earning could be 336,000 *yuan* (US $48,000) for three months of family labor.

The urgency of harvesting sick shrimp made farmers too individualized to have any collective bargaining power with the middle-men. Sister Ling, director of the Leizhou Aquatic Science and Technology Extension Center, explained to me why it was more difficult for shrimp farmers to establish a cooperative to increase their collective bargaining power than, say pompano farmers. When shrimp experience disease, farmers could not wait for each other to sell shrimp collectively for a good price. In the same manner, when each farmer harvests his shrimp at a different time, the timing for stocking the juveniles for next crop is different. There is no way that farmers can collectively purchase shrimp juveniles. The same goes for feed because a different size pellet feed will

be needed for each phase of shrimp growth. Disease has compromised the farmers' capacity of uniting together.

The "flexible accumulation" appears to be operated with the "invisible hand" and be equal to both producers and buyers, but it conceals how farmers' surplus values are appropriated by the downstream processing factories.

Class Stratification and the Rise of Nouveau Riche

The anti-dumping issue finally brought farmers and the processor face to face, when the price dropped to the bottom through G Group's monopoly. Now, the "invisible hand" became visible as farmers felt angry about G Group's behavior.

News reports touted the G Group for "leaving a splendid page for Chinese aquaculture industry" and "winning glory for the motherland." In year 2004, G Group grabbed the export orders with values over US$100 million, quadrupled from just less than US$3 million (200 million yuan) in 2003. Soon Gong, owner of G-Group became the wealthiest individual in the Leizhou Peninsula with assets of 1.1 billion *yuan* (US$ 162 million). After the success harvest of the "first bucket of gold, G Group quickly achieved vertical integration of the whole commodity chain from postlarvae supply, feed production to shrimp processing. A news report was headlined "The Rise of a Shrimp Kingdom (*duxia wangguo de jueqi*) in Eight Years" to convey its spectacular performance: "an increase of 200 times in revenue in just 8 years…a miracle in the aquaculture industry (Xiao 2009)." The news report title definitely mimicked the name of a popular documentary called "Rise of a Great Nations" (*daguo jueqi*) broadcast at the China Central Television (CCTV) at the end of 2006. The documentary series presented the history of the six major industrial

countries representing "western civilization" including Britain, France, Germany, Japan, Russia, and the United States, describing how the pursuit of economic wealth granted freedom and prosperity to those great powers. While those countries were condemned as "imperialist" (*diguozhuyi*) for the bloody cruelty they inflicted through colonization at Mao's time, now they become simply great nations because of the end result—through the accumulation of wealth they succeeded. The legitimated success of G Group turned Gong into a celebrity as he gained honors such as the "2004 Contemporary Chinese Excellent Entrepreneur" and "2005 Outstanding Youth of Guangdong Province."

Leizhou Peninsula epitomizes the "miracle" of Chinese economy in the era of neoliberalization. On one hand, it was crowned with "five laurels" (*wu guiguan*) of shrimp aquaculture records in the country, as one of the biggest shrimp farming area (410,000 mu, or 27,000 hectare), the largest shrimp breeding center in the nation, the biggest shrimp processing base, the largest trading center, and the largest feed manufacturing center. On the other hand, the peninsula is also well known as one of the poorest regions in the province. In the Dongli Township where I conducted fieldwork, there was still no running water or waste treatment in the villages. Electricity for household use was reduced to a minimum in order to save energy for the forever-running aeration machines in shrimp ponds. The only physical exercise facility in a local primary school was a dilapidated ping-pong table whose bricks were cracking. School teachers told me that they had to sell lottery tickets to supplement their income because the salary was too low for survival. Recently, all major media in the country reported the news that identified a stereotypical village located in the Leizhou Peninsula as the poorest village of Guandong Province, highlighting the fact that its economic development had lagged behind the Country for 30 Years and there was

no toilet for a school enrolled with 300 Students (Xu 2010). The story opened with remarks by Wang Yang, the Party Secretary of Guangdong Province: "Guangdong Province has the richest town and the poorest town of the country. At this stage of development, Guangdong still has the poorest area (of the country). This is the shame of Guangdong, the shame of a region that gets rich first."

How do we analyze the rise of *nouveau riche* and the plight of shrimp farmers in light of the concepts of labor theory of value? If we adopt a perspective from traditional Marxism, we might easily come up with a quick conclusion that G Group, as the capitalist, intentionally suppressed the market price and extracted surplus value from farmers. This will just be another case that exemplifies the bloody exploitation in capitalist production. This view considers labor as external to capital and perceives the problems to be between production and distribution. As useful as this analysis might sound, it fails to capture the intricate social relations that are coming into being and shifting throughout this time. Such an analysis assumes that the capitalist and workers are pre-existing classes and power works top-down with the capitalists exploiting the proletariat. However, in this case, the formation of Gong into a capitalist class was thanks to the effort of farmers whose overproduction led to the anti-dumping tariff and in turn tripped their toes.

The early years of reform created a labor value system different from that in the mid-2000s. Labor, under the early HRS years when commodity production and exchange did not predominate, was not a totally objectified entity but was the outcome of "a wide variety of customs, traditional ties, overt relations of power, or, conceivably, conscious decisions" (Postone 1993:143). In a word, labor was socially mediated. As I described in

Chapter 1, the beginning of agrarian capitalism in China did not turn out to be a bloody process as Marx configured in his "so-called primitive accumulation," as shrimp ponds were still constructed upon collective land that avoid a process of land dispossession. While the "so-called primitive accumulation" was predicated upon the destruction of feudal, precapitalist mode of production, in China, the cultivation of a market subject took place not so much by the orchestration of the "invisible hand" as by a resurrection of the Maoist spirit of seeking common good.

Two decades later, in the confrontation between G Group and shrimp farmers, we found that when farmers were selling their labor to the urban-based market system, there was no way for them to prevent the drop of shrimp price in any will out of reciprocity. Now, "money has a corrosive aspect; it destroys the relations of prestige, knowledge, and desire that constituted the old communities and forms of labor, effectively decoding the old codes" (Read 2003:58). The dissolution of precapitalist ties sets up the condition for a new, abstract form of social mediation. "*Labor itself constitutes a social mediation in lieu of overt social relations* " (Postone 1993:150, emphasis original). Now, labor is no longer just a mediated product, but is mediating itself, as it constantly reset the social average hour of value. This helps to understand how urban-centered system objectified labor and was instrumental in creating the class stratification in the countryside.

The value flow from farmers to the G Group, though unfair, was also perceived as the inevitable outcome of market regulation. Sister Ling, who worked closely with farmers and was known for her outspokenness, commented to me the misery of the farmers many times. However, she did not voice a critical tone when she considered the outcome to be

just a manifestation of "market law" (*shichang guilv),* a buzzword that repeated in the media frequently since the late 1990s amidst the massive layoffs of state-owned enterprise (SOE) employees, telling the victims to accept the reality and refrain from their request for compensation (ref). Here, "market law" emits an image of objectivity and impersonality by occupying an independent sphere not attached to the social.

The Farmer's Complex and the Crowd

Among the hundreds of complimentary reports, one caught my attention. Entitled "A Farmer's International Perspective—G Group Leading the Shrimp Processing Industry for Exports," the report from Southern Rural News, a media targeting the agriculture sector and farmers, touted Gong, as an exemplary farmer. "I am still a farmer," Gong tried to down play his privileged status as a *nouveau riche*, "and have a serious farmer *qingjie* (complex)." The Chinese word *qingjie* derived from the psychological concept of Oedipus Complex coined by Freud to denote a child's primordial desire for the mother. By invoking a "farmer *qingjie*," Gong claimed a farmer identity as determined by birth and would not be shed by his conducts.

The *qingjie* discourse granted Gong the identity of a farmer in a proper name, preempting any thoughts that try to link Gong's ascendance with farmers' loss. Literacy critic Wang Xiaoming (2003), in an essay called "The Portrait of Half Face," vividly illustrates how the nouveau riche are represented in their half-face as "successful elites" (*chenggong renshi*) who presume to have money, deploy business shrewdness, and maintain a good taste even in their leisure time. Wang questions what's missing in the concealment of the other half face. "When you see him going in and out of the spacious,

luxury mansion, you don't know where he gets his money from for his property. He deploys a reserved gesture when he signs a contract, but you don't know where he can obtain the capital and power for signing a contract (ibid:29)." This concealed half-face legitimates the exposed half to be blurred, intoxicating the aspiring white-collared youth to think that the upper-class life can be readily emulated. What gets dismissed in this imagination is rapid social stratification in Shanghai into four new groups of *nouveau riche*, white-collared, migrant workers, and laid-off workers, and how the social hierarchy is normalized. Wang demonstrates how concealment and conjuring work together as a tool to promote mainstream ideology. If the "half-face" of the successful elite seeks to cultivate a middle-class subjectivity in the city, the *qingjie* discourse might serve a similar function with the farmers. As the media was flooded with the successful stories of Gong, the appropriation of the farmers' surplus value gets concealed. The discourse "national hero" embraces Gong's export strategy, while the farmers' losses in the international trade upheavals are left obscured.

However, unlike the urban middle-class who are trusted citizens who weave a dream of social mobility, the farmers are always reminded of their potential to be turned into a crowd. One time, Sister Ling helped me see how farmers tripped over their toes from overproduction as we talked about the severe shrimp mortality caused by the consecutive rainy days. As I looked depressed and concerned, she tried to console me: "This is very normal. With the current status of overproduction, if the shrimp do not die, farmers would not be able to sell them in any case." She gave me a real case example. Last year, the price was very low. One farmer felt very sad to see his shrimp die in 30 days and envied his neighborhood who could raise the shrimp to over 100 days successfully. However, by the

time his neighbor harvested his shrimp, the price already plummeted to only 4 yuan/jin, lower than the 6-7 yuan/jin production cost excluding the value of human labor, and his neighbor ended up losing more money than him. "Who was the loser in this scenario?" She asked me, "Right now as long as shrimp farmers make a success of only one crop a year, they won't lose money. With the current rate of overstocking intensity, mortality is inevitable. The Chinese people like to follow the crowd (*yihong ershang*). I want to stock that high intensity just because I see him doing it. Right now we have a problem of overproduction. The market does not need that much."

Here farmers' fate is recognized as emanated from the problem of overproduction, but instead of being viewed as victims of the treadmill effect of commodity economy, farmers are described as a "crowd," portraying a new sociality in the emergent presence of both nouveau riche and underclass. Timothy Mitchell recounts how the concept of "crowd" remain essential in colonial Egypt when liberalism began to emerge in the political thought in late 19th century and early 20th century. The book called *The Tale of Isa ibn Hisham* revealed chaos in the society when peasants behaved as an equal to the prince. The popularization of the book constructed the association between "crowd" and disorder, helping readers to understand the real meaning of liberal ideology, as Mitchell posits "Rights could only be enjoyed within a society of obedient and industrious individuals, and it was these characteristics, as we have seen, that Egyptians now suddenly seemed to lack. Liberalism was the language of a new social class, threatened by the absence of the mental habits of industry and obedience which would make possible a social order" (Mitchell 1991:116). The discipline of mindless, threatening individuals into an industrious whole represents the duty of *society*, a concept that pioneer sociologist Emile Durkheim

established as "something with an 'objective' existence, as a mental order independent of the individual mentality… From the fear of the unbounded and undisciplined subject arises the need to know and to strengthen the objective existence of society" (1991:121). Through the representation of social realm in law, statistical records, fashion, and other "material" objects, a non-material realm of ideas—the society-- became real. "The reality or objectivity of the social resided in its presentational nature" (1991:126).

In the discourse of "crowd," farmers' tendency to overproduction is often ascribed to their low value (*suzhi*), in contrast to the high-value, management-savvy nouveau riche. Anagnost (2004) delineates how *suzhi* value coding serves to legitimate new regimes of social differentiation and governmentality. She presents pictures of two bodies subsumed in the *suzhi* discourse: the body of middle-class child imbued with practices of nurture for training future *suzhi* citizens and the migrant's laboring body presumed to be lacking in *suzhi*. The migrant's body is devalued as having "low quality" (*suzhi di*) emanated from their high quantity, a discourse promoted by the state in the 1980s in efforts of modernization and later circulated more broadly in popular discourse to conjure up the rural population as "a specter of social disorder" (199) amidst the quickly stratifying society. Anagnost (2004) argues that "the double-sided of *suzhi* discourse marks out a difference between the reliance of one class on physical labor and that of another on intellectual labor," or as she reiterates Spivak's thesis, "The idealist predication of the subject is grounded on consciousness ('the subject's irreducible intendedness towards the object'), while the materialist predication of the subject is grounded on labor power ('the subject's superadequation,' its ability to produce a greater value than it costs itself')" (ibid:204). The question "where did value go?" in the neoliberal economy cannot be

answered if we forget to think together the rise of the *nouveau riche* and the superadequation of the farmers.

Conclusion

The two cases that pivoted on the anti-dumping case have revealed difficulties in analyzing labor, class, and capital in the global economy. U.S. shrimpers' union activism resulted in the reinforcement of market rule, while the Chinese shrimp farmers succumb themselves to capitalist exploitation in spite of the absence of wage labor bondage.

By exploring the political economy of shrimp aquaculture in south China, I argue that the "extra-economic" factors such as family structure and communal relations help construct conditions under which farmers' labor-power is reproduced. Through viewing the family and village as sites of overdetermination, I want to refrain from a reductionist judgment on whether they are good or bad, but respond to Gibson-Graham's statement that "(a)s we begin to conceptualize contingent relationships where invariant logics once reigned, the economy loses its character as an asocial body in lawful motion and instead becomes a space of recognition and negotiation" (Gibson-Graham 2006:xxx).

Critics of capitalism often lament that capitalism tears communities apart by disrupting communal economy and social relations. The case of the shrimp farming communities in the Leizhou Peninsula actually counters this argument. Many shrimp farmers I interviewed express their preference of this career, not only due to the high monetary return compared with their past experience of grain farming, but also due to their ability to still main their communal form of life. Unlike the majority of villages in China that fall into "empty nests" (*kongchao*), when industrial capitalism wrenches a

migration of the youth and middle-aged labor force, the shrimp farming villages in Leizhou are still able to maintain their vibrant collective life, such as various religious rituals, ethnic opera performance, and village committee for planning and organizing various events. I will end with the most important festive celebration in community that takes place every year to celebrate Lantern Festival on the fifteenth of the first month, marking the end of the Chinese New Year. In the parade, thirteen villages organize their respective lion dance troupe and parade to each village one by one to worship their deities (Fig 3.1-3.4). When the parade group arrives in a village, all households offer banquets to serve guests coming from afar. The worship of deities has facilitated gift-like exchange where people no longer need communication mediated by commodity. As I knell down with the villagers and kow-tow to the array of deities, I felt a loss of self to be subsumed in the power of the collective. Maybe that is the venue to look for social changes, through self-reliance and localized economy, not necessarily through seeking a global discourse of labor solidarity between U.S. and Chinese workers.

Fig 3.4 Every household offers a chicken as sacrifice to the deity.

Fig 3.5 Lion dancing to worship the deity.

Fig 3.6 Deity parade.	Fig 3.7 A villager bows to the deities.

Chapter 4

Vibrant Drug Residues:
In the Attempt to Standardize Food Safety Regulation

This chapter explores how "drug residues" became a new domain of food safety regulation after the EU Chloramphenicol Incident in 2001, which led to the banning of all animal source products from China. I will illustrate how "drug residue" discourse seeks to discipline the production of small-scale farmers and the responses from various levels that challenge the legitimacy of the drug residue discourse. Some fisheries officials question whether the small unit of residue –ppb—actually has significant effects on health and whether developed countries use this as a pretext for setting technical barriers in post-WTO trade regulation. Scientists challenge the food safety regulation concept that divides food as either good or bad, forsaking the knowledge of food as an embodied experience. Grassroots officials and farmers question the notion of priority of human health over animal health. Scientists acknowledge that the abuse of drugs stems from the limit of earlier science that only paid attention to the health of animals without caring for human beings. Other people are concerned with how the traceability system might work against farmers or processors. Drawing on Janet Bennett's notion of "vibrant matter," I try to demonstrate how drug residues are not passive entities that fall into the instrumental use of human beings, but are "actants" that possess a certain power of action. This theorization is epistemologically important as it sees natural and social systems as governed by an emergent rather than a linear or deterministic causality, challenging the notion of the rational and intentional human actor. The attribution of vitality to nonhuman bodies, forces,

and forms unravels the assumption of human exceptionalism that shapes so powerfully our inclination to confront and control nature.

