Global standardization and local complexity. A case study of an aquaculture system in Pampanga delta, Philippines.

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Abstract

International standards result from global policies formulated primarily to address issues on food safety, traceability, environmental impact as well as social accountability. As in other agro-food industries, these rules increasingly regulate aquaculture, especially since it has started to be the object of many criticisms. The standards are generally designed in a top-down way and do not always consider the local specificities of production systems. Such implementation favors the emergence of similar patterns of production and trade across different locations. Based on a case study, this paper aims to highlight the gap between the vision conveyed by expert-based, simple and replicable policies of standardization, *versus* the real complexity and uniqueness of local aquaculture systems. The assumption is that the lack of recognition of this complexity leads *de facto* to the reproduction of dominant modes of production based on standards, ignoring some local actors with a capacity for innovation, while favoring a few larger stakeholders. To reveal the gap, the study looks at some agents of an extensive aquaculture system in the Philippines and at their interaction, focusing on gleaning and trading activities. It then reveals the changes that followed the local implementation of an International food safety standard. It finally discusses (i) the links between the global and normative point of view, and the local and unique dynamics and (ii) some bridges able to reconcile both.

Keywords

Aquaculture; International Food Standards; Pampanga (Philippines); social-ecological system; commodity chain; livelihoods; gleaning.

Accepted refereed manuscript of: Mialhe F, Morales J, Dubuisson-Quellier S, Vagneron I, Dabbadie L & Little DC (2018) Global standardization and local complexity. A case study of an aquaculture system in Pampanga delta, Philippines, Aquaculture, 493, pp. 365-375. DOI: https://doi.org/10.1016/j.aquaculture.2017.09.043

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1 Introduction

Agricultural commodity chains have traditionally been monitored, regulated and controlled by states, but since the 1980s and 1990s, in-depth changes have occurred, as a result of globalization and liberalization of trade, leading in particular to the development of new market-led regulatory schemes (Swinnen, 2007). The emergence of this process also coincided with the occurrence of several food crises and fears about food quality in Europe, and growing concerns about the sustainability of aquaculture (Bostock et al., 2010; Godfray et al., 2010; Grunert, 2005; Muir, 2012). Food safety and environmental issues are now high on the agenda and many standards have been developed by governments, private companies and non-government organizations (Bush et al., 2013; Cab International, 2005; Jonell et al., 2013; Vos, 2000; Washington and Ababouch, 2011). With 37% of all fish produced currently traded globally, and more than two thirds of developing countries' exports delivered to developed countries (Asche et al., 2015; FAO, 2014), seafood value chains have been particularly shaped by these approaches (Washington and Ababouch, 2011).

However, because they are intended to mirror the expectations of remote consumers, remote in both geographical and cultural senses, the values conveyed by these standards may be different from the values that prevail at the local level. In this way, there is a risk that local practices and knowledge are neglected and marginalized. Local regulatory schemes dedicated to govern the use and management of natural resources are sometimes simply not considered (Kusumawati et al., 2013).

In parallel to their wide diffusion during the last decade in trade between North America and Europe (Bush et al., 2013), a growing concern has emerged that they had the potential to negatively impact local producers and local production, distribution or sharing of resources (Unnevehr and Ronchi, 2014; Vandergeest, 2007 ; Holzapfel and Wollni, 2014; Rueda and Lambin, 2013). This is particularly true in the case of export chains, as it is becoming increasingly clear that the socioeconomic benefits are not distributed equally among the different strata of the society, and often result in stronger negative impacts on the poorest (Belton et al., 2011a; Bush et al., 2013; Haque, 2003).

Nevertheless, empirical-data based studies dealing with these issues are not yet sufficiently numerous to develop robust conclusions. The goals of this paper are thus (i) to detail the social complexity within an aquaculture system in two particular activities, gleaning and trading, (ii) to describe a process of compliance with a European food safety standard, and (iii) to discuss ways to reconcile or bridge the multi-dimensional and multi-scale processes at stake. The study aims to fill a gap in the literature regarding the dynamics occurring around local aquaculture systems (*e.g.*, Kusumawati et al., 2013), as well as to highlight the (dis)connection between the global and the local processes constituting the aquaculture system. It was conducted in a coastal area located in the north of Manila Bay (Philippines) where aquaculture has been practiced for more than a century and where today extensive polyculture production systems dominate. Such extensive production systems have been

little studied the Philippines, despite their importance and roles in reducing risk and vulnerability (Irz and Stevenson, 2012).

2 Study area

2.1 The social and natural environment

Fieldwork was conducted in the municipalities of Sasmuan (Pampanga province) and Hagonoy (Bulacan province) (Figure 1), both entirely located in the deltaic complex of the Pampanga River Basin, the fourth largest in the country (~10,000 km²). Topography is flat and elevations are close to sea level. A remarkable geological feature is the presence of the Pinatubo volcano. Its eruption in June 1991 had tremendous global and local impacts. Locally, lahars (mudflows made of pyroclastic elements) buried hectares of aquaculture ponds and increased production costs by modifying the physical environment (*e.g.*, changes in depth of waterways). The tropical monsoon climate (*Am* in Köppen classification) is characterized by most of the annual rains falling during the monsoons and typhoons period, *i.e.* between June and December (2,300 mm in average at Masantol weather station). Another hazard is the anthropogenic-accelerated deltaic subsidence (Gaillard et al., 2008; Rodolfo and Siringan, 2006), which induced a rise in salinity that stimulated the conversion of paddy fields to aquaculture ponds (Mialhe et al., 2015). Natural deltaic vegetation is now restricted to small patches of mangrove, stretches of *Nypa fructicans* (‘*nypa*’) along the canals and scattered acacia trees on pond dikes (Mialhe et al., 2015).

[Placeholder for Figure 1]

In 2010, the population of Sasmuan and Hagonoy reached 27,254 and 125,689 respectively (Census of Population and Housing, 2010). Four *barangays* (the smallest administrative unit in the Philippines) of Sasmuan were investigated: Malusac, Sebitanan, Mabuanbuan and Batang Dos. Their populations are concentrated on small islands surrounded almost exclusively by ponds (Table 1). At the municipality level, the share of land-use dedicated to aquaculture reached 98 % (Hejdova, 2006). These four *barangays* have very high population densities, *i.e.* between 734 and 1166 inhabitants per hectare of residential area (Coloma, 2008) and are located 10-15 km from the town center of Sasmuan. They are islet-villages accessible only through waterways. Aquaculture and fisheries constitute the bulk of the local livelihoods options and aquatic gleaning is a particularly important activity for the poor, although it has not really been considered by studies so far (Irz and Stevenson, 2012). In fact, formal salaried employment is more visible locally, possibly as a consequence of the remoteness of the area that creates a high level of absentee ownership in the aquaculture system.

In Hagonoy, the economy is more diversified than in Sasmuan due to closer proximity to Manila, making it a convenient location for trading shrimp intended for the export market. It was selected because not less than thirteen shrimp-specialized auction houses are located in the town, in the

barangay of Santo Niño investigated during this study (Chaigne, 2009; Talbot, 2008). Like in Sasmuan, riceland is another important local feature and the majority of the population is working in fisheries and aquaculture (Chaigne, 2009).

[Placeholder for Table 1]

The four *barangays* of Sasmuan were selected by considering the following criteria: total number of households, presence of gleaners, and importance of aquaculture and fishery in the community, based on (i) the Municipal Comprehensive Land Use Plan that is an official document including local statistics, and (ii) local key informant peoples. The *barangay* of Hagonoy was selected because it hosts all the shrimp-export-grade auction markets.