The Birth of "Drug Residues"

At the end of 2001, the EU Food and Veterinary Office (FVO) started its lab work as usual. Technicians took out a stack of food samples that they gathered from a visit to China and started their routine work of testing. After examining some batches of shrimp samples, an inspector submitted a report that said "Detection of chloramphenicol residues 0.5ppb, exceeding the MRPL (minimum required performance limit) of 0.3ppb." "Chloramphenicol" soon marked the headline of the media. One month later, on January 25, 2002, the EU Standing Veterinary Committee voted to agree on the suspension of imports from China valued at nearly €330 million annually, including rabbit meat, poultry meat, honey, molluscs, crustaceans, frozen shrimps and prawns, and pet food (EU FVO News 1/25/2002). This unexpected trade ban cast a devastating blow to China which was just about to make a fanfare presence in the "free market" after struggling for many years to finally join WTO only months before.

As a broad-spectrum antibiotic, Chloramphenicol (CAP) is an efficient veterinary drug against bacterial pathogens. Originally found in certain strains of the soil bacterium *Streptomyces venezuelae*, it is now mainly produced synthetically. In China, it has been reported that CAP has been used with the successful treatment of *Vibrio* diseases, a major threat for shrimp aquaculture because of their close association with larval mortalities (Saulnier et al. 2000; Wang et al. 2004) For human health, CAP is limited to use in typhoid and other salmonella infections as well as in the treatment of bacterial meningitis (Impens

et al. 2003). In China, it is also used for treating conjunctivitis and the eye drop is an over-the-counter drug that I have been used since childhood. Although CAP has no reported adverse effect on animal health, it is known to have severe side-effects to humans (in relatively high doses). CAP is found to cause suppression of bone marrow, which results in many related diseases such as leucopenia. Other fatal adverse effects include aplastic anemia and a syndrome of cardiovascular breakdown known as the "grey syndrome". Due to these well-known risks, CAP was banned in the production of food by the United States in 1994 and by the EU in 1996 (Impens et al. 2003; Shakila et al. 2006; Wang et al. 2004).

The "Chloramphenicol Incident" became a landmark in the history of aquaculture of China, as it, for the first time, "exposed the issue of drug residues" (*yaocan*) in aquatic products," according to Chen Wen, Director of the Guangdong Province Aquatic Animal Epidemic Disease Control and Prevention Center (GADCC) in an interview on aquatic product food safety management. As the largest sector in agricultural exports from China (Wang 2007), aquatic products captured national attention for its ups and downs. Since then, "drug residue" has become a buzzword in the daily conversations of fisheries officials, and it eventually shifted the priority of the country's aquaculture production from "high-yields" to food safety, a shift from quantity to quality. Until then, the food safety issue associated with aquatic products was mainly concentrated on bacterial contamination, an issue that could be solved by proper processing or cooking and not related to producers. Now with the new concerns about drug residues, food safety risks were perceived to be emerging from the production phase, turning farmers into suspicious perpetrators.

In response, the Chinese Ministry of Agriculture quickly launched a series of acts to standardize aquatic veterinary drug use, including the legalization of drug production and use, starting from issuing a list of "Banned Veterinary Drugs and Miscellaneous Chemical Compounds for Food Animals" in March 2002 and an act to penalize those that produce, sell, and use "banned and illicit (Wang et al. 2004). The passing rate of chloramphenicol improved dramatically from 83 percent in 2002 to 98.4 percent in 2005 (Fan 2006).

However, the decline of chloramphenicol use helped a little to reduce the food safety risks as scandals on new banned drugs were consecutively exposed by importing countries. Fisheries managers found it hard to keep up with the rapidly expanding list of "banned" drugs. In 2005, a warning about malachite green was issued to all European food safety institutes after it was detected in organic salmon in a large grocery store in the U.K. Malachite green is originally a chemical dye product that can kill bacteria. It is commonly used in fish farming to treat fungal diseases or in shipment of live fish to keep them fresh. However, recently, this chemical has been recognized as a carcinogen. As this new banned drug entered the list of food safety inspection across the world, Japan banned eel exports from China after malachite green was found in 2006 (Yang et al. 2007). Around the same time, trace amounts of malachite green was found in freshwater fish from China to Hong Kong and aroused consumer concern, causing freshwater fish exports from Guangdong Province to be halted for 19 days (South China Morning Post 11/19/2006; Wu at al. 2007). Nitrofuran (NF) drugs, a group of artificially synthesized drugs developed in 1940s and widely used in treating bacterial disease in aquaculture, became another focus of alert as a carcinogen (Radovnikovic et al.). In November 2005, Japan detected residues of this drug from eel products imported from mainland China and Taiwan and soon rejected some of

the contaminated products from an exporter in Ningbo in February 2006. NF soon entered the list of banned drugs for food safety inspection by Chinese officials. Subsequently, Shanghai authorities detected AOZ, an NF metabolite in turbot fish farmed in Shandong, arousing panic for urban consumers in China. In 2007, the detection of NF by the U.S. Food and Drug Administration (USFDA) resulted in a halt of imports of five types of farm-raised fish from China until importers could prove that the products did not contain banned or excessive-levels of veterinary drugs (USA Today 7/2/2007).

In January 2007, in response to the frequent media exposure of seafood safety scandals in the previous year, GADCC organized a conference called "Seminar on Responses to Malachite Green and Nitrofuran Drugs Incidents in Aquatic Products," congregating over 100 participants from grassroots aquatic extension centers, fisheries scientists, veterinary scientists, and veterinary drug manufacturers. Wang Yutang (2007), an official from the National Aquaculture Technology Extension Center, identified three phases of aquaculture drug use and designated the aftermath of the 1993 disease outbreak as the watershed moment that started the phase of "excessive use and misuse of drugs".

In China, the first aquaculture drug appeared on the market in 1990 and was made with garlic powder to cure bacterial diseases in farmed fish. By 2005, before the state undertook legal means to standardize fish drug manufacturing, there were already 450 manufacturers producing 150,000 tons of fish drugs in 600 varieties from sterilizers to antibiotics. Although Wang acknowledged the "lack of standardization" (*bu guifan*) to be a problem, he ascribed the rapid development of aquatic veterinary drug to be driven by scientific research. After the 1993 White Spot Syndrome Virus (WSSV) disease outbreak,

widespread pathogens and increasing stocking intensity exacerbated fisheries diseases and instigated the scientific development of fish drugs. While early "folk therapies" (*minjian tufang huo tufa*) in fish disease control relied on "experience" (*jingyan*) and lacked scientific testing, the post-1993 drug development brought together the joint effort of scientific researchers in universities and research institutes with product development by corporations (Wang 2007:6).

As an administrator, Wang's celebratory tone failed to reveal how scientific development could also lead to the generation of further drug residue problems that severely crippled fisheries exports. This issue was addressed later by two scientists from the Aquatic Animal Research Institute at the Jinan University. Zhang Qizhong, an expert in aquatic veterinary drug metabolism and residue assessment, and Lin Xiaotao, a specialist in aquaculture ecology, presented a paper on the source of aquatic drug residue. In the past, new drugs were developed only through tests of drug efficacy (*yaoxiao*) without investigating drug metabolism (*yaodong*), the change of drug residue in animal over time. Farmers were instructed to use drugs based on results from drug efficacy tests but were not told to pay attention to problems of drug residues. At the same time, a lot of the presently banned drugs such as nitrofuran, chloramphenicol, and malachite green were still listed as recommended drugs in aquaculture textbooks due to their low cost and well known efficacy.

As a critical frame through which to view the issue of drug residues, I propose the notion of "vibrant matter," a term coined by political theorist Jane Bennett to highlight "the capacity of things … not only to block the will and designs of humans but also to act as quasi

agents or forces with trajectories, propensities, or tendencies of their own" (2010:viii) . For the study of political ecology, Bennett suggests three advantages of the notion of "vital materiality" over the commonly used term "environment." First, materiality conveys Latour's notion of assemblage that "tends to horizontalize the relations" between human and nonhumans. Second, the perception of material as vibrant reveals how the world is governed by "an emergent rather than a linear or deterministic causality," challenging ideas of nature as both "a purposive, harmonious process" and "a blind mechanism." Third, this thinking is reflexive in helping us understand "an 'alien' quality of our own flesh, and in so doing reminds humans of the very radical character of the (fractious) kinship between the human and the nonhuman." The difference between life and matter will be dissolved if we think that we are "an array of bodies, many different kinds of them in a nested set of microbiomes" (2010:112-113).

In my study of aquaculture, I explore the problem of drug residues as part of an assemblage, "an open-ended collective" in Deleuze and Guattari's term. It poses a problematic that recruits human actors, such as fisheries officials, aquatic scientists, fish farmers, Euro-American consumers, Chinese consumers, the WTO, animal actors, such as shrimp, tilapia, chicken, pigs, as well as other entities, such as natural and artificial chemicals, cancers, kidney stones, sensitive detection machines, and so forth. This animal-chemical cluster is not just an organizational category, but as an entity in which "bodies enhance their power *in* or as a *heterogeneous* assemblage (Bennett 2010: 23, emphasis original). I seek to present how the notion of assemblage helps us perceive the power and agency of matters, forcing us to forsake the notion of human exceptionalism. By refraining from a linear understanding of causality, this framework may direct us to move away from

the conventional action of laying blame but to a more nuanced understanding on how knowledge is produced and travelled.

The "emergence" of drug residue reflects how drugs shift their trajectories from something to improve animal growth and human nutrition to something that might be harmful to human beings. The priority of drug efficacy (*yaoxiao*) testing over drug metabolism (*yaodong*) testing mirrors how our knowledge is developed through the categories we use to see things, therefore we always encounter limits to what we can see and what remains unobservable. Until drug residue becomes a category in aquatic drug research, the focus of scientific research resided primarily in the enhancement of animal growth in which drugs are considered passive materials that operate according to the will of human beings. Now, the drugs leave their footprints—trace amounts—that make the hidden side-effects visible. We are forced to admit that "nonhumanity infects culture" (Bennett 2010:115). However, as we should withdraw from the idea of agency as composed of rational actors and the notion of causality as linear, we should not perceive the triumph of matter as a manifestation of the intentionality of nonhumans. The shifting meaning of drug residues unveils an emergent and fractal causality where "one finds the circuits in which effect and cause alternate position and redound on each other" (2010:33). The emergence of drug residue testing unveils no intentional actors in the threat to human health as the division of labor confines veterinary scientists to study only the health of animals. Until we understand the concept of "vibrant matter" in which the world is an assembly between human and nonhumans, life and matter, and both the biochemical and biosocial systems are vibrant, can we overcome the limit of binary categorization and truly respect the unobservables.

In the 2007 seminar that sought to identify responses not to say solutions to the frequent media exposure of aquatic drug residues, quite a few participants argued for more efforts cracking down on banned drugs, the development of alternative drugs, and better communication with farmers on knowledge about the drug withdrawal period. Hu Chaoqun, an expert on fisheries diseases, raised concerns that the use of alternative drugs might generate new incidents of food safety concerns. In his view, drug residues were primarily caused by farmers' inability to identify specific pathogens leading to the use of broad spectrum antibiotics to treat diseases unnecessarily. He advocated an approach of "pathogen exclusion," which I discuss as a mission impossible in Chapter 2 but the agency of pathogens can never be ignored -- the hidden pathogens always pose a threat.

"Technical Barrier"

Although the Ministry of Agriculture prioritized the regulation of drug residues, not all fisheries officials felt that western importers' demands were legitimate. "After the WTO, when the market becomes 'free,' new kinds of trade barriers will arise especially to protect domestic producers in the importing country," said Li Qing, Director of the Drug Use Advisory Board in the Ministry of Agriculture. In a lecture on veterinary drug use for an aquatic veterinary training program in Guangdong Province in 2008 (see Chapter 5), she informed the trainees about the severe impact of drug residues on fish exports, citing from the "Annual Report on Technical Trade Barriers 2007," a report that the State Quality Safety Inspection Bureau compiled starting in 2006 to help Chinese exporters respond to the mounting trade barriers since China's accession to WTO. In 2007, exports of aquatic production totaled 3.064 million tons with a value of US$9.74 billion, as the largest sector

(26.3 percent in value) in agriculture exports, although its share had dropped 3.9 percent compared with 2006. Among all the commodities affected by the trade barrier, aquatic products ranked at the top in frequency for a record 196 cases, or a stunning 33.5 percent of the total cases in 2007. Among the causes of the barriers, drug residues accounted for 44.7 percent, followed by 25.4 percent rejected for not meeting sanitary standards, and 11.4 percent for unregistered causes.

Later Director Li gave the trainees an example of how the Japanese government raised food safety regulations to deter eel imports from China and protect domestic fishermen. The Director had studied in Japan before she began her work at the Ministry of Agriculture in China and was familiar with the ups and downs of the Sino-Japan seafood trade. She told the class that in Japan, eel had been recognized as a traditional food that provided good source of energy replenishment. The annual eel festival held every August attracts millions of visitors to taste this highly esteemed food. Market demand has been steady for many years to record 120,000-130,000 tons annually, shared between 20,000-30,000 tons from domestic production and 90,000-100,000 tons from imports mostly from mainland China and Taiwan. However, in recent years, eel imports have soared dramatically and depreciated the market value. In 2003, the Japanese Eel Association, representing domestic producers, began to put pressure on the government to limit eel imports. However, given the free-trade agreement, the Japanese government could not order a cut back to imports directly. Therefore, eel imported from China was later detected to have excessive antibiotic residues, starting with the detection of chloramphenicol in 2002, *enrofloxacin* in 2003, and malachite green in 2005, resulting in an overhaul of eel exports to Japan (Yang et al. 2007) .

Among the major Chinese seafood importers, the European Union, the United States, and Japan have heightened their detection standards of illicit drugs, designating "zero tolerance" for banned drugs such as chloramphenicol, malachite green, and nitrofuran. However, the legal concept of "zero" does not exist in the real world and can be reflected only through the best-available techniques (BAT), now in the technical term MRPL (minimum required performance limit) in technical terms (Hanekamp, Frapporti, and Olieman 2003). Until the mid-1960s, the general ideas of food safety meant that food should not contain any potentially harmful residues of veterinary medicine and the goal was realized through a more or less realistic measurement of drug residue determined in concentrations of around 1 mg/kg (parts per million: ppm). Since then, the advancement of analysis methods have driven for more sensitivity to reach the common level as low as 1μg/kg (parts per billion: ppb), 1,000 times lower than ppm (Hanekamp, Frapporti, and Olieman 2003). There is even a race between western importers to detect lower and lower amounts of residues. As I discuss in Chapter 3, after Chinese shrimp were banned by the European Union due to the detection of chloramphenicol in early 2002, they were re-exported to the U.S. market, which at that time had a less strict standard in drug residue control. In fact, the Southern Shrimp Alliance, the union representing shrimpers from eight states in the United States in the anti-dumping petition, wanted to pressure the FDA to increase its current inspection rate of two percent to match the EU rate of 20 percent and reduce the tolerance rate of five part per billion (ppb) tolerance to the EU level of 0.1 ppb (Huang 2003). In a report in 2002, the FDA announced its plan to use the same standard as Canada and the European Union after it was criticized for not keeping its chloramphenicol standard in par with the European Union:

> "Until recently, the sensitivity of the methodology prevented the detection of chloramphenicol in shrimp below 5 ppb. Canada and the EU have refined their methods to detect even lower levels and have taken action on food products from China and Vietnam found to be contaminated by chloramphenicol.
>
> The FDA has modified its methodology to confirm chloramphenicol levels in shrimp and crayfish to 1 ppb and is further modifying the methods to detect 0.3 ppb, which will place the U.S. methodology in line with Canada's and the EU's" (FDA 2002).