2.2 The aquaculture system

Understanding the current patterns of ponds distribution and land ownership requires an historical examination of past events. The enclosure of water bodies, which paved the way to aquaculture, began in the late 19th century (Mialhe et al., 2015). Enclosures were developed by building barriers across the water flow and by building small side-dykes around *nypa* swamps in order to retain fish, a process that required hiring local labor and that marked the beginning of the privatization of a common-pool natural resource. Many legal conflicts ensued to determine ownership status of these new landscape entities. The development of aquaculture came with several tradeoffs, due to the new forms of interaction between society and nature triggered by these legal changes. Mialhe et al. (2015) outlined the following chronology of farming systems in the Pampanga delta from the late 19th century to the late 20th century: (i) until the 1970s, aquaforestry systems combined *nypa* (used for alcohol, vinegar, and roofing), milkfish (recruited first from natural environment and then from nurseries) and secondary products; (ii) in the early 1980s, the shrimp boom driven by high revenue expectations (some producers stated that they obtained ten times more revenues with shrimp than with rice) and supported by the Bureau of Fisheries and Aquatic Resources (BFAR), the government agency in charge of the fisheries and aquatic resources in the Philippines (Talbot, 2008); (iii) from the 1990s, a return to more diversified systems (monoculture of milkfish or tilapia, extensive polyculture, agriculture-aquaculture rotation, etc.), driven by environmental changes following the Pinatubo eruption, deltaic subsidence, and shrimp disease outbreaks. Between the 1970s and the early 2010s, the area devoted to aquaculture expanded five-to-six-fold, moving landward to include former rice field areas (Mialhe et al., 2015). Today, a majority of the small-scale producers (from less than one hectare to a few hectares) are found in these areas formerly devoted to rice production.

As in other countries, recurring disease outbreaks severely affected shrimp farming in the Philippines, but the extensive mode of production practiced in Pampanga seems to have afforded some level of resilience (Figure 2) as compared to the other two main shrimp producing areas of the country, the Southern part of Luzon (Southern Tagalog) and the Visayas region (Negros Island). As a result,

Pampanga became the main black tiger shrimp production area for both the domestic and export markets, accounting for 43 % of the national production in 2005, at the time of the study (Figure 2).

[Placeholder for Figure 2]

The most common farming system across the study area is the extensive polyculture of black tiger shrimp (*Penaeus monodon*), tilapia (mostly *Oreochromis niloticus* but also *Oreochromis mossambicus*), milkfish (*Chanos chanos*) and crabs (*Scylla serrata* and *Scylla paramamosain*). *O. mossambicus* was introduced before *O. niloticus* but is less popular among the producers because of its slower growth (Diener, 2000), its darker coloration and poorer marketability. *O. niloticus* is also particularly appreciated for its beneficial impact on invasive plants (*e.g.*, *Hydrilla verticillata*). Mud crab was introduced into the polyculture because its production is reliable and the demand is high.

2.3 The European market and standards

The European Food Law (EFL) developed in the aftermath of recent European food crises, particularly the Bovine Spongiform Encephalopathy (BSE) crisis and was applied to all food and feed products marketed in the EU to ensure a higher food safety. At the time of the research, it consisted mainly of EU regulations setting the new principles and responsibilities for food safety (178/2002), and setting the hygiene requirements of foodstuffs (852/2002) and food of animal origin (853/2002). The EU regulation 854/2002 and Council Directive 96/23 on their side respectively regulated the Official Control and the residue-monitoring program. Among the major changes from previous regulations was the move for primary responsibility for food safety to the Food Business Operators (Article 17 of regulation 178/2002), the obligation of results, not of means (Art. 14 “Food shall not be placed on the market if it is unsafe”), the adoption of the Precautionary and Transparency principles (Art. 7, 9, 10), the traceability (Art. 18) and the generalized use of risk analysis (Art. 6). For the operators, those requirements generally implied training on Hazard Analysis and Critical Control Point (HACCP) method and traceability, changes in the work processes, additional tasks (traceability, documentation, hygiene) and for some, investments (new equipment, new staff).

Implementation was under the remit of the inspectors of the EU-Food and Veterinary Office (FVO) charged with verifying the compliancy of producing countries. In countries exporting to the EU, FVO worked with the local Competent Authorities (CA), which, in the case of the Philippines, is the Bureau of Fisheries and Aquatic Resources (BFAR). Following serious deficiencies being identified during an inspection in 2004 (FVO, 2004), the local authorities initiated strong procedures to meet compliancy with EFL within a few months (Dabbadie, 2009; Dabbadie et al., 2007).