When commenting on the increasing standard of food safety, Director Chen Wen criticized the unrealistic goal of ppb as he frowned, "It is like applying one drop of drug into a whole pond. This is the level of excessive drug residue. Do you think that amount of drug residue in the shrimp will affect your health?" Later I found more vivid description of ppb, in analogies such as "one sheet in a roll of toilet paper stretching from New York to London," "one second in nearly 32 years," or "one pinch of salt in 10 tons of potato chips (Scatterfield and Black 2004)." Then Director Chen showed me evidence he collected upon Hong Kong's ban of mandarin fish (*Siniperca chuatsi*) on detection of malachite green in 2006. The Hong Kong Food and Environmental Hygiene Department stated that with the malachite green detection level of 0.0022-2.3 mg/kg (or 2-2,300 ppb), consumers would need to eat as many as 290 kgs of contaminated fish each day to produce any serious health concerns (Li and Chen 2007). He continued, "Now the problem is that there is little research conducted on the risk analysis of drug residues. How badly do the residues affect consumers? There is no authoritative conclusion. Each country just announces their tolerance level, but we don't know whether this is really the case. The rigorous level is used to scare consumers. Now when they hear of drug residues detected in food, they become too scared to buy it. But do they really know what the deleterious effects are?"

"Zero tolerance" is predicated upon the identification of trace amounts of drug residue but ignores the contexts from which the trace amounts are sourced. Scientists have

challenged the linear correlation between proof of residues and harm to human health. Hanekamp et al. (2003) propose four points on the paradoxical issues of zero tolerance. First, chloramphenicol is a natural chemical, produced by the bacteria *Streptomyces venezuelae* belonging to the Actinomycetes, which are ubiquitous in soil around the world. Second, chloramphenicol is used elsewhere and may enter surface and waste water even though fish farmers have not used the drug for treating aquatic diseases. Chloramphenicol was identified in a sewage treatment plan in Germany at a maximal concentration of 0.56 ug/l (ppb). Thirdly, the technical operation of "zero" relies on the refinement of analytical methods, ushering the development of more and more sensitive detection machines. Fourthly, zero tolerance is based on a precautionary regulatory viewpoint that is built upon a linear model of dose-response relationship. The authors advocate instead a hormesis U-shape rather than linear model that might be more accurate in reflecting an organism's response to toxicological perturbations. Hanekamp et al.'s summary criticizes the decontextualization of food safety regulation that ignores the multi-source potential of residue presence, when the analytical technology "becomes a goal in itself, irrespective of toxicological relevance of the concentrations detected" (2003:218) .

Now in the international seafood trade, zero tolerance has become a "technical barrier" that is predicated upon the economic and scientific inequalities between First-World importers and Third-World exporters. "(P)roducts designated as 'safe' by an exporting country can be designated as 'non-compliant' if the importing country uses a more sophisticated method of analysis" (Hanekamp, Frapporti, and Olieman 2003:216). This technical governance of food safety reduces Third-World farmers to becoming disposable laborers who can be wanted or rejected anytime by First-World nations. In addition, First-

World seafood importers also develop a new channel of business by forcing Third-World exporters to improve their analysis sensitivity through the importation of the more sensitive drug residue analysis equipment. Director Chen told me that with the increasing sensitivity of analysis, domestic equipment failed to meet the international standard and the government had already spent millions of dollars to import new equipment. For example, the machine that detects nitrofurans in the level of ppb is called a liquid chromatography device which costs over 1 million *yuan* (US$147,000). In the commodity chain of shrimp, we see a division of labor in which the United States takes up the high-end position to produce sensitive drug residue detection equipment and Specific Pathogen Free shrimp broodstocks, while China occupies low-end production to farm cheap shrimp for U.S. consumption. This production and consumption cycle epitomizes the global processes of "labor arbitrage" in which low-end, labor-intensive, and environmentally disruptive production is transferred to developing countries on the premise that this would free citizens in the more advanced countries to pursue jobs in the "knowledge economy" (Ross 2006).

The rejection of food imports legitimized by the zero tolerance policy has helped resurrect the reputation of First-World states. This is despite the fact that the First World states tolerates industrial food production to go wild and are criticized for their inability to handle crisis such as the E. coli O157:H7 outbreaks, mad cow disease, and so forth. The media's sensational reportage on third-world producers' drug residues wrongly conveys the image that first-world animal producers use minimal or no antibiotics. "By one estimate, nearly 25 million pounds of antibiotics are used in animal agriculture, whereas just 3 million are used to treat human infections," says Marion Nestle, the famous food critic, who

reveals the stunning portion of antibiotic use for beef, pork, and poultry producers in the United States (Nestle 2003:47).

At a glance, it seems odd that a country like the United States with such an extreme tolerance for antibiotic abuse will impose zero tolerance on some of the aquatic drugs by Chinese producers. This riddle was soon dissolved as I interviewed fisheries officials and scientists from China. Compared with the wide use of animal drugs in land animal production, the U.S. FDA allows only six fisheries drugs, including three antibiotics: Oxytetracycline dehydrate**,** Sulfadimethoxine and ormetoprim**.** Director Chen told me that it was due to the small scale aquaculture sector in the United States that can maintain low-intensity production without the need of much drug use. Later, I discussed this issue with Prof. Yang, a biologist that has worked on various issues from parasites to shrimp virus. He fretted at the idea that seafood was considered more unsafe their other meat production. "It is not the problem of seafood in itself, but our inconsistent standard of food safety," commented Prof. Yang. "Aquatic products have to meet almost zero tolerance of drugs. In comparison, poultry and cattle do not have such a rigorous requirement. This is highly related to the interests of drug manufacturers." He then recounted his previous research experience working with a German-made pesticide to control coccidian, a parasitic disease common in chicken. This pesticide is still widely used as a feed additive in chicken feedlots around the world. "The pesticide is way more toxic than antibiotics, as you see, the former deals with a parasite which is an organism, while the latter treats only bacteria. Therefore, we need to impose equal requirements on different systems of animal protein production. You can't say that chicken has a standard, pork another, and fish, yet another. It is not fair that the United States and European Union use drugs widely with their own cattle and then

get fastidious with our seafood." His remarks called into question why antibiotics used as growth hormones was not blacklisted by the European Union until 2006 when a ban on antibiotics as growth promoters went into effect (European Union 2005). However, it still remains an approved drug by the USFDA and China (U.S. Food and Drug Administration 2006; Chen 2007). Prof. Yang was not happy about the technical hegemony of the West in imposing their standards, as he continued, "We should not kow-tow to them, but should question their criteria."

Instead of blaming the Chinese government for failing to meet international food safety standards, Prof. Yang criticized the state for its inability to challenge demands from the global markets. "To be nor not to be, that's the question." Many of the grassroots fisheries officials I met expressed their contradictory will to participate in the food safety campaign. Director Ma, an official from Zhanjiang fisheries bureau called it "ethnic discrimination" (*minzu qishi*) when China often tries to keep the best products for export while leaving the mediocre ones for domestic consumption. A few years ago, an EU delegation went to inspect drug residues in some fish farms in northern China. They did not just want to visit the farms scheduled by the Chinese hosts, but randomly asked the car to stop in an undesignated farm. When the result came out that the farm contained banned drug residues, the Chinese fishery officials explained that the fish raised in the farm was for domestic consumption, and not for export. However, foreigners also have the habit of exporting trash to other countries and keeping the good stuff for themselves. The EU delegate rebuked, "The food you keep for yourself is already that crappy. Wouldn't the food you sell us to be even worse?" Director Ma signed, "The Chinese really lack backbone (*mei zhiqi)*."

As food safety becomes a mandate that Chinese fisheries officials comply with western standards, drug residues reduce food safety regulation to simply a technical issue that hinges on the detection of trace amounts out of the contexts of farmers' knowledge. In China, chloramphenicol is not a banned drug for human use, but is easily available over-the-counter for treating conjunctivitis. Therefore, it poses a huge task for fisheries officials to educate farmers about the harmful effects of even a tiny dose of the antibiotic. Zhanjiang Fisheries Bureau dispatched free brochures on banned drugs and even screened an advertisement on a local TV station stressing "Maximum 50,000 *yuan* fine" for corporations and individuals who use chloramphenicol, nitrofuran, and malachite green.

Before 2008, drug residues were considered an issue largely relevant to exports and the concept of food safety was reduced to the tracking of the several drugs banned by importing countries of EU, the U.S., and Japan. Actually the establishment of the General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ), the highest state organ responsible for food safety regulation, was established hastily with the merger of the State Bureau of Quality and Technical Supervision and State Entry-Exit Inspection and *Quarantine* Bureau in April 2001 to fulfill the mandate of WTO, which China had joined later in the year after a long struggle (China Metrology 2007). In 2008, AQSIQ accomplished a huge success of zero food safety incidents after inspecting over 170,000 kgs of meat, 67,000 cartons of milk, and 132,000kgs of wheat for international athletes participating in the Beijing Olympic Games (Xu and Wang 2008). However, in less than two weeks after the conclusion of Olympics, a food safety scandal shocked China and the whole world as the melamine contamination of milk led to the deaths of six infants and the hospitalization of 52,000. Another 250,000 children were estimated to have suffered mild kidney and urinary

problems (Pei et al. 2011). This event is significant not only because of the scale of impact, but because the victims are mostly rural children, rather than "modern urban consumers." Li Changjiang, director of AQSIQ, when questioned about why melamine was not identified in dairy products earlier, responded to the press that this item was listed neither in the national standard of infant formula nor in the correspondent international food safety specifications. He might be honest, because, different from either chloramphenicol or malachite green, melamine is not a drug that is used for cows to enhance milk production and thus leaves no trace of "residues." If the aquatic drug residues can be blamed for their neglect of food safety, melamine, a nitrogen-rich by-product of plastics, is added precisely for the opposite cause, to fraudulently improve food quality, signified by the protein content of milk. It is hard to judge the relation between cause and effect, legality and illegality here. Food safety control through drug residue detection echoes a concept of what food critic Michael Pollan terms "nutritionism," in which the quality of food is measured according to officially established metrics, rather than a focus on the value of whole foods that are not tampered with through the addition of additives (2009). Given the length of the value chain and the scale of production either at the producer or processor level, the reduction of food to composite substances seem the only option for managing risks. Then, in the case of melamine-tainted milk, the questions are: Is it the designation of our food safety standard that creates "unlawful people" (*bufa fenzi*) who use fake protein nitrogen, or is it our food safety criteria that compel people to fulfill legal requirement of reaching nitrogen content?

It was hard to convince the public that such a toxic chemical was not on the list of AQSIQ. Li Changjiang was highly criticized for his comment as journalists reminded him the

notorious pet food recall in the United States in 2007 as pet food imported from China contained melamine and caused kidney stones of pet animals. Although melamine entered the list of AQSIQ, but as food safety regulation geared towards meeting western demands, the toxic substance failed to be listed in products targeted for domestic consumption. Li was forced to resign as he was blamed for allowing the big brands such as Sanlu "China Famous Brand" to be exempted from quality inspection (Su and Ma 2008). However, Li's oversight reveals how the trajectory of melamine from a hidden toxic in the AQSIQ inspection list to visible kidney stones in the poor children render the boundary between human and nonhumans redundant. Matters are always vibrant, but whether it is visible or not is depended on how we define visibility in the first case.

The state's tightened control on food safety has failed to contain scandals, as unheard toxins like Sudan Red, *ractopamine* (feed additive to promote the leanness in pigs) keep mounting. What scared the public most in 2011 might be the word "gutter oil" (*digou you*), cooking oil that was recycled by "a criminal network" who filtered, repackaged, and repeddled it to restaurants. It is estimated that each year, 2 million tons of "gutter oil" enter the food chain. In September, the police arrested 32 suspects in Ninghai County of Zhajiang Province who were believed to be part of a ring spanning 14 provinces that participated in the underground trade of impure oil. What engaged the public was not only the stunning scale of volume and the widespread network of the gang, but an official's surprising announcement that the gutter oil actually passed the edible oil quality standard (Xinhua News 2011). After a spokesman from the Ministry of Health admitted that none of the detection methods proposed by experts worked to distinguish the recycled oil, a call was posted to collect folk methods from the public. In less than two weeks, 300 testing methods

were submitted by email to the government agency and awaited validation from experts (China National Radio 2011). The technical standardization of food safety management both generates a necessity for liquid chromatography devices sensitive to detect ppb level residues along with equipment unable to distinguish gutter oil from edible oil, revealing the vibrancy of "toxins" that often escape technical detection. Gutter oil continues to live an afterlife of our dining, not much as a product of gangster act or government oversight, but as a visible demonstration of the recalcitrant effect of excessive consumption.

"Backyard Farmers" Vs. "Modern" Consumers

Despite of fisheries officials' uneven acceptance of the ever stringent testing standards, they still have to fulfill their duties as food safety controllers. In the "National Aquatic Food Safety Management Meeting" in June 2006, the first meeting in China on food safety of aquatic productions, Fan Xiaojian, a vice director of the Ministry of Agriculture in charge of the fisheries sector, amidst the media frenzy of food safety scandals exposure, attributed the problems of the ongoing food safety violations in aquaculture to be "the incompatibility between producers' traditional mode of farming and concept of management and the modern consumption concept" (Fan 2006). In several of my interviews, fisheries managers described their difficulties in turning fish farmers into legal subjects as a problem of "thousands of family and households" (*qianjia wanhu*), who were too scattered to be centralized, too small to sustain financial penalties, and too ill-educated to absorb emergent knowledge on food safety.

The image of backward farms doing harm to modern consumers was reiterated in a *New York Times* year-end report in 2007 entitled "In China, Farming Fish in Toxic Waters,"

as part of the series called "Choking on Growth," which examined China's acute pollution crisis accompanying rapid economic development. It argues that "(e)vironmental degradation… has become a food safety problem" when the congestion of fish farms causes pollution and the spread the fish diseases, forcing farmers to cope "by mixing illegal veterinary drugs and pesticides into fish feed, which helps keep their stocks alive yet leaves poisonous and carcinogenic residues in seafood, posing health threats to consumers" (Barboza 2007). The allegation of irresponsible farmers was triggered by an earlier trade block by the FDA known to the Chinese seafood exporters as the June Restriction, when the FDA banned imports of Chinese shrimp, catfish, eel, basa (a type of catfish), and dace (similar to carp), due to detection of banned drugs including malachite green and nitrofurans (Schmit et al. 2007). Readers' comments ranged from lambasting the U.S. government's unrestricted control on imports thus killing domestic jobs, to calling for boycotting products from the "communist and hostile country 'China.'"

The report's condemnation that Chinese farmers intend to poison people reflects how "care for life" has become a dominant principle in developed countries. Foucault asserted that "biopower"—the power to "let live"—became the mode of governance in contemporary society to regulate both the anatamo-politics of the human body as well as the well being of population ((1990[1978]). Rabinow and Rose (2006) elaborate this term to discern at least the following elements: 1) a truth discourse of "vital" characteristics of living human beings and a array of authorities competent to speak that truth; 2) a "biological citizenship" as an aspect of a collective existence in the name of life and health; 3) "biosociality" as a mode of subjectification through which individuals work on themselves and relate to others in the name of their own life and health. Thus, Euro-American

consumers have become rational calculators of risk as the care for life forms a middle-upper class identity. Vegetarianism and consumption of organic food are on the rise and more and more people take a risk calculus approach to increase their health. Consumers as subjects of risk are produced in relation to more and more rigorous control of food safety (Cooper 2008).

Consumers' "care for life" rationale has driven up the demand of seafood. In recent decades, fish have been more and more recognized as a good resource of protein that contains unsaturated fat and omega-3, a substance essential for brain development. Aquatic food's contribution to animal protein supply has shown a gradual increase, jumping from only 6 percent two decades ago to 15 percent in 2008 (FAO 2011). In developed countries, as obesity and cardiovascular diseases gradually plague consumers indulgent in fast food, seafood carries the badge of "healthy food." Researchers have even shown eerie correlations between the reduction of criminal offenses and intake of omega-3 fatty acids as well as between the amelioration of depression and rates of fish consumption (Bennett 2010:41).

This image of the health-savvy middle-class consumer has traversed national boundaries to consolidate its basis when it reaches a productionist country such as China. Once, I joined a fish veterinary training program in Guangzhou and chatted with fellow students issues of food safety (see Chapter 5). As they knew that I came from a U.S. institution and lived in the country for several years, they often lamented: "The Americans care about their health and life very much. They have good sense and don't use any banned drugs. In China, however, human lives don't seem to be that valuable." I could not help

dampening their ungrounded admiration by replying: "Do you think that fast food and soda drinks are healthier than our shrimp? They put so many additives into processing and I don't think those additives are healthy at all."

However, I might be less capable in confronting the notion that the Chinese did not care about their life as much. In late 2008, I visited the Leizhou Fishery Technological Extension Center (LZFTEC) and asked Sister Mei, the director of the center, whether their grassroot center witnessed the change from promoting "high-yield" aquaculture to "healthy" aquaculture oriented towards food safety. To my surprise, she expressed little enthusiasm in the promotion of "healthy" aquaculture.

> Sister Ling: "You have lived in the village for some time and know that people (*laobaixing*) don't have the concept (of "healthy aquaculture"). Honestly, I don't think it matters that much if people (*laobaixing*) use small amounts of drugs. We still use chloramphenicol in eye drops. Why should we make a fuss if we use it a little bit in aquaculture? It is proved to work effectively with killing streptococcus, but I guess that it is ok if we use a substitute."
>
> Huang: "Director Chen Wen said that the U.S. demands a too rigorous standard. Even if you add one drop of banned drug into the whole pond, you will be accused of exceeding the limit."
>
> Sister Ling: "I agree. What the U.S. is doing is 'picking chicken bones from an egg.' Farmers are used to living in dirty conditions and don't have these concepts of hygiene. If you tell them that the shrimp can't be consumed just because it contains a little bit of the drug, they won't listen to you. Now malachite green has been banned because it is believed to be a carcinogen. However, when I worked in the hatchery in the late 80s, we used it everyday. Often we grabbed it with our hands and got our fingers all yellow. Then we grabbed food without even washing our hands. Now, am I not healthy? The U.S. wants to promote its standards (of hygiene), but how can the Chinese people accept them? Is it really that good if you live in such a hygienic environment? It doesn't seem that the U.S. people live much longer than us Chinese. I am really not much motivated in promoting "healthy aquaculture." If you want me to promote a good farming technique, I would be interested, but not so much for the knowledge of banned drugs."

I was quite shocked when I heard her comments. Looking at the piles of official documents on the food safety campaign, I am sure she was way more knowledgeable on the toxic effects of those banned drugs than I or another ordinary consumer, but how come she was not hailed into the food safety discourse? That probed me to rethink farmers'

responses to one of my initial interview questions: "If some one gives you a bag of shrimp that has been detected with banned drugs, would you dare to eat it?" I got quite a few positive answers and felt uneasy while I was in the field.

It was not until I started to do experimental shrimp farming that I saw my own standpoint shifted from a consumer to a producer. After taking classes on environmental studies and aquaculture at the University of Washington, I learned the concept of sustainability and decided not to use antibiotics and other chemicals. But as I got into the process, ever day there was tremendous risk. There were at least three major typhoon attacks during the 82 days of my farming experience. The heavy rain accompanying the typhoon is believed to be harmful for shrimp growth as water stratification caused by the influx of fresh water to the surface of the pond might result in the decrease of pH value and salinity, exacerbating an oxygen deficient environment when microalgae was already weak in the ability of photosynthesis (Hu et al. 2010). Moreover, the change of water environment might stimulate the growth of *vibriosis*, a detrimental disease for shrimp that required the use of antibiotics such as chloramphenicol before it was banned. In low oxygen condition, shrimp easily get sick and did not feed well. Whenever those days came, I was very worried and often could not sleep in the evening. The bigger the shrimp, the more concerned I became as the loss would add up day by day.

Now pairing Sister Ling's comment with the farmers' answers, I realized that the gap between "backyard farmer" and "modern consumer" was not an outcome of the uneven exposure to "knowledge" itself. It is not so much that farmers were illiterate and unable to understand the scientific evidence of food safety risks, but they see the salvation of shrimp

as prioritized over caring for consumers' welling-being. Although shrimp is produced for consumption, the linkage between production and consumption is broken when commodity becomes the mediator to disruption the interaction between farmers and consumers.

Reading closely, Sister Ling's dismissal of the harmful effects of malachite green does not convey her indifference towards health hazards, but an understanding of risk that is embodied from her own experience. As the trajectory of the carcinogen from her yellow fingers to her stomach did not leave her any uncomfortable feeling, this visceral encounter that links production and consumption together informs her perception of risks, one that differs from "modern consumers" who have to buy into scientific nutrition advice as the industrial production of food renders a "time and space compression" (Harvey 1989) much faster than the accumulation of visceral experience.

The nutritional science that designates certain food as good or bad counters human being's long tradition of being adventurous and not necessarily wanting food to be perfectly safe. Speaking about the desire to try the unknown, the Chinese people will easily remember a statement by Lu Xun, one of the most prominent writers in the early 20th century who expressed an outcry for national awakening when China was about to be torn apart by colonial forces and domestic bureaucratic corruption. "The first person who tried crab is to be admired. If not a warrior, who would dare to try it? Crab has been eaten, so have spiders. However, a spider does not taste good and people don't want to eat it afterwards" (Lu 1973). Writing at the end of 1932, almost one year after the "January 28th" incident when the Japanese tried to expedite their occupation of China by attacking

Shanghai, Lu was indignant on how people in Shanghai resumed their lives so quickly and seemed to have forgotten the blood and sacrifice expended in the resistance against the Japanese troops. By calling the first crab eater a warrior, he reminded us that the ease we have now in knowing which food was edible and which was poisonous should be attributed to the sacrifices of predecessors. "Many historical lessons are obtained though tremendous sacrifice"(Lu 1973).

The first crab eater feeds into the feedback loop of what is edible and what is not reminds us that food taboos and risk perceptions are always embodied, different from presumably universal nutritional advice that designates certain food as good and certain as bad *in themselves*. Haraway criticizes the masculine totalizing approach of scientific objectivity, concealing the rhetorical and social aspects of science. By calling certain food nutritional guidelines as universal, consumers might sometimes forget that what enters the list of recommendation and taboo is highly political. For example, the 2005 food pyramid was changed from a vertical one to a horizontal one, obscuring the notion that meat producers wanted to encourage consumers to not limit their consumption.

The Chinese people's lack of a modern consumption concept is sometimes blamed for spurring global food safety threats. Mei Zhan depicts the eerily human-nature encounter in the aftermath of the SARS outbreak in China. The origin of SARS remained uncertain, but the civet cat became a "scapegoat" that people laid blame on. The Orientalist accusation of Chinese as having an aged-old appetite for "wild animals" collided with the neoliberal discourse that propels desires for consumption in a Real Madrid football team's visit to China. Western media highlighted how the exotic food in the menu proved indigestible for

Beckham's healthy body, but failed to problematize his body as a consumable when his unwashed slippers, pajamas and bed sheets were auctioned to feed the appetite of frenzy fans. By tracing how the "visceral" enters into contemporary knowledge production, Zhan shows how Orientalist and neoliberal discourses are entangled with each other in the realignment of human and nonhuman bodies.

The image of the unruly farmers who lag behind modern consumption demands poses a headache for food safety regulation charged with tracking health hazards.

Sister Ling's comments might have downplayed the state's effort in enhancing the standardization of aquaculture production. "Without standardization of agriculture, there would be no agriculture modernization, and no guarantee for food safety." In April 2007, President Hu Jintao issued the above statement after a study group meeting with two food scientists from the College of Food Science and Nutritional Engineering, China Agriculture University. One was Luo Yunbo, dean of the college who specializes in research and assessment of Genetically modified (GM) food and was famous for his later statement that he could accept a four-legged chicken if it was protein that we demanded. "A two-legged chicken and four-legged chicken looks the same to me. Our ears are short while the pigs' ears are long. We won't grow big ears even if we eat pork. Therefore, we won't grow four legs if we eat four-legged chicken" (Beijing News 2009). His bold statement was soon cited in blogs, questioning his reductive statement of protein equivalency. At first, it might seem odd if one of the most prominent scientists working on agricultural food quality and safety endorsed GM food. However, if we understand the current food safety management regime to be guided by the principle of standardization, of meeting verifiable criteria, we will see

why GM food might become even a better source of protein or carbohydrate. The "nutritionism" that Luo falls into fails to see the possible harms of changing the materiality of thing at the genetic level.

The standardization of small famers began in 2004 when the Ministry of Industry and Commerce designated farms to be registered and affiliated with a processing company if the products targeted exports. In recent years, with the increased frequency of food safety scandals domestically, the state began to learn from Euro-American countries to establish a traceability system. Guangdong became the first provinces that launched a trial of aquatic production traceability system. I interviewed Li Linna, an official from the GADCC who took charge of the trial system with 7 aquaculture farms, 5 wholesale markets, 2 processing companies, and 1 provincial food safety and quality control center. Li talked about how they encountered technical barriers as aquatic products were usually transported collectively instead of as an individual like a chicken or a pig. As products mix with each other during transportation, it is hard to trace which piece of fish is contaminated.

Tilapia Forum

I had not realized that "food safety" enforcement could revamp the whole tradition of farming until I attended a tilapia industry crisis forum in July, 2009. Since the outbreak of the global financial crisis the previous year, farmed tilapia from China to the U.S. has suffered a stunning decline of 30 percent. The forum invited the participation of farmers, processing factories, fisheries officials, and other stakeholders to find out how to get out of the plummeting pricing spiral. The processing factories were purchasing fish from farmers at a price of *7 yuan*/kg, but could hardly find any U.S. distributors willing to purchase if

they quoted a price over *3 yuan*/kg. The farmers suffered the hardest hit over the years because the cost of production not including labor was about 7.5 *yuan*/kg. Who is making money in this business? The riddle was quickly solved as a speaker showed the audience the Wal-Mart price tags that he got from his student who was studying in the U.S. The price of the whole frozen tilapia was US$ 3.08/lb, equivalent to 16 *yuan*/kg. From 3 *yuan*/kg to 16 *yuan*/kg, the audience burst in anger, asking why Chinese exporters did not have any power to set prices despite China's status as the biggest tilapia exporter in the world.

However, the discussion ultimately did not focus on how we could improve Chinese bargaining power against the Americans, since the solution of this would take too long to save the Chinese farmers from bankruptcy. Therefore, if the price remained inflexible, cost saving seemed to be the only road to salvation.

Fig 4.1 A "3D" Farm

Fig 4.2 Geese shed next to the "3D" Farm

The forum entered a heated debate on whether the mode of "three-dimensional farming (Three-D farming)" (*liti yangzhi*) should be promoted. In front of the scientists and

officials, farmers' representatives strongly recommended this kind of farming. One farmer showed that compared with the cost of monoculture, i.e., 7-8 *yuan*/kg, Three-D farming could reduce the cost to as low as 5 *yuan*/kg. Three-D farming, a kind of farming that integrates both pigs and poultry farming on land and fish aquaculture in water, can significantly reduce food conversion ratio (FCR) as fish consume the manure of pigs and poultry that are raised by the pond. Chen Zhisheng, a long-time fish farmer but now the owner of a major processing plant, recommended highly this "ecological model" for not only reducing costs, but also dissolving feedlot wastes in an environmentally-friendly manner. This mode of polyculture also gives farmers extra income from selling pigs, chickens, ducks, and geese. Even the United Nations Food and Agriculture Organization (UN FAO) recommended this mode of aquaculture a decade ago. I visited one such farm in April this year as I followed fisheries officials for a food safety inspection trip in a reservoir area. The water was green and clean. I got very excited as I saw the geese swimming in the pond. Compared with industrialized chicken farm described by Michael Pollan in "The Omnivore's Dilemma," the Three-D model that traverses land and water proves itself to be an ecological and economic system. However, my excitement was shortly dampened as the director of the local tilapia cooperative told me that this farm was not eligible to join the cooperative whose products were targeted for export. Why?

In the forum, despite Chen Zhisheng's well-received talk on the pros of 3-D farming, it seemed obvious that he still failed to accomplish his alleged goal, which was to "rectify the bias against farmers" (*wei yangzhihu pingfan*). The audience witnessed how vulnerable 3-D farming became, as experts, scientists and officials, one after another, easily knocked down the legitimacy of farmers' knowledge. "Three-D farming" needs to be banned (*dujue*), said

Li Laihao, a renowned scientist on tilapia processing technology. He then pinpointed the problem of bacteria excess and antibiotic residues, a fact prominent with 3-D farming that gathered manure from land animals. The processing expert then tried to enlighten the audience to explore new markets such as fish fillets for microwave cooking and for fast food use such as MacDonald's tilapia burger. Next, Wang Wei, an official from the Office of Food Management of Guangdong CIQ authoritatively stated that tilapia raised with 3-D farming absolutely did not meet export requirements. Instead, he presented a model of rigorously managed traceability (*zhuishuo*) system and certification system that could ensure markets for exports. Finally, the much respected "father of tilapia," Li Sifa, a professor from the College of Life Sciences at the Shanghai Oceanic University, wrapped up the debate with the following remarks: "In fact 3-D farming was an invention of our old ancestors (*lao zuzong*), starting from the Tang Dynasty (618-907). In the past, this mode of farming represented the essence of fish aquaculture that integrated aquaculture with terrestrial grass and fruit tree planting as well as pig and poultry farming. However, the way we are doing fish aquaculture today is not the same as the integrated fish farming in the past. At that time, there was not much use of fertilizers or pesticides, but now we apply fertilizers, pesticides, feed additives, and all kinds of hormones. Therefore, even if we replicate our old ancestors' methods, we don't get the same product. If we can practice 3-D farming without adding harmful inputs…I cast my great support of 3-D farming." As I waited for his guidance on how to revive our great civilization, instead he just paused as if it deserved no more than a passing mention not to mention extended discussion. Then he immediately shifted the topic to urge tilapia processors to unite together and defend the price against foreigner purchasers. "Our industry cannot allow the existence of Han-traitors

(*hanjian*), a term that was used to refer to the Han people who betrayed the interests of the Han kingdom or nation to foreign invaders. He even cited historical cases of Chang Kai-shek's pacification policy against the Japanese colonization and Wu Sangui's complicity in the Manchu conquest of Han as warning signs of why we failed to get a fair price of tilapia from the U.S. purchasers. The 3-D farming debate subsided as farmers failed to present new evidence to defend their argument and challenge the experts.

Chapter 5

Dialectic *Guanxi* (Relation): Neoliberal Logics in the Campaigns for Food Safety Control

It has been little argued that the Chinese reform leadership pursues a development path drastically different from the Maoist era, as profit-seeking ethos have gradually replaced the class-leveling campaigns that promised a future of common prosperity. Despite of the state's massive marketizing effort, many political scientists still feel it problematic to see a visible hand as they lambast the Chinese state for being a "developmental autocracy (Pei 2006)," "market Stalinism (Blecher 1997; Nolan 1997)", and even "gangster capitalism" (Holmstrom and Smith 2000). These terms champion a social and economic formation regulated by the "free market," condemning the state as the heavy-headed apparatus that jeopardizes individual freedom and market efficiency.

Recently, there has been burgeoning interest in whether we could apply the term of "neoliberalism" to China. Many commentators refuse to acknowledge that neoliberal logics have been formative of China's economic reforms because of the visible role of the state in engineering the redistribution of power between state and market.

In this chapter, I analyze two cases in the Chinese state's food safety regulation campaign: a fish veterinary training program and a drug residue detection trip. I argue that not only should we not dismiss neoliberalism's influence on China's political governance, but we should also pay serious attention to its operation and transformation so as to gauge the entangled rather than dichotomous state-society relations. Drawing from Althuseer's concept of overdetermination, Foucault's theorization of governmentality, as well as the

Chinese concept of *guanxi*, a conceptualization relation as reciprocal, I urge a reconceptualization of state-society relation that refrains from the binary top-down, consent-coercion framework, but explores how cause and effect are the condition of each other. In China, the emergence of food safety exposes the deficiencies of markets in self-regulation and thus urges the state to intervene in the deregulated veterinary pharmaceutical industry. However, the neoliberal state encounters a dilemma as the state attempts to step back while encouraging the creation of market forces. The fish veterinary program represents a neoliberal process of creating a lean state, when the state will employ only official veterinaries to control epidemic diseases and leave the certified veterinaries to learn self-help and make their living from the market. The drug residue detection incident, on the other hand, indicates the complex but fragile *guanxi* between the marketizing state and citizens. The old *guanxi* of the state as a commanding and caring father was declining as the planned economy was terminated, but a new basis for reciprocity has yet emerged.