In 2005, following the national-level restrictions to export seafood products to the EU, the European market absorbed only 1% of the national shrimp production, while Japan absorbed 52%, South Korea 20% and the US 15% (Regidor and Dabbadie, 2007). In 2003, prior to the ban, the EU market share was 15% (Regidor and Dabbadie, 2007) but this market has never been as important as the more

traditional East Asian markets. Indeed, Japan has always been the top destination, with a market share that reached 75% to 85% of the total volume of shrimp production before the 1997 Asian financial crisis (BFAR, 2000, 1997, 1994).

3 Method

The findings presented in this paper are based on intensive field investigations conducted between 2007 and 2009 by an interdisciplinary research team (agronomy, economics, sociology, and geography). Through a sequence of individual research studies, the team was able to generate broader information regarding the geographical and social setting in the research area. The goal was to generate and collect data about the socioeconomic dimension of the aquaculture system and the compliance process to hygiene standards for export. Data was collected through semi-directive and open interviews, participatory appraisals (Dabbadie and Mikolasek, 2015; FAO, 1999), as well as participatory observations. Interviews concerned a wide range of stakeholders (Table 2). Participatory activities were implemented with focus groups of all local key stakeholders (usually five participants per group and two to four groups per community). During the implementation of the research, the local language (Kapampangan) as well as English and Tagalog were used.

[Placeholder for Table 2]

4 Results

4.1 The social complexity of trading and gleaning

Field investigations revealed the presence of very specific agents and activities in the shrimp industry and the complex supply chain of Pampanga: the various auction markets and the gleaning activities in shrimp farms that make the system unique. Gleaning occurs when local people are given access to the ponds after the main harvest for the purpose of removing hitherto unharvested aquaculture products on an informal basis. Those products are then locally consumed or are sold through established market channels. By focusing on these two sectors of the shrimp farming industry, and also identifying the main livelihoods issues connected with aquaculture, this section attempts to understand the local social complexity of aquaculture.

4.1.1 The *consignacions*

Auction houses, which are specialized in consolidating and trading aquatic products, are known by their Spanish term, *consignacion*. Until 2005, auction houses were the only areas where exporters sourced the product destined for foreign markets. Most aquaculture producers and middlemen sell their products to auction houses due to limited access to, or information about, alternative markets and their strategic locations. Located along major river channels, several auction houses are scattered

throughout the delta. Some auction houses trade specific species while others are non-selective; for example, milkfish and tilapia are not traded in the same places as export-grade shrimps. The different species are sorted out on the farms during the harvest and then transferred to their respective markets. Shrimps are generally the first to be moved, as they are intended for the export market, unlike tilapia and milkfish that are exclusively intended for the domestic market. Species like mud crab that can easily be kept alive, are the last to be transferred.

Auction houses that regularly supply exporters usually source directly from farms with large volumes of production whereas middlemen dominate the flows of products to auction houses that cater to the local market. During the survey, there were thirteen auction houses dealing with shrimps, all located in the *barangay* of Santo Niño (Hagonoy, Bulacan). The first shrimp-specialized auction houses were established during the peak of the shrimp production in the region in the early 1980's by a few wealthy families that also operated shrimp farms. These well-off families tend to vertically-integrate their operation to secure their business. The same families still manage the largest enterprises in the area (Chaigne, 2009; Talbot, 2008). The success of the first auction houses influenced a few more local individuals, that were attracted by the 5% commission retained on every transaction and established their own auction houses by investing capital generated from sources such as shrimp farming or processing plants. In the year 2000, following the sudden decline in production in other shrimp-producing areas of the Philippines, non-local investors started to enter the sector, as the demand for large volumes of export-grade shrimps had locally increased to balance the deficit of other regions.