Theorizing State-society Relations

Despite of their condemnation of the state's intervention in the economy, the liberal economists who refuse to endorse neoliberalism's entrenchment in China actually coalesce with the Chinese state's espousal of the "economic law" (*jingji guilü*). In the aftermath of the Cultural Revolution, the reform government valorized economic law as the "true, natural, objective, and necessary science of historical Development" and they blamed Mao for his defiance or ignorance of the law and thereby holding up China's economic progression (Yan 2008:232). The rationale of market fundamentalism, as exemplified in the late pragmatist

leader Deng Xiaoping's "cat theory," known as "It doesn't matter if the cat is a black or white cat, as long it catches mice," ironically converges with elites who champion vulgar Marxism as they highlight China's inevitability of going through the stage of capitalism when they reiterate how Marx proscribes a universal, linear, and teleological progression of history that unfolds through stages of development: primitive, feudal, capitalist, socialist, and finally communist. Therefore, economic law "perhaps stitches together the discontinuities of party leadership in separated realms of economy and ideology" (Yan 2008:233).

The reform government's political and ideological endorsement of the market problematizes liberal economists' simplistic projection of a zero-sum game between the state and the market. In recent years, amidst the sweeping force of neoliberalism, scholars have called into question the "top-down" relation between state and society as they challenge that neoliberalism is predicated upon: 1) the concept of state and society as self-contained totalities; 2) the notion that equated "governing" with the state's action upon society (Dean and Henman 2004).

Overdetermination

In the early 1960s, after Stalin's death, the International Communist movement encountered a conjuncture in terms of how to defend Marxism in critique of the "cult of personality"(Althusser 2005[1965]). As a member of the French Communist Party, Althusser remained unsatisfied with the "humanism" of the Communist intellectual as he began to think deeply the relation between capital and labor, between economy and ideology, as well as between theory and practice. As scholars questioned the efficacy of the

linear history as outlined in the vulgar Marxism in the work German Ideology, Althusser tried to identify ways to resuscitate Marxism as he eschewed a deterministic view of history to understand how "survival" of old elements might become determining elements in the new superstructures.

Althusser's critique of the humanistic revisionists begins by demonstrating how Marx's dialectic does not mean a simple inversion of the Hegelian concept. Hegel illustrated a development of human consciousness and knowledge to be grounded in a process of negation in the triple process of thesis-antithesis-synthesis. Use the example of freedom. A liberal notion of freedom might conceptualize it as people can do anything they want. This thesis soon encounters oppositional forces that change it into antithesis as one's freedom inevitably interfere with other people's freedom. A rational person will not be defeated by the counter forces if he or she is able to move into another stage of negation—synthesis when the individual realizes that unless one respects other people's freedom, there will not be freedom for everybody in the collective. At this stage, one achieves "absolute knowledge" as the mind realizes things hostile to itself is in fact part of the self and as a result is able to order the world in a rational way (Singer 2001). Even at his time, in early 19th century, Hegel was already challenging the British liberal economists who championed a utilitarian notion of freedom driven by brute desire.

Hegel's dialectic method upholds that ideas and phenomena are inherently bound up with their opposites in such a way that the resolution of contradictions leads to continual qualitative progression. However, as an idealist, Hegel was only concerned with the freedom of the *geist* (spirit). In his division between a civil society governed by material

needs and a political society or State embodying the consciousness of the epoch, material life is "merely a Ruse of Reason" and the concrete history of all peoples is to be explained by a dialectic of consciousness (Althusser 2005[1965]). As Marx takes up the dialectical method, he proposes the term "materialistic dialectic" to highlight how people's ideologies are merely the phenomena of their material life. However, Marx's materialistic grounding should not be reduced to a simple inversion of Hegel. When Marx replaced Hegel's term civil society with social class, on one hand, he refutes Hegel's notion that the State represents a sublimation of human groups (phenomena), but reveals how the State set people to base themselves on ideas of the ruling class. This is not to be reduced to simple economic determinism, however. Critiquing Hegel for confusing "the real as the result of self-synthesizing, self-deepening and self-moving thought" (Althusser 2005[1965]:108), Marx argues that the relation between the economic base and superstructure is "overdetermined," each acting as the condition of existence of each contradiction. "This reflection of the conditions of existence of the contradiction within itself, this reflection of the structure articulated in dominance that constitutes the unity of the complex whole within each contradiction" is what Althusser defines as "overdetermination" (2005[1965]:206).

The overdetermined, dialectic relations between state and the social class will be helpful to understand the Chinese circumstances by debunking the notion of civil society as a homogenous entity and freedom as detached from social relations. Moreover, this theorization reframes from a linear causality to conceptualize the state and social class as mutually constituted and interested. Rofel (1999) problematizes a Eurocentric universalist modernity in her book entitled "Other Modernities: Gendered Yearnings in China After

Socialism," as she portrays how post-Maoist modernity is overdetermined by aspirations shaped by transnational capital, socialist conviction of gender equality, and nationalist sentiments of progress. Pun proposes the concept "*dagong* (worker)-subject" that deploys transgressional resistance through narrating their personal pain, dream, and scream, experiences "of not only minority but subalternity and collectivity (Pun 2005:193)." Yan posits that a "specter of class"—a moment of awakening—does not automatically derive from the division of labor between masters and servants, but individual humiliation needs to go through "a process of dialectic return to the collective" (Yan 2008:211). Subaltern subjectivity is not a thing but "social and cultural formation arising from processes" (Yan 2008:212). These examples problematized the notion that society, or social class in Marx's term, exists as the target of oppression by the state, but reveals how a contradiction between state and society are the condition for the existence for each other.

Governmentality

The attention to the importance of superstructure has lead Althusser (1971) to distinguish a difference between state power—objectives of class struggle—and state apparatus—the instruments deployed to obtain state power. Among the domain of state apparatus, he further differentiates a Repressive State Apparatus and an Ideological State Apparatus (ISA), depended on whether they prioritize their working by way violence or ideology.

The notion that power might not necessarily work through repression helps his student Michel Foucault to further explore a form of power in discourse and governmentality. Foucault reveals his inclination to move away from an analysis of subjects

driven by "techniques of domination" to an interest in "techniques of the self". However, a genealogical study of the subject requires an analysis between these two techniques with respect to each other. From the point of view of domination, one "has to take into account the points where the technologies of domination of individuals over one another have recourse to processes by which the individual acts upon himself" (Foucault 1993:203). From the point of view of techniques of the self, one "has to take into account the points where the techniques of the self are integrated into structures of coercion or domination." Where these two techniques meet, as a "contact point, where the individuals are driven by others is tied to the way they conduct themselves, is what we can call, I think, government" (Foucault 1993:203).

To govern, argued Foucault, is "to structure the possible field of action of others" (1982:221). The concept of "governmentality" breaks down the consent-coercion framework that identified power with domination, drawing our attention to the heterogeneity and complexity of power relations. It tries to bridge the "missing link" between state and individual relations by establishing the connection between the constitution of the subject and the formation of the state. Semantically, governmentality links governing ("gouverner") and modes of thought ("mentalité") to integrate the study of technologies of power with an analysis of political rationality (Lemke 2002).

Foucault's concept of governmenality has been adopted by scholars who try to understand the process of subject formation under the current neoliberal economy. While neoliberal protagonists insist that the new economy regulated by the "free market" represents a break from the previous stage of Keynesian state control, critics immediately overthrow their logic by presenting the "roll-out" neoliberalism in which the state

intervenes to eliminate anti-market forces and legitimize the reduction of social welfare (Peck and Tickell 2002). State imposes the same direct intervention by empowered and specialized apparatus, but also develops indirect techniques to lead individuals into becoming "responsible (moral)" and "rational (economic)" individuals. Compared with the technique of dominance in discipline power, neoliberal governmentality identifies "technique of the self," "where the individuals are driven by others is tied to the way they conduct themselves" (Lemke 2001:204).

Governmentality highlights the intimate relationship between "ideological" and "political-economic" domains and is instrumental in analyzing the issue of government reason and subject formation. The reform era in China witnessed political governmentality to shift from "government" (*zhengfu*) to "governance" (*zhili*). Sigley terms this integration of authoritarian and liberal rules as a "hybrid socialist-neoliberal" form of political rationality (Sigley 2006:489). While the Maoist period deployed Marxist-Leninism to implement "socialist art of government" hinged on social and economic planning, the reform period gradually adopted strategies that call for governing through economy and the absorption of social science into government policy (Sigley 2006).

The reform government has deployed various human engineering projects to cultivate individuals' civic awareness especially in terms of their economic and social rights (Keane 2001). In place of a subject identity associated with labor, the reform era promotes citizen rights to consumption and recreation through disseminating "leisure culture" (Wang 2001). The dissolution of the socialist *danwei* (work unit) is superseded by state's promotion of "community building" (*shequ jianshe*) that emphasizes "self-governance"

(*zizhi*) through channeling democratic methods for decision-making in the "three selfs:" "self-management," "self-education," and "self-service." (Bray 2006:544). The 'self" initiative is predicated on dividing citizens between those who are qualified to govern themselves and those who are not. By assigning qualified subjects "self-help" duties, "community building" serves to reduce government costs of management while preventing social ruptures.

One remarkable change in state-subject identity is the shift from "class-status" (*jieji*) to "social strata" (*jiecen*) (Anagnost 2008). After the Cultural Revolution, class was repudiated as an inappropriate category both for its unpleasing political connotation associated with sectoral fighting (Wortzel 1987:115) and for its ultraleft equalitarian ideology that deprived peasants of enterprising spirit (Anagnost 1989). The new language of "social strata" is a depoliticized one as it seeks to dislodge social inequality from an economic mooring, but relegates poverty to the individualized domain of human capital. In the early reform era, a discourse of "quality" (*suzhi*) began to acquire its power as an index of human capital, through association with population quality (*renkou suzhi*), representing a shift in state policy "from regulating births to raising the quality of the population as a whole" (Anagnost 2004). In the 1990s, *suzhi* discourses spread a wider use in domains like: urgency to development of urban children's psychological health (*xinli suzhi*) and the disparaging remarks that render rural migrant workers as "low quality" (*suzhi di*) (Anagnost 2004). Yan defines *suzhi* as "somewhat ephemeral qualities of civility, self-discipline, and modernity" that bear its manifestation on the individual. The new site of micropolitics represents a "value articulation of human subjectivity" (Yan 2003:494), differing from the more macro constructions of the socialist commune and the contracted

household. This "neohumanism" functions as the "intangible operator" to solicit peasants to leave their rural household and move to the cities, both to learn in the "comprehensive social university" and to aspire for urban middle-classness and a desire for for material consumption. However, *suzhi*, despite its glamorous promise to deliver "value" to citizens, operates as a concept-metaphor that is able to sustain itself only through a "lack" rather than fulfillment. Through a discourse of devaluation, migrant labor's body is represented as not only exhibiting a "superadequation to itself" by producing "surplus value", but also "superexploitation" in its ability to endure extended risks of body impairment (Anagnost 2004:194).

The Marxist dialectic method and Foucault's governmentality discourse are helpful for me to analyze state-subject relations in projects such as fish veterinary system reform and food safety law enforcement control as explicated below.

Guanxi

Guanxi literally means social relationship or social connection. Scholars on socialist Chinese society have lavishly elaborated on the prominence of *guanxi* in constructing interpersonal relations (Anagnost 1986; Chan and Unger 1982; Solinger 1983; Sun 1983, Yang 1989). Mayfair Yong describes *guanxi* as a "gift economy" that "carves out a sphere of oppositional tactics against techniques of normalization and discipline" (1989: 50) under the state redistributive economy). In the early 1980s, not long after the end of Cultural Revolution, the Chinese state still maintained an active role in a redistributive economy based on the rationale that the "centralized state can best determine social needs and distribute in an equitable fashion according to objective needs." However, these "objective"

criteria often turned into a normalizing force that generated inequality among people, and it is the role of *guanxi* to ameliorate the deficiency. For example, at that time, the state still assumed the responsibility of providing housing to employees of work-units (*danwei*) and an applicant's eligibility was usually determined by their credits based on a "List of Conditions for the Allocation of Housing" that included criteria based on seniority, intellectual merits, observance to the state population policy, personal honors, need for housing, and so forth. People who ranked high in these criteria might still need to use *guanxi* to consolidate their priority, while those who ranked low might have to work harder with *guanxi* to rise in the list. "(T)he art of *guanxi* exchange lies in the skillful mobilization of moral and cultural imperatives such as obligation and reciprocity in pursuit of both diffuse social ends and calculated instrumental ends" (Yang 1989: 35). As a form of gift economy, the *guanxi* discourse reiterates the state's responsibility in provisioning welfare to citizens.

The above summary problematizes a top-down, oppositional relations between state and society and thus reveals how we cannot deny neoliberalism's operations simply by judging state's intervention or not. The discourse of "retreat of the state" and "freedom of the market" champions an ideology of market triumphalism that cultivates subjects as "*homo economicus*," versed in competition and absorbent of risks, who does not beg the state for welfare provision. However, this discourse conceals how "(c)ompetition necessitates a constant intervention on the part of the state, not on the market, but on the conditions of the market" (Read 2009:28). In the following section, I would like to discuss the two campaigns under the "Action Plan for the Promotion of Healthy Aquaculture" (*shuichan jiankang yangzhi tuijin xingdong*) to demonstrate the paradoxical process when

the Chinese attempts to step back while encouraging the creation of market forces. This will help us understand how neoliberalism constitutes an overdetermined relation between state and society.

Fish Veterinary System Reform

In 2007, a newspaper headline caught the public attention: "Nation's Fish Veterinaries Debut in Guangdong" (Su and Cai 2007). As one of the top three aquaculture producers in China, Guangdong Province hailed the launch of a trial program for training licensed fish veterinarians. However, the tone of the paper was both celebratory and worried, as it also pointed out the frequent drug residue scandals associated with aquatic products. "Guangdong citizens, who enjoy seafood and are audacious in food consumption, can't help feeling scared of aquaculture products" (Su and Cai 2007). The news report then tried to ease readers' concern by showing that the provincial fisheries management agency's effort of establishing a licensing system for fish veterinarians might help ameliorate food safety risks by standardizing drug use. Chen Aiping, Director of the Office of Aquatic Animal Disease Control in the National Fishery Technology Extension Center (NFTEC), was both proud and concerned to see the establishment of fish vets, as she talked to me during an interview: "China is the first country to produce fish vets. There is no other country that holds such a large-scale aquaculture industry and we definitely need to create fish vets for the standardization of (*guifan*) drug use, but the problem is that we don't have an established model to follow in terms of how the system should run."

Guangdong Province, as one of the top three aquaculture producers in the country, was selected run a pilot project to establish a fish veterinary license system, as part of the

broader agenda called the "Action Plan for the Extension of Healthy Aquaculture (*shuichan jiankang yangzhi tuijin xingdong*)" which the Ministry of Agriculture launched in 2006 to standard fish farming practices to meet international food safety standards (Guangdong Fishery Technology Extension Center 2008).

Since the exposure of the "Chloramphenicol Incident" in which the European Union issued a ban of all animal source products from China after the detection of antibiotic residues in some shrimp products in 2002, the Chinese fisheries management has had to take up the mandate to curb the ever increasing food safety concerns that have crippled exports and alienated domestic consumers. What are the best ways to prevent such incidents from happening in the future? That is a thorny question in which the state finds it difficult to reposition itself in relation to the market. Have the food safety scandals exposed market's inability of self-regulation or have they signaled the presence of an immature market? Does the state needs to intervene and overcome the defect of the market or should the state step back to let the market standardize itself?

The establishment of the fish veterinary system reform reflected the dialectic relations between the state and the market. The brute freedom of the market needs to be harnessed as immoral profit seekers will produce and use illicit drugs to harm consumers. However, the state under the "socialist market economy" sees it impossible to go back to the time of "command economy" in which the state oversaw the minute behavior of each producer. Instead, the state chooses to see itself as not antagonistic of the market, but ironically turns its rationale as market-oriented. Food safety will be guaranteed as all fish farmers become moral and responsible producers and the licensed fish vets will soon

replace charlatans to facilitate the transition. Therefore, the establishment of the license system can be understood as a kind of neoliberal project that operates in two aspects. First, the reform calls for the creation of a lean state, which will employ only official vets to control epidemic diseases (*yi*) and leave the licensed fish vets to learn self-help and make their living from treating regular diseases (*bing*). Second, the licensed veterinaries will have to become market subjects who excel through standardizing their practices.

The first licensed fish veterinary training program was launched in August 2007 to recruit 22 students, mainly shrimp farming professionals from Zhanjiang, the largest shrimp production base in China. In 2008, two more train programs were organized that produced about 60 prospective fish vets. I attended the second one that was held from November 25 to December 9 in 2008.[13]

Demarcating *Yi* and *Bing*

If food safety works as an external force for China to standardize drug regulation, the need to slim government might serve as an internal impetus for the state to push forward the Veterinary System Reform (*shouyi tizhi gaige*) which the establishment of licensed vets is part of. In one of the beginning classes, Director Chen Aiping explained to the students that the Reform will soon divide animal diseases into two categories: epidemic diseases (*yi*) that fall under state control and regular diseases (*bi*) that are left to the hands of the market. Epidemic diseases are divided up into three levels. Level I are those that

[13] After they finished the training program and passed the tests, the candidates' profiles needed to be submitted to the Ministry of Agriculture for approval before the license was issued. Due to the change of state policies, Guangdong Province's trial of licensed fisheries veterinaries was not endorsed by the state. As a result, the students who passed the training were not certified as licensed fish vets.

pose a serious threat to both human beings and animals and the state will stamp them out, such as avian flu and mad cow diseases. Level II and III are diseases that have a minor threat and impact and fall into the jurisdiction of local governments. In contrast, regular diseases are the ones that fall outside of the domain of epidemic disease and do not demand government supervision at all. Accordingly, the vets will be organized into three groups, including officials vets, licensed vets, and rural vets. The official vets are government-appointed officials who are authorized to carry out quarantine duties. The other two groups of vet will deal with regular diseases and have to resort to the market for survival. In five to ten years time, rural vets will be dissolved or become licensed vets.

The mandate of the training program is to facilitate the transition of rural vets into licensed ones. The rural vets are semi-officials of the socialist communes that ran from the late 1950s to early 1980s. With the dissolution of the commune, their status as "officials" becomes ambivalent in the reform era. Currently, state-run rural cattle vet stations still employ around 400,000 vets that perform tasks such as immunization, disease treatment, etc., even though many of them are operating marginally. The rural vet station was established in the 1950s as an organization under the commune system. At that time, when China did not develop a strong industrialization basis and was eager to "catching up with Britain and surpassing the U.S.," the most efficient way was to collectivize the countryside so that resources could be collectively deployed for militarization and industrialization purposes (He 2008). Although the state decided to terminate the commune as a political structure in 1983, many of the functions that communes used to run were still carried over, including the grassroot vet station.

Sister Ling from the Leizhou Fishery Technology Center (LFTEC) remembered her experience working as a rural fish vet by making vaccine for grass carp gill disease. She collected diseased fish and cut the infected area before it was sterilized in the pot. Later she rode a bike to inject the vaccine in different villages. However, her work was forced to be terminated in 1986 when the government gradually withdrew from sponsoring the vet station, hoping that market could take over automatically. Many vet stations encountered funding cuts and had to lay off employees and increase the vaccination fees. The result is that fewer vets offered vaccination services to farmers who were also reluctant to get the expensive vaccination. At the same time, when vaccination became a market option, many money-craving vets emerged to charge farmers high fees.

The avian flu that broke out in 2005 exposed the latent problems of the market-directed vet system. Due to the insufficiency of the vets, the epidemic could not be controlled immediately and spread to many areas of the country. Now to learn from the avian flu lesson, the state decided to fulfill its responsibility in controlling epidemic diseases. Political theorist Thomas Lemke argues that "retreat" of the state is a "displacement from formal to informal techniques of government and the appearance of new actors on the scene of government (e.g. NGOs) that indicate fundamental transformations in statehood and a new relation between state and civil society actors" (2001: 11). In addition, even though the licensed fish vets are supposed to only handle regular diseases, they are responsible for identifying suspected epidemic diseases and reporting to the relevant management agencies. However, this also proves to be a challenging task for them. On one hand, according to the Animal Epidemic Prevention Law, if they treat disease that is supposed to be stamped out without reporting up, they will be

fined with up to 5,000 *yuan* (Article 28 of the Measure for the Management of Certified Vets). On the other hand, if they mistake a regular disease for epidemic disease and cause the local government to launch an unnecessary eradication campaign, the state will not be responsible for the expenses but the local government will have to pay for them. Students were concerned that the line between epidemic diseases and regular diseases is not clear and the list of epidemic diseases is constantly changing. Secondly, they might not have the proper knowledge or equipment to identify epidemic diseases.

Standardizing Practices

The fish vet system reform already shouldered contradictory responsibilities in its design. On one hand, it represents a neoliberal project exemplified by the retreat of the state and restoration of market's logics to rule, when the state desired to limit its responsibilities to with the control of epidemic diseases and to leave regular diseases to the hands of the market. On the other hand, the system was set up just because the free market failed to perform its function of regulation satisfactorily. While the market boosted fish drug production and sales, it also created many drug residue incidents that greatly crippled China's seafood exports. Therefore, a free market might become a disordered space and the state definitely has responsibilities of stretching its strong hands to stop the market from acting unruly.

The prospective certified fish vets will have to know how to navigate the murky borders between the state and the market. Financially, they are not expected to beg the state for sponsorship, but should become rational business people responsible for their own profits and losses. However, their activities also need to be harnessed by the state's

control especially when individual misconduct of prescribing inappropriate drugs might severely affect the whole country's seafood exports.

In the near future, the fish vet license is not just an option of choice, but a legal requirement if you want to sell drugs to fish farmers. The prescription system will offer a license to qualified fish vets, meaning that those who are not "qualified" will not be allowed to practice. The future fish vets need to claim their identity through the qualification process (*zige*). In the future, fish vets will become the fifth profession to obtain a license through a qualification test, along with the existing professions of medical doctors, pharmacists, lawyers, and accountants, said Director Chen Aiping in the fish vet training program. However, although the Fish Vet System Reform reiterates neoliberal discourse of building a slim state, due to the lack of professional accrediting associations, the fish vet licensing management including the qualification test organization still falls under state supervision.

How do fish vets obtain their qualification? There are two ways for two groups of candidates. Director Chen vividly summarizes the recruitment principle as: "old ways for old men, new ways for new men" (*lao ren lao ban fa, xin ren xin ban fa*). The Animal Epidemic Prevention Law designates in article 54 those who hold at least an associate degree or higher may register for the certified vets examination. If this standard is adopted, many of practicing fish vet will not be qualified because they lack appropriate educational credentials. However, the state has realized that the vets are not to be blamed for their low educational level. For people who were young in the 1950s and 1960s, their education opportunities were deprived by various social movements even if they excelled in

academics. The "Going to Mountains and Reaching Countryside Movement" (*shangshan xiaxiang*) in early 1960s called for young people to leave the city and live in the countryside[14], The Cultural Revolution 1966-1976, terminated the college entrance exam for almost ten years and deprived young people of opportunities for entering college[15]. Therefore, the state decided to implement favorable policies to the "old fish vets."

Obviously, this training programs are designed to help "old fish vets" become certified ones. But who exactly are the students? The student recruitment is based on the principle of "high quality, rigorous screening" (*gao zhiliang yan baguan*). Students register in the local fish extension center which screen the better ones and recommend them to the provincial extension center, which makes the final selection. Guangdong Province, with an aquaculture area and productivity among the top three in the country, was selected as the first pilot province to organize the fish vet training program in August 2007. Along with the two programs organized in 2008, 84 students were recruited in which 82 passed the qualification test and 2 failed. The summary report described the "training objects" (*peiyang duixiang*) as the following: technicians from city-level aquaculture extension centers and those from farming enterprises registered for exports and they come from cities where major export species such as eel, tilapia, and shrimp are farmed. Therefore, the student composition demonstrates a mixture of personnel from state agencies and from the market. The first program recruited students who worked in shrimp aquaculture in

[14] Scholars also pinpoint that after the Great Leap Forward Movement in 1958 and the three years of economic hardship 1959-61. Middle school and college graduates in the city had difficulties getting a job. To prevent social upheaval, the state decided to persuade the young people to go to the countryside and reestablish their revolutionary consciousness.

Zhanjiang, the largest shrimp production base in China. The second and third program expanded recruitment to five cities that specialize in eel, tilapia, and turtle aquaculture, including Zhaoqing, Guangzhou, Foshan, and Zhuhai. Students of the three programs included technicians from fish feed mills, grassroot fishery extension officials, export-registration fish farm technicians, and fish drug sellers. In the first program, among the 22 students who passed the qualification tests, 17 of them actually have an education credential of associate degree and/or over (*dazhuan yishang xueli*), aged between 21 to 55. All are male and only one is female. Most of them have worked for fish disease prevention and treatment for less than ten years, but a few of them had experience of over 20 years. In the third program which I attended, 20 out of the 31 had associate degrees or higher and 6 students were female.

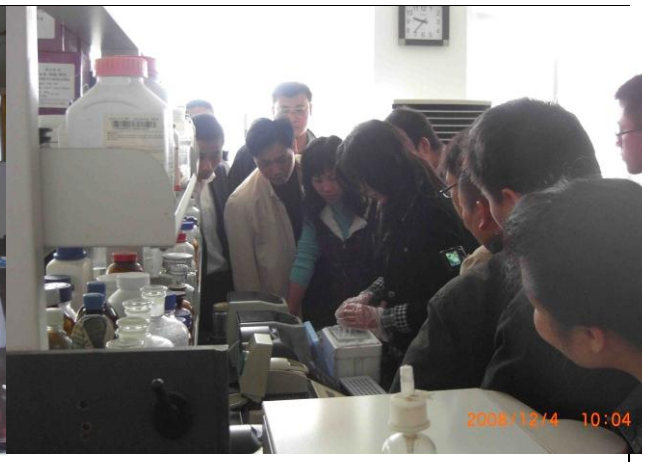

Fig 5.1 Students attending a lecture in the fish veterinary training program.	Fig 5.2 Students observing lab activities.

Fig 5.3 Dissecting fish for bacteria isolation.

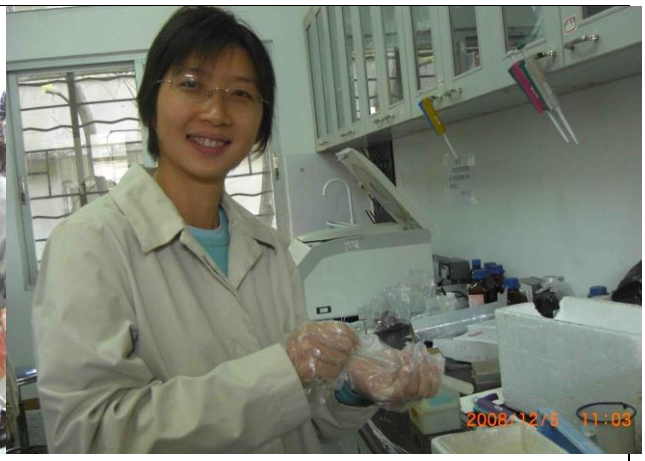

Fig 5.4 I was doing a PCR experiment to identity shrimp WSSV.

Fig 5.5 Examination on fish dissection.

"Many of your current practices are not standardized (*guifan*)," said Director Wang from the GDFTEC, when he explained what were the requirements for licensed fish vets, "Therefore, in the future, you need to standardize your practices especially in terms of disease diagnosis and drug prescription."

The first lesson of learning "standardization" is how to write a prescription. Although many students have prescribed fish drugs for many years, they have not written any prescriptions before. Officials from GDFTEC viewed the prescription system as an

empowerment apparatus. Director Wang emphasized that the prescription system was launched to legitimate fish vets' practices since those who do not have license will not be allowed to issue prescriptions in the future. Moreover, instructors reiterated in the training class that by standardizing their activities through the prescription system, they would be protected from being sued by the drug users. Then he elaborated what standardization entailed. Fish vets will need to issue written prescriptions in a standardized format. He remained unsatisfied with the current practice that was based only on oral communication. Often, the fish farmer came up to the fish vet and told him or her the problem with the fish. Then the fish vet would choose several drugs from the store or tell the farmer to get it from the next store if that specific drug was sold out. This oral instruction is not standardized because it does not leave any written record for tracking. Now the vets are required to write the diagnosis record and issue a prescription in a standardized format. The former includes information on: name of the farm, date, farmer owner, address, phone number, pond number, farmed species, size, disease outbreak process and relevant causes, main symptoms and testing results, diagnosis. Finally the diagnosis record has to be signed by the fish vet and stamped with the clinic's stamp. Similarly, the standardized prescription has to incorporate farm details, clinical diagnosis, drug name, ingredients, dosage, and instructions for use. At the end of the prescription, apart from the vet's signature and clinic's stamp, the pharmacy's stamp and pharmacist's name, recipient's name and the amount of drug are also needed. Written information will not only be more reliable than oral instructions, but it will leave a tracking record behind. The fish vets are supposed to keep the prescription on file for two years.

While extension officials touted the prescription system as a tool for empowerment, the students saw it as a double-edged sword. They are very concerned that the written record might put them in a vulnerable position in litigation. One fish drug seller told me that once he prescribed some antibiotics to a fish farmer who reported his carp to be affected with gill disease. After applying the drug, the fish all died the next day and caused the fish farmer a loss of hundreds of thousands of yuan. The fish farmer went to court to ask the drug seller for compensation. However, since there was no written record left, the court could not gather sufficient evidence to charge the drug seller. He told me that very few drug sellers wanted to issue a written prescription for fear of lawsuits.

Second, standardization also entails scientific methods of disease diagnosis. Currently, diagnosis is only based on clinical symptom observation, or even worse, an oral description of symptoms by the fish farmer. In future, the licensed fish vets will need not only observe the symptoms, but more importantly, use scientific equipment to detect the pathogen. Instructors emphasized that similar symptoms might be caused by different pathogens. For example, grass carp's (*Ctenopharyngodon idellus*) hemorrhage is often caused by a virus, while the same symptom on crucian carp (*Carassius carassius*) might be indicated a bacterial pathogen. It is also important to differentiate secondary infection from primary infection and confirm the pathogen of the primary infection. Therefore, the macro gaze by human eyes is not reliable and they are supposed to resort to the microscopic gaze of bacteria in μm (10^{-6} m) and even the virus in *n*m (10^{-9} m) to know the exact cause of the disease.

Students range in age and education background. The middle-aged have many years of disease treatment experience, but most of them have only secondary technical school education and have not kept themselves updated with the current scientific developments. There are a few young college graduates who have a lot of lab experience, but they have little experience in disease treatment. While instructors emphasized the importance of using cutting-edge technology to identify pathogens, students were not much excited by the glamour of science. One student who has owned a fish drug store for more than twenty years commented that the only equipment they had was a simple microscope in the store which was not used very often. In most cases, they even did not need to do disease diagnosis for the customers because the latter already knew what drug they should buy. Moreover, their purpose is to cure the disease instead of doing scientific research. If they spend a few days on doing various experiments to confirm the real pathogen, the sick fish would die out. Finally, the experts already recognized that virus-generated disease did not have a cure. Then why did they spend that much effort identifying the pathogen if the pathogen could not be eliminated? Rather than wiping out the pathogen, their goal was to prolong the life of fish and restored its vitality.