The role of auction houses in the supply chain is central, for both producers and exporters, functioning as intermediaries or facilitators of transactions. Exporters have specific requirements regarding the size of the animals, demanding shrimp that are both large (between 8 and 25 pieces per kilo) and homogeneous in size. However, extensive systems generally produce shrimp with heterogeneous sizes and the auction houses therefore provide an essential role for both buyers and producers to ensure access to large volumes graded to meet these requirements (Chaigne, 2009; Talbot, 2008).

All auction houses work in much the same way. The producers (farmers) deliver the shrimps (goods) by boat. The shrimp are then sorted according to size and displayed to the buyers. Buyers will then successively whisper their bids to a broker, so that other buyers can't hear, until the broker stops the process and the product is sold to the winning bidder. The transaction turns out to be beneficial for suppliers, auction house and even the municipality as they have their respective share on the profit/sales. The producers/sellers pay a 5-6% fee to the auction house and 1% to the municipality for every transaction. All local actors therefore share a common interest, to achieve the highest price (Chaigne, 2009; Talbot, 2008). Operators of auction houses compete to attract producers/sellers as this will optimize the volume of products auctioned. Auction houses build trust and loyalty with their suppliers, through provision of other services such as informal loans through cash advances before or

during the culture period. These were critical to enable cushioning of seasonality in income. Efforts were also made to provide services to farmers delivering the products like seating areas, drinks, food and polite staff). Loans of up to USD 4,000 were largely based on verbal agreement rather than written contracts. In exchange for loans, shrimp farmers were required to deliver subsequent harvests to the auction house and pay an additional commission (1% of the amount of sales). Our investigations revealed that 94% of the interviewed farmers visited the same auction house regularly to sell their products. This loyalty is undoubtedly linked to market assurance as well as these credit arrangements, which are more favorable than loans from other informal lending institutions that offer rates of interests up to 15% and beyond. There is no clear time limit for repayment and producers are not obliged to repay the loan in full at the next transaction. However, they have a moral obligation to deliver all future goods to the auction house until the total amount has been settled. In case of unpaid loans, the auction house has no legal recourse beyond informal blacklisting of the producers whereby access to a new loan with another auction house is also compromised. This type of interaction is the norm in the Philippines' markets particularly in farming (both agriculture and aquaculture). This norm is characterized by the high degree of reciprocal and conscious social obligation that is carried forward into the marketplace (Davis, 1973). Such traditional patron-client relationships (Wolf, 1966) are known locally as *suki*, reflecting the way an economic transaction is part of a relationship of loyalty or that of *utang na loob* that reflects an asymmetrical situation in which an individual has a moral and/or economic debt to another person, placing an obligation in relation. All auction houses are locally influent and as such benefit from various benefits, whether in terms of markets, taxes or regulations (Chaigne, 2009). Such arrangements also benefited from institutional reforms (the Local Government Unit code in 1991) that gave enhanced powers at lower levels.

4.1.2 Livelihoods in aquaculture producer communities

The study identified the different stakeholders involved in the local aquaculture system. A simple and synthetic classification scheme obtained by combining several variables (*e.g.*, time, ownership, areas of production) enabled categorization of aquaculture farmers into three groups: (i) traditional local landowners from the wealthy and influential families holding vast area of lands (over 50 ha). They are generally absentee farmers and their group is the one to which the first auction houses belong; (ii) the local renters, a fairly broad class that includes individuals who have large rented areas (over 50 ha) and others, with smaller holdings (less than an hectare), and (iii) the former rice-sharecroppers who managed to obtain land through agrarian reforms in the 1970's and the 1980's and who have limited (less than 7 hectares) landholdings (Levy, 2009; Mialhe, 2010). Location also distinguished the larger ponds and farms in the southern part of the study area near Manila Bay, and the smaller ponds usually located farther north where former rice paddies were converted to aquaculture ponds due to the increasing salinity of the surrounding water resulting from subsidence (Mialhe et al., 2015). While

large land owners established their aquaculture farms before or during the 1980s, surveys showed that many current farmers started their activity recently, 10.5 years ago on average for the producers surveyed during the study (Mialhe, 2010; Talbot, 2008).