Apart from a theoretical study (Fig 5.1), the fish vet program also covered lab work and taught students the identification of bacteria and viruses (Fig 5.2, 5.3, 5.4 and 5.5). While the separation of bacteria seemed acceptable to the experienced fish vets, the virus detection proved too difficult for them. Students who sat around me often looked at each with confusion when the instructor introduced the theory of LAMP and PCR technology, two of the most common technology currently used for virus detection. Even when students were doing the PCR experiment, they did not know what they were doing and

even asked me what DNA amplification was since I took an aquaculture class in the U.S. and did PCR test before.

For them, this advanced technology is too invisible for them to understand. They separated DNA pieces and put it in a machine for multiplication, but what the machine was doing and why remained too abstract. When the test result came out negative, meaning the sample shrimp was infected with WSSV, students were quite excited. However, when they heard that the PCR machine cost 100,000 *yuan* and the experiment materials were also costly, they soon lost their enthusiasm. "Fish farmers won't pay for the high expenses of pathogen identification. We often earn only 10 or 20 *yuan* from drug sales. If we charge them 50 *yuan* just for pathogen detection, nobody will come to my store."

Third, the fish vets will have to prescribe standardized drugs. Right now drug manufacturers might need to pass a series of inspection to obtain production permit from the Ministry of Agriculture before they can produce drugs. The Ministry of Agriculture also promulgates the list of National Standard Fish Drugs (*guobiao yuyao*) and manufacturers will need to obtain an item number for each drug they produce. Therefore, the licensed fish vets are supposed to use only National Standard Fish Drugs manufactured by an authorized factory. However, "National Standard" is not necessarily safe and some are banned drugs in the United States or Europe. For example, in June 2006, the U.S. FDA detained imported farm shrimp and catfish from China after detecting Oxilinic acid, which has been listed as an approved drug in China. There is also the problem with the appropriate amount of drug application. The fish vets often suggested that fish farmers did not follow the amount of drugs that the directions designated in the packet cover rigorously. An instructor explained

that the drug factories were afraid of being sued by customers and tended to put a lower amount of usage in the direction. Another instructor commented that the standard amount of drug use came out based on lab experiment. However, with the current increased resistance to drugs, using the suggested amount might not be effective. It seemed to me that the standardization did not work that easily in reality.

Paradoxical as it seems, the licensed fish vet system reform preaches a notion of the market triumphalism as it believes that food safety problems are not inevitable side-effects of the market itself, but are just outcomes of the immature market condition of China. Once the market gets standardized and rules with its internal rules, the problems will be dissolved. What the state needs to do is not to intervene the market, but to enhance the market's function instead. In the food safety regulation, the Chinese fisheries managers adopt both this rosy vision of the market as well as an opposite one that sees the market as unable to regulate itself. Therefore, state's regulation of the market is considered necessary. This latter notion is reflected on another important component in the Ministry of Agriculture's campaign of tightening the law enforcement of illicit drugs.

Food Safety Law Enforcement

The long "food mile" that shrimp travels from farm to table has posted great challengers for food safety management, which often runs like an ad-hoc response to major food safety scandals. In 2004, an incident of "Fuyang Big Head Baby" shocked the whole country as the media revealed that gangster groups made fake formula milk from starch and cane sugar to cause a dozen of babies to die and hundreds. After months of investigations tracking the area of nine provinces, the case ended with the crack down of

four major illicit processing factories. However, consumers especially the parents of victims remained angry of why the inferior milk power was able to circulate for so long without any government detection. After the incident, the various government agencies in charge of food production, circulation, processing, and consumption all wanted to shield their responsibility. Media commentators furiously lambasted the unruly governance as "Nine Dragon Controlling Water," which metaphorizes from an ancient story telling of the ramification of political division of labor (Jin 2004). Long long ago, there was only one dragon that took charge of rain for irrigation. Later, the dragon was worried that it was not able to address the needs of the whole territory and requested the Jade Emperor to send eight more dragons to help. However, none of the nine dragons took their duty seriously, thinking that the other eight would do the job well. Therefore, the people suffered either from flood or draught despite of the presence of more management agencies (Dai 2008).

To overcome the default generated by the overlapping duties of various government agencies, in 2004, a consortium called "Guangdong Food Safety Committee" was establish as the overarching agent to specify the duties of its umbrella agencies. Take the example of aquatic product management. The Guangdong Ocean and Fisheries Administration (GDOFA) was responsible for stopping illicit seafood from the source by inspecting fish farms and hatcheries, however, once the products leave the farm and enter the circulation process, the Administration of Industry and Commerce (GDAIC) will take over unless if the products target exports. In that case, the Entry-Exit Inspection and Quarantine Bureau (GDCIQ) will supervise the processing factory to certify that the products meet importing countries' food safety requirement. For processed food not aimed at the export market, the Administration of Quality and Technology Supervision of Guangdong Province (AQTSGD) will intercept to

supervise unlawful activities. Finally, if the consumers got food poisoning by eating at the restaurants, the Guandong Department of Health (GDDOH) should take responsibility. The committee served from 2004-2008 and was rescinded when new rounds of food safety threats happened. After the Sanlu melamine-tainted formula milk caused a bigger crisis as I described in Chapter 4, the state designated the Ministry of Health the highest authority in handling major food safety crisis, absorbing the power of the much-criticized State Food and Drug Administration which issued Sanlu the "national exemption product" and "China top brand" awards (Xinhua News 2008).

Despite of the influx of government powers, the fisheries administration did not see many changes of their duty as they were always relegated to manage the safety of aquatic production. In 2007, GDOFA set up the Department of Fishery Quality and Safety Management (DFQSM) to supervise the production of primary aquatic products (*chuji shuichanpin*), including fish juveniles and commodity fish either in the farm/hatchery or in the seafood whole sale market before they enter the processing factories. (Chen 2010). In 2009, I shadowed a food safety inspection trip that screened tilapia farms for residues of antibiotics chloramphenicol and nitro furan, the antifungal agent malachite green, and steroid Methyltestosterone.

Finding Local Contacts as Guides (*shuren dailu*)

If the training of fish veterinaries represents state's effort of cultivating good citizens, the food safety law enforcement campaigns, also under the *Action Plan for the Extension of Healthy Aquaculture*, might operate in a way to punish unlawful subject. After EU's "Chloramphenicol Incident" in 2002, China took a serious effort to track down banned

drug use. However, the building of testing centers is going slowly because of the high costs of equipment and difficulties in training qualified technicians for testing assignments. There are two regional testing centers located in the provincial capital of Guangzhou and several testing stations located in the big coastal municipalities. However, there are none established below the city level, i.e., the counties, townships and villages. Therefore, the municipal inspectors usually have to travel for a few days to go to the villages to collect samples. This posts a significant inconvenience for the inspection work because the inspectors usually are not familiar with the village situation. They can spend days driving just to realize that the village cannot be accessed by car. Or if they get to the farms, they do not speak the dialect and thus cannot explain their purpose to the farmers. Or if they happen to have the language proficiency, farmers have the right of refusing samples to be taken just because of distrust of strangers. Therefore, it has become a must for the inspectors to be accompanied by guides, who are usually county-level fisheries officials and even township level government officials. The grassroots officials usually have a lot of connections with village farms and are acquaintances of farm owners. Finding local contacts as guides (*shuren dailu*) has been a default rule that makes inspection work possible.

I followed a food safety inspection trip that sampled tilapia raised in the outskirts of reservoirs in the mountainous Lushan Town. The trip could not be accomplished without guides because the farms were all large, covering an area of at least 7 hectares, and were dispersed distantly from each other in a mountainous area. On that day of our trip, we started out from the city at 8am and reached the county fishery bureau at about 9:30am. However, we could not depart at once because even the county officials felt unfamiliar with

the farms and had to call up Brother Fu, secretary of the local tilapia farmer union to lead the way. I cannot not imagine how we would have found the location of the dispersed farms without his assistance. We saw some very scenic views and enjoyed the fresh air in the hills, but the roads were bumpy and did not have signs. He made a plan with us in the car as he explained the local customs. According to the local belief, you are not supposed to cast the net to catch samples before harvest, as farmers would consider it inauspicious (*yitou buhao*). This is not to be interpreted as an irrational perception, though. Last year, I went on a field trip inspection for testing soy-based feed on fish. A foreign soybean association offered subsidies to farmers to buy soy-based feed, while farmers did the management work and allowed technicians from the soybean association to do regular monitoring of fish growth. Farmers complained to me that they did not have a great incentive to participate in the trial even though they might learn new techniques during the process. They disliked the monthly sampling activity that scared the fish and even made them stop feeding for two days each time. In the tilapia trip, Brother Fu then led us to a farm that had sold fish the day before. However, since the big fish in the pond were already harvested, there were only small fish left that weighed only 50-100 grams. Each set of sample required fish weighing at least 400 grams in the main and spare sample respectively[16]. We watched the inspector killing about 20 fish to get enough material for just one sample. Later we figured out it would be best to sample only farms harvesting the same day to get the larger fish. Brother Fu made several phone calls and finally found out two eligible farmers whose

[16] The sampling requirement designates that each sample will be divided into three portions: one portion will be used for drug residue detection experiment, one as back-up sample for evidence in the lawsuit, and one for the repository of the farm or hatchery being sample. However, the farm or hatchery are often persuaded not to keep a repository sample.

farms were in remote areas of the mountain (Fig 5.6). Working the whole day, we only obtained eight samples altogether, much less than the quota of 20 samples set by the city fisheries bureau (Fig 5.7).

Fig 5.6 Harvesting tilapia for sampling.	Fig 5.7 Taking samples for drug residue detection.

This tilapia sampling trip demonstrated how important *guanxi* is in carrying out government job duties. The practice "consists of personal exchange and circulation of gifts, favors, and banquets, and that the art of *guanxi* exchange lies in the skillful mobilization of moral and cultural imperatives such as obligation and reciprocity in pursuit of both diffuse social ends and calculated instrumental ends" ((Yang 1989:35). The network of *guanxi* is so diffuse and omnipresent that even an activity as impersonal as law enforcement cannot be accomplished without the exercise of *guanxi*. However, the reciprocal relations between law enforcers and farmers works antithetically to the impersonal nature of law enforcement and thus poses complexities in discipline and punishment, as described in the shrimp post-larvae (PL) inspection trip below.

Paying Tribute to the Deities

Manipulating my *guanxi* with officials, I was able to join a shrimp juveniles inspection trip in Kaihe County, K City, when I was doing research with a shrimp farm in the area and was lodged in a friend's house in a hatchery. My friend, Brother Ping, is the secretary of the local hatchery union that incorporates more than 20 local hatcheries. One day, I heard him calling each hatchery in turn to let them know that the County Fisheries Bureau was going to do drug residue inspection the next day and he asked the hatchery owners to "do the cleaning," meaning to hide away whatever banned drugs they were using. The next day, Director Zhang from the County Fisheries Bureau brought a team of inspectors from the neighboring Q City to take sample shrimp juveniles from all the hatcheries (Fig 5.8). The hatchery owners are all natives and know Director Zhang well, as he does this for staff from both the city and provincial officials every year and therefore knew the owners of each hatchery well. All owners happily allowed them to take samples (Fig 5.9), which included 60 grams of shrimp juveniles from two ponds respectively in each hatchery. In the end, the owners needed to sign to give their approval and acknowledgement of the sampling. At noon, Director Zhang asked me to go to lunch with the team together to talk about life and study in the U.S. I definitely accepted the invitation, but was surprised that none of the hatchery owners joined the lunch with us. Even Brother Ping, a good friend of Director Zhang did not go.

The result of the shrimp PL testing reached the fisheries bureau of Kaihe County ten days after the inspection. The testing results stunned Director Zhang, who saw that 6 out of the total 22 hatcheries showed results containing furazolidone residue, the antibiotics belonging to the family of nitro furans. He immediately called up his old friend, Brother

Ping to talk about the violation and it was decided that he should set up a meeting to discuss this issue with all hatchery owners.

Fig 5.8 Inspectors taking shrimp PL samples.	Fig 5.9 Hatchery owner signing an agreement for drug residue inspection.

I missed the meeting as I was away observing a deity worship ceremony in a nearby village. In the evening, I inquired of Aunt Fang, one of the hatchery owners, what had happened in the meeting. She told me that Director Zhang told everybody that he received the testing results from the Q City fisheries bureau. Then he announced the list of hatcheries that were identified with negative results and told everyone that the violators would be fined 30,000-100,000 *yuan* (equiv to US$4,412 to US$14,706) by law. This was a huge sum that could force some hatcheries out of business immediately. The meeting room burst into commotion and even cut short Director Zhang's explanation on what harm the banned drug residues would do to exports.

Fig 5.10 The local temple worshiping the sea goddess	Fig 5.11 Ethnic opera show

Later Uncle Sheng interrupted the conversation: "Let us stop complaining and ask Director Zhang what we can do to minimize the penalty." "Can you help us *jingshen* [pay tribute to the deities]?" (Fig 5.10 and 5.11) They were hoping that the fines might be reduced if they asked the Q City fisheries officials to withhold the results and not report them to the province. Director Zhang said, "No. I don't want to get involved in this. If you want to do it, you do it by yourself. I will keep you apprised once I get updates." Then he left.

The hatchery owners picked up the *jingshen* discussion and everybody agreed that they were punished because they did not serve the "deities" well in the inspection trip. They should have donated money and treated the team to a big feast. Better yet, they should have given them crabs to take home like what they did last year.

Actually The shrimp hatchery union was established precisely to represent the hatcheries in their efforts to cultivate *guanxi* with government officials. It is a rule that each member pays 200 *yuan* dues per year, and the funds are mostly to be used for

miscellaneous "tribute" purposes. However, we might ask why the association failed to do its duty of cultivating good *guanxi* with the officials this time?

Later in the day, Brother Ping told me their dilemmas. He said that they did it every year but not this time because the hatcheries were having a hard time making money due to unfavorable weather conditions. This spring had been unusual. It was very cold and rainy for most of the time, causing a high mortality rate of shrimp juveniles. Even Brother Ping himself, the only technician holding a bachelor degree in marine biology and also the one with the longest experience in shrimp juvenile production, had to halt production after failing three consecutive times this year. He tried to collect membership dues earlier in the year, but it was difficult because nobody had enough cash. Collecting membership dues was just one of the many hassles, said Uncle Ping with a look of exhaustion, "I do not want to work as a secretary any more. It is too tiring. When you have a collective association, the 'upper-level' [*shangtou*, a synonym for government] will screw money out of you just because they don't have to go door-to-door but could collect fees all at once. Every year, I have to deal with fees like the marine resource fee, the family planning fee, and so forth. The local police station even requests me to extort 1,000 *yuan* from each hatchery each year as a security fee. I am really tired of my work dealing with both the upper and lower levels."

In the early 1980s, cities in China still operated on the planned economy system in which the state controlled the distribution of social and material goods. The gift economy of *guanxi* represented a complementary if not corrective force to the state redistribution of social needs. The situation is very different now. The marketizing state gradually

surrenders many of its rights and responsibilities to the market and lets the market reign. Brother Ping used to manage a large state-owned hatchery in the 1980s and 1990s. He often told me how famous and prosperous the hatchery was to even attract customers from other provinces. However, ten years ago, it could not stand the wave of "state-owned-enterprise (SOE) bankruptcy (*guoqi daobi*),"[17] but was forced to shut down for complex reasons. Now there are not any state-owned hatcheries any more in the area; they are all private ones. Now the *guanxi* system has been relocated from within the state to the periphery of the state---between state and citizens. In the past few years, when the economy was good, the reciprocal relations could still hang on. However, in light of the grim weather this year, the vulnerable connection of *guanxi* quickly collapsed. Uncle Sheng claimed in the meeting with Director Zhang, "The fine of 30,000-100,000 *yuan* is too excessive! In the past, when everybody earned over 100,000 *yuan* per year, it did not matter if we paid you a few thousand *yuan* as tribute. However, this year, everybody is losing money. I can't even pay back to Forest Sea a couple of hundred *yuan* for feed. I want to halve my production, but feel bad if I have to ask the workers to go home and then they cannot feed their families. Where do I find money to invite officials for a big feast?" His remarks reveal the dilemma of postsocialist entrepreneurs. When the state retreats from social redistribution, the individual has to burden all the risks without even the basic means for survival. Moreover, the state not only fails to offer help in time of crisis but continues to extort more in the form of fees and fines. No wonder nobody wants to please the "upper level." However, the officials might not care about *guanxi*, if they do not feel like it. They have the legal power to issue you a bill of 30 to 100 thousand yuan, although that

[17] The year 1995-2000 witnessed major SOE closedowns. See Wang 1989, Han 2002.

would risk the complete breakdown of reciprocity with the shrimp farmers. But that did not happen.