Another occupation in connection with aquaculture is the caretaker. Caretakers, locally known as "*bantay*", mainly guard the farms against threats, either human or otherwise (*e.g.* natural calamity, poaching) and conduct daily farming operations such as feeding and water management. The caretaker is also responsible in providing updates to the farm owner on whether the stocks are good for harvest already. They tend to have kinship links with the owners and usually live on-farm with their family. In some cases, the caretakers' family members also work in the farm. Their remuneration typically includes an incentive package (commission after harvest) depending on the final harvest, which can be substantial, several times the annual salary: 40,000-60,000 PHP on average, up to 90,000-100,000 PHP (Mialhe, 2010). They are also generally allowed to fish from time to time for self-recruiting species (SRS) such as tilapia in the ponds and other native species (snakehead, catfish, crabs and other small indigenous species). Furthermore, the farm operators, apart from providing housing within the vicinity of the farm, generally support part of current expenditures of caretakers, such as food and sometimes education of their children. Despite some constraints as caretakers, such as limited social relations with the nearby community, the occupation is one of the most favored job as it brings positive social capital, being the most trusted by the landowner. The community often believe that caretakers can influence the farm owner on who to hire or even whom to sell the product.

Laborers are those that are paid on a daily basis and are responsible for all day-to-day pond management activities that include direct management task (*e.g.*, feeding, stocking) or indirect (improving or repairing dikes) linked with production. Generally, laborers were only employed seasonally during the peaks in labor/activity in the farm. The caretakers usually take care of the remaining minimal operations in the farm. Such job insecurity and the lack of continuous work led the majority of such labourers to diversify their livelihood strategies by having several sources of income. As a result, such labor linked to aquaculture farms is usually not the main source of income, but rather tends to contribute to a more diversified livelihood portfolio in combination with other activities (fishing for snails used as shrimp postlarvae feed, dike improvement, gleaning, construction work, transportation, local trading, etc.). Categorizing such individuals based on their main sources of income may prove to be difficult as these changes can also be seasonal as the main livelihood activities vary over time.

4.1.3 The gleaning system

Another important activity that was identified during the fieldwork was the gleaning sector. As the name implies, this group manually harvest aquatic products along the rivers' banks and in the drained aquaculture ponds, just after the commercial harvest has taken place (Irz et al., 2007; Parker, 2008).

They are locally called *mangangapa*, which literally means 'pick up, caught with their bare hands'. This denomination is explicit on how these individuals collect aquatic organisms in the production pond after harvest, whether inside the ponds or in the adjacent channels and streams or even in the supply and drainage canal inside the farm. These people generally have limited capital to invest on their fishing equipment, hence they generally do not use nets, which they often cannot afford, except to store collected aquatic animals. Moreover, farm owners and caretakers discourage the gleaning sector to bring harvesting equipment when entering the farm to avoid conflict.

It is not clear either how to group individuals who practice this activity in a category with well-defined limits. Indeed, gleaners also practice a variety of activities, including fishing, throughout the year. However, during the research, participants readily identified this category of individuals, underlining the singularity of their livelihood. During the wealth ranking exercise, participants ranked gleaners among the poorest members of the community and used it as main indicator to identify poorer member of the community. Gleaners were considered even poorer than snail collectors (who collect small gastropods and bivalves used to feed shrimps), and fishermen. Gleaners are differentiated from fishers by the fact that the latter are fishing throughout the year, whereas gleaners fish only seasonally. Moreover, local community defined fishermen as those having fishing boats or having fishing traps in the main channel whereas gleaners most commonly fish in farmer's managed areas like ponds or water canals. This link between poverty and gleaning finds an explanation in the fact that almost no financial capital is needed to start this livelihood activity. Only a minimum of social capital, which all locals have, is required to start the activity that is practiced in groups (Parker, 2008). The limited livelihood alternatives in coastal communities also explains why a significant part of the population is drawn to this activity. The study found that gleaners were in fact the main population in some communities, such as in Batang Dos where 195 households (49.8% of all the households) mainly relied on gleaning activities for both money and food.

The gleaning system appears to be a complex sector in the shrimp farming industry in the Philippines. Gleaners are often organized through a third party (a middlemen, the *degaton*) who represent the group and negotiates with the pond owners or caretakers the permission to glean, and who mobilizes the gleaners and supports the operation by providing transportation. In return, the gleaners commit to selling the gleaned products to their *degaton*, who will then sell them to a specific auction house. *Degaton* are specialized in the organization of gleaning, and are often better-off people that own boats and transport equipment. Although they are mobile, they still live in the community (Parker, 2008). *Degaton* and gleaners depend one upon each other because a *degaton* needs as many gleaners as possible to be able to meet the volume required by the auction houses or markets while gleaners need someone to purchase their meager harvests locally and to provide assistance (transport, food and containers). Not all gleaned products are sold, some are kept for household consumption particularly the lower valued species (*e.g.*, goby, tilapia, and other small indigenous species) while some are also

being used in exchange for necessities (barter). To ensure the loyalty of the gleaners (eventually through *utang na loob* which means debt of gratitude – see above –), the *degaton* often provides various services to gleaners, including financial loans, which are critical to enable cushioning of seasonality in income resulting from the seasonal limitation in opportunities to glean. About 76 % of the gleaners in Batang Dos and 50 % in Malusac have a bondage debt toward their *degaton*, and 60% of the *degaton* are in debt to their auction house (Parker, 2008). Such dependency on a debt provider reflects the lack of alternative livelihood opportunities and the seasonality of pond harvest, and thus opportunities to glean after these harvests.

The seasonality of production affects the gleaners' livelihood in general. Harvest intensity tends to peak at times of high consumption of aquaculture products (*e.g.*, Christmas, community events like festival and church-related celebration) and to decline during periods of low consumption (*e.g.*, school enrollment when fees are high) (Figure 3). Average incomes are minimal during the rainy season (May to October) when pond harvests are minimal and highest during the dry season (November to April). This is reflected in the average number of gleaning trips: in Batang Dos, only five trips per month are possible in August, but more than fifteen/month between December and April.

[Placeholder for Figure 3]

Although interviews also revealed that gleaners received higher prices for products harvested in aquaculture ponds, river collection is considered as more reliable since they can go anytime, stay as long as they want and do not require permission from the pond owner (Parker, 2008). The number of gleaners using the *degaton*'s services varies seasonally and depends on how the number of boats the middleman owns. Typically, a *degaton* can organize up to forty gleaners in one day. After the harvest, the gleaned products are sorted by species (high values species – shrimps and crabs – and self-recruiting species) and by size. Provision of ice and containers for transport is the responsibility of the *degaton* as the products need to reach the auction house in good condition. The *degaton* pays the gleaners based on the weight or number of catch.

The relationships between the pond operators and the middlemen/gleaners are complex. Accepting gleaning activities supports good relations between the aquaculture producers and local communities, while a refusal could be accompanied by threats to the farming activity through forced harvests or payments, particularly for the medium and small-scale operators who cannot afford to pay for private security like the wealthiest and most influent farmers. Organized or casual theft has been a major constraint to aquaculture in many contexts (Little and Bunting, 2005). One positive reason for farmers to accept gleaners is that they help in collecting unwanted fish, *i.e.* the ones that survive in the mud between two crops and become predators in the following cropping season. By removing the unwanted species, the need and cost of using piscicide, generally tea seed, is reduced.

On the other side, the main difficulties perceived by the gleaners is the need to constantly negotiate access to the pond whereas the number of refusals is increasing. The decreasing quantity of leftovers in pond, as farmers have improved their harvest efficiency by using more effective nets and by employing more manpower during the harvest, is also a concern as well as the increasing number of gleaners that result in reduced individual shares. The obligation to work in groups, the dependence on the middlemen and the lack of alternative livelihoods were also identified as problematic.

The activity, which has probably existed since the onset of aquaculture, is likely to have expanded with the reduction of capture fisheries and the extension of aquaculture ponds at the expense of natural resources. The lack of alternatives and the growth of the population are also likely to have played a role. Gleaning occupies a large part of the population, mainly composed of young men with few resources. The activity seems essential for a large number of households in these communities but the growing difficulties faced by many gleaners may become exacerbated by the transformation of the aquaculture system in general.