I returned to Kaihe County in a month for another research. Brother Ping told me that the violators would be fined for only 2,000 yuan, not the 30 to 100 thousand *yuan* originally stated. "Is it because they 'paid tribute to the deities'?" I asked with surprise. Uncle Ping shook his head. Later, I had a chance to interview Director Ma, the upper-level of Director Zhang and K city official in charge of drug residue. He hinted that everybody needed to make a living. His colleague, vice Director Wang, also disliked the notion of issuing fines to farmers. "I hate to disrupt the friendship between grassroots officials and the farmers. If you are friends with farmers, do you dare to penalize them? If you do, you are not welcome to go to their farms any more. I feel it very problematic that the current way of drug regulation focuses on blocking. Like controlling the floods, you can't just block it, but you need to do the dredging… You can't just tell farmers which drugs can't be used, but need to tell them what the substitutes are."

Director Ma also supported the method of blocking. His metaphor was not the flood, but heroin. He suggested that we needed to block the source of the banned drugs in order to make them disappear from the market. "People often reproach us for not fulfilling our duties of curbing banned drug use. However, the fishery bureau's power is limited. Often, we can't stretch our hands that far." He then told me how unreasonable the current fishery drug regulation was. "The drug management is very fragmented. The livestock department deals with the production and sales of veterinary drugs. We, the fisheries management, monitor the use of drugs in aquaculture production. If the fish arrive at the market, the

commerce bureau takes care of them. If the fish are shipped to the processing plant, the CIQ department will manage. If the fish are sent to restaurants, the public health department will jump in."

Views from the Testing Center

My *guanxi* with fisheries officials helped me to gain access to a food safety testing center of the province. Several officials have told me that the testing of ppb (part per billion) level of drug residue requires the use of liquid chromatography technology that requires equipment costing over 1 million *yuan* (US$147, 000) and has to be imported from Euro-American countries.

The center is located in a major fishery research institute. It used to do environmental monitoring work and was gradually changed into a food safety testing center after 2002, the year when EU started the ban of seafood imports from China.

I first met Director Feng during the tilapia testing trip and she was very kind to introduce me to her work. I called her up to schedule a visit and she told me to come two days later. I arrived in the morning and she told me she already obtained permission for my visit from her supervisor. Since all of their work is confidential, she needed to follow procedures to grant me access. Moreover, she hinted that it would be better if I just took a cursory look at the equipment and should not inquire about the results of their experiments. I had brought a camera with me but I put it away immediately. She then introduced me to her supervisor who seemed a little nervous about seeing me.

The food safety testing center is located inside the city next to an arterial road. Director Feng told me that the whole institute would soon be relocated to the suburbs with

cleaner air because the city dust has a negative impact on the precision of the equipment. Presently, the institute has two main office buildings and the center is located in a building that is further away from the artery. It takes up the top two floors of a seven-floor building, with the sixth floor assigned for microbe testing and the seventh floor for drug residue testing. In the top floor, they have three large labs. The atomic florescent testing lab detects heavy mental residue in shellfish. The gas chromatography lab tests drug residues that are volatile with a low boiling point, such as organic phosphorous and chlorenphenicol, PCB, PCP, etc. The liquid chromatography lab tests antibiotic residues such as the notorious nitrofuron.

There were two technicians working at the liquid chromatography lab and one was Little Ping whom I had first met also on the tilapia trip. Director Feng said she had an urgent report to finish today and could not accompany me on my tour. I asked if it was ok for me to stay in the lab for a while and looked at the equipment closely. She said ok and introduced me to Ding, who was the head supervisor in the lab. Ding was running a test and was watching the screen to see the change of waves. I did not understand the details, but it seemed that the computer could draw the chromatograph automatically after the testing is finished. I then chatted with Ding. He used to do research at a food processing lab and was asked to transfer to the food safety center when it was established and was severely short of experienced staff. “I still want to go back to the processing lab,” he said to me. “Why? You don’t like this high-tech work?” I asked with surprise.

“Firstly, the assignments here are very heavy. Last year, we had the Beijing Olympics and we got a lot of samples from other provinces. We are short of staff and had to work

overtime until 7 or 8pm. Sometimes, we have to work overtime on weekends. However, my status is a state cadre and therefore I am not eligible to get overtime payment. ”

“If you do a lot of work, do you get a bonus?” I asked. “No. The funding for food safety testing is a specialized fund, which, unlike the regular research funds, does not allow extracting management fees for personal use. Therefore, we get the same salary no matter how much work we do.” “Is your current income lower than what you got from the processing lab?” “Yes. I get at least 10,000-20,000 *yuan* less than my previous work. Moreover, the work here is very boring. Everyday, you do the same thing, but you cannot take a rest because you need to keep watching the screen. I prefer doing research than this testing work. When you do research, you don’t have to stay in the lab everyday. You work in the lab for a while and walk to the office next door to write or play word games (*wenzi youxi*). However, for this testing work, you stay in the lab every day, absorbing the poisonous reagents.” “But why don’t you request from your supervisor to return to the processing lab.” “I did, but he did not agree, saying that we were short of staff here. My supervisor has a bad temper and I don’t want to offend him. Anyway, I have a few more years to retire and will bear with the time. However, I can tell you that I don’t have much incentive working here.”

“I heard from Director Ma that you could not cite the data of the experiment because they are confidential and that will impact your publication.”

“Yes. Now we are so busy and do not have any enough spare time to do research projects. However, though we are not allowed to write on the testing results, we can write about the experiment protocols. Right now the protocols are developed by university

professors who are more concerned with saving money than saving time. If we have a large number of samples, it is very time consuming to do the experiment following the protocols." "Wow, that seems to be a fantastic research topic." "I know and I really want to develop new protocols, but how can I find time now that I have so much work to do?" He added that under this system, their center could not attract young technicians to stay and there is a high turnover rate there.

Conclusion

Despite of the liberal proponents who refuse to put the label neoliberalism on China, the above two cases show the complex entanglements between state and market as not exhibiting a top-down or exclusive relations. The state attempts to step back while encouraging the creation of market forces. To access China's situation better, I propose that we need to reconceptualize state-society relations through both government reason and subject formation and understand how state and society are overdermined with each other. This might help us better envision an alternative way of life in a world in which social responsibility is quickly disappearing.

Conclusion

In spring 2012, I returned to China to give a job talk to a local university in Guangdong Province and visited the Leizhou Peninsula again. Ming, my foster brother, invited me to see the new craze of the village. Surrounded by farmland nearby, I saw a new pig shed with cement walls and steel roof erected above the ground. Inside was divided into two sides, with six "rooms" at each side. There were no windows but only a few tiny openings on the wall for ventilation. I asked whether such a confined room would get very hot in the summer. Ming said that he was going to install electric fans. The bottom of the shed was laid with pipelines delivering manure to a pond nearby. He was quite proud of this design to not only keep the shed clean but also collect the manure as fertilizer for both agricultural and aquacultural farming. He first got the idea of raising swine from a TV program in the CCTV Agriculture Channel and immediately borrowed about 200,000 *yuan* (US$31,746) from friends and relatives. Then he Googled the shed designs from the internet and synthesized different ones to form his own. He also bought a big truck and was preparing to stock the piglets in the next few days. He planned to start with 100 piglets and if successful, would increase to 200 next year. He was quite confident that he could make a fortune as it takes only three months to raise a 20- pound piglet to a 400-pound swine. "Do pigs easily get disease like shrimp?" I assumed that he shifted from shrimp to swine because the latter might encounter fewer risks. My foster mother and Ming told me not to worry because they raised pigs previously although in a much smaller scale. They knew that pigs shared similar diseases with human beings including flu and fever. "Whatever drugs are effective for human diseases, we can give them to pigs." "What about swine flu? Are you afraid?" these spontaneous questions came quickly out of my mouth before I gave

them a second thought and I hope that they did not sound very discouraging. To my relief, Ming replied lightheartedly, "No, I am not afraid, because we don't have swine flu in this area yet." Then he continued to reassure me: "It is definitely easier to raise pigs than shrimp as I can easily observe the pig's health condition. If it looks as though it is dying, I will sell it immediately, unlike shrimp which often sink to the bottom of water and you can't tell whether it is dead or alive."

At the time of my fieldwork, Ming was already experimenting with different technologies to combat the diseases and predators of shrimp. He was the first person in the village to buy a computer (with my help) even before the village was hooked up with an internet connection. He believed that the control of shrimp risks resided in improving his "human capital"--knowledge, skills, and abilities--through constant learning. No longer a farmer who is limited to manual work, he realized the importance of intellectual labor in deciding his success. However, when disease is rampant and epidemic, to what degree will individual effort be able to fight with it? Shifting from shrimp to swine, he envisioned that as a pioneer, he would encounter minimum risks in swine flu. But in this globalized world, where can we find a place immune from disease threats? In the recent decade, with the improvement of biosecurity technology, the SPF broodstock facility does not need to be restricted to the isolated Hawaiian islands, but has been expanded to the U.S. mainland in Florida. Established in 1988, the Shrimp Improvement Systems (SIS) has dramatically grown into a major SPF broodstock provider in the world. With a capacity to supply a large number of broodstocks with features of disease-resistance and fast growth, SIS soon established its dominance in China since its entry in 2007 to market 90,000 pairs of SPF broodstocks. SIS's potential to supply shrimp broodstocks from a "biosecured" facility has

concealed how vulnerable the industry is. As Pacific White Shrimp (*L. vannamei*) becomes the dominant farmed species in major aquaculture countries, broodstock supplies in the whole world are controlled in the hands of only five to six providers with SIS dominating the market. In 2010, China sourced 90 percent of its SPF broodstocks from SIS alone (Wu 2011). To think about SPF's inability to exclude unobserved pathogens and the emphasis on monoculture in the industry, we can hear the dynamite alarm clicking every minute.

Contributions: Towards a World of Democracy

Science and Technology Studies

If the industrial revolution in the 19th century represented the heyday of science and technology development, after WWII, few people would embrace technological solutions unreservedly. Science and technology can do as much good as much harm. Nuclear weapons can destroy an enemy but the fallout can contaminate the earth for years. Cars make travel easier but also contribute to global warming. DDT kills pests but also silences the birds.

It does not need to be argued that science and technology always work as a double-edged sword depending on whether you are affected by the "effect" or the "side-effects." Therefore, the hotly debated question "is science and technology good or bad" is not only an irrelevant one, but a misleading one, as it assumes that science and technology enters into society only through its consequence, but knowledge production and dissemination are autonomous processes that are not affected by social conditions. Stories of ingenious scientists further construct science and technology as a privileged domain of knowledge which the general public feel disqualified to participate.

Accompanying this sense that scientific knowledge is elite is the colonization of science and technology discourse in our everyday life. Farming is no more just sweating and plowing, but the use of inputs and equipment has become indispensable. Eating is no longer a practice of sustenance but a site of scientifically management of nutrition.

How should we grapple with this contradiction that science and technology are moving into "high-tech" but at the same time controlling our lives more and more? How should we envision an activity of democratizing science and technology if democracy means the collective decision-making of the public?

Science and Technology Studies (STS) has thrived in recent decades to relativize the scientific and technological knowledge, by following the activities of scientists, showing scientific knowledge as a form of representation (rather than fact), and opening the blackbox of truth-making. However, a lot of the STS researches follow scientists only through their lab work and thus narrows their definition of science to be experiment-based and the scientists to be professionals (Martin 1998). To unfix the border between scientists and non-scientists, my research follows the science extension network of shrimp aquaculture. By moving the site of scientific aquaculture from the lab to the field, I examine how science and technology of disease control and food safety management might generate new risks as they are predicated on excluding the observed pathogens and hazards, at the cost of disregarding the vitalities of unobservables. By observing how shrimp farmers engage in the knowledge production process, I seek to bring into STS a discussion on socioeconomic class, which has largely remained absent in scholarly work. An attention to the issue of class will illuminate how value is produced and extracted unevenly, looking at

how science and technology works as a form of capitalist production that constantly generates and reacts to crisis. A way for scientific democracy might lie in channeling science to face the unobservables and consider class-leveling as a way to engage the general public into collective decision-making.

China Studies

The field of China Studies has bifurcated into two different ways of representing reform China in relation to the socialist legacy. The liberal critiques portray an image of "China Threat" by condemning the government as following the authoritarian communist rule despite of the growth of market economy. Many radical scholars, on the contrary, solicit a discourse of "Victimized China" as they demonstrate how global capital crudely violates labor rights and environmental policies to create sweatshop factories everywhere, calling for a return to the Maoist attention to class inequality. My research critically addresses both themes by looking at the political economy of agrarian capitalism in shrimp aquaculture, pondering on issues of globalization, labor value, and knowledge-making. The liberal notion that condemns China as "authoritarian" for lacking freedom of speech and direct election has largely limited our imagination of the notion democracy. This notion has ironically engaged with the "sweatshop" discourse to galvanize U.S. workers for blaming Chinese for stealing their jobs, as implied in Florida fishermen's rage towards the Chinese shrimp farmers in the anti-dumping lobby. As the former lays blame onto the latter, both groups fail to realize that their plight comes as a result of capitalism's "treadmill effect" of chasing production and depreciating labor value. Therefore, a real notion of democracy lies

not in whether workers have the "right" to form a union, but whether they have the option of getting out of the capitalist production treadmill.

I echo the radical scholars' call for social justice, but do not consider the improvements of factory conditions and workers' welfare as fundamental solutions to change the plight of Chinese labor. The agrarian capitalism of shrimp aquaculture does not operate inside a slave-like factory where the workers scramble to follow the pace of the machine. The unique character of agrarian capitalism shows that capital feels reluctant to invest in the process of grow-out due to the paramount risks, but only control the upstream and downstream supply chain. I contribute to the study of labor in China by focusing outside of the conventional domain of migrant labor to explore the livelihood of farmers themselves. By speculating on the risks small-scale shrimp farmers need to bear upon themselves, I contribute to the study of transformative capacity and crisis response of neoliberal capitalism.

Food Studies

The domain of food might expose the Achilles' heel of capitalism more poignantly than any other forms of production as it affects our everyday life and we have a corporeal experience with it. The eruption of numerous food safety scandals have proved that the global food regime has failed in all ways. However, the subsumption of capitalist food discourse and ideologies has prevented us from forming an imagination by delinking food from commodity. The exposure of farmed fish's chemical residues might direct consumers to turn to chicken or beef, while obesity might tempt people to try out Atkins or paleo diets. Farmers in Leizhou might start pig farming after shrimp diseases become unmanageable.

The prohibition of Chloramphenicol might induce farmers to experience other kinds of "unbanned" drugs.

Wendy Brown shows how solutions to social problems have been depoliticized. "As neoliberalism converts every political or social problems into market terms, it converts them into individual problems with market solution (Brown 2006:704)." Quotidian examples abound: gated communities as designed for concerns about security and safety; bottled water comes up as a response to concerns about water purity; antidepressants for controlling lives of meaningless or despair amidst wealth and freedom. All these solutions "offer the opportunity for individuals to *opt out* rather than address political problems" (Read 2009: 35, emphasis mine). As neoliberalism promotes discourses on self-interests and competition, effacing the boundary between politics and markets, between capital and labor, and between ecology and economy, where can we locate possibilities for change?

Spivak calls for returning to the notion of collectivity: "Socialism could be described as the winning back of the gift supplement into responsibility" (1995:77). The gift supplement counters the extraction of surplus value in labor and seeks to shift the process of objectification into contextualization. Our goal should not be limited to a pursuit of economic equality, but economic democracy where communities can engage in collective decision-making in what they want to produce and how to produce them, as indicated in the concept "food sovereignty" advocated by the international peasant movement La Vía Campensina (Wittman 2009). Only by calling for a return of subjectivity to the collective may we reconceptualize the relation between freedom and responsibility.

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II. Publications

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