4.2 The compliance process

The need to comply with EU food law came following a temporary exclusion from the European market, but the process remained relatively unnoticed over the short-term by most stakeholders due to the low market share of the European market. However, over the medium-term, it also induced changes for other stakeholders as, for example, after one out of the thirteen Hagonoy's auction houses supplying the shrimp export market committed to reach compliance, others followed. According to their operators, the reason is that this compliance improved their market position in East Asia, by giving them an image of quality and performance.

In accordance with the EU regulations, compliance is required to focus on the whole production chain supplying the European market, but the regulation was only considering a simplified supply chain, mostly made of approved producers supplying approved exporters. The complexity of the local aquaculture system and the specific stakeholders such as the small-scale producers, the small traders (or consolidators), the gleaners or the middlemen (like the *degaton*) were not considered and consequently, the compliance process initially induced changes to a very limited number of large stakeholders involved in the EU-export chain: exporters, the large auction houses and very few large-scale pond operators (Fig. 4). As the Competent Authority, BFAR handled the whole compliance process, and also had to undergo major changes. It modernized its official control units, by putting them directly under the authority of the Director General and conducted intensive training of its own staff on risk analysis, traceability, hygienic practices etc. Procedures for risk-based inspection and a national residue-monitoring plan were introduced and the official control laboratories underwent an ISO 17025 certification (Dabbadie et al., 2007).

[Placeholder for Figure 4]

418 The registration of farms with BFAR was also introduced, requiring their enrollment in a residue-
419 monitoring program by submitting samples to the official laboratory. They also had to have
420 traceability in place. Ragasa et al. (2011) reported that some farmers were requested to comply with
421 commercial aquaculture standards (Best Aquaculture Practices/BAP of the Global Aquaculture
422 Alliance); however, no such case was found in Pampanga during our study. Nonetheless, at the
423 beginning of the process, only a minority of producers were registered by BFAR: 10% of the 110
424 farmers surveyed (Talbot, 2008). On the other side, the establishment of traceability was not overly
425 restrictive for most producers initially involved, as they already used to record the financial documents
426 and invoices that are often sufficient for being compliant with this requirement.

427 On their side, the auction houses and exporters had to comply with traceability requirements, risk
428 analysis and hygienic practices to retain access to the EU market chain. For the auction markets, even
429 the most recent and modern establishments were not meeting the requirements set in the EU
430 regulations. Some of the major issues included the sorting of shrimp on the floor as well as the source
431 of water being used in washing the shrimp during and after the sorting. The compliance process
432 involved significant investment from BFAR to conduct trainings of auction house staff on traceability
433 procedures and HACCP standards. Another key innovation in meeting the compliance requirements
434 was the use of sorting tables for sorting shrimps. These were initially subsidized by BFAR to induce
435 the change, as initially, the staff in charge of shrimp sorting did not want to change their traditional
436 practices; this strategy proved to be successful as within a few months, the sorting tables were being
437 purchased and installed by the auction houses themselves (Figure 5).

438 **[Placeholder for Figure 5]**

439 Regarding the processing plants, only two of the seven enterprises that had earlier been allowed to
440 export to EU were able to keep their approval status (FVO, 2006, 2004). At the national level, only
441 38% of processing plants dedicated to aquaculture and fisheries products remained certified, but two-
442 thirds of the firms that lost their agreement were already not exporting to the EU prior to their
443 decertification (Ragasa et al., 2011). For these, the change may have affected their quality image, but
444 not their export capacity.

445 To be approved, the processing plants had to comply with the same requirements as auction houses but
446 since many already had HACCP plans and hygienic practices in place, this was not a major constraint.
447 Their main difficulty laid in their ability to ensure a sufficient volume of direct supply with full
448 traceability from the few BFAR-registered farms. Indeed, given that at this point no auction house had
449 yet been approved, export plants had to establish direct contracts with farmers to comply with EU
450 requirements. As they needed large volumes of shrimps to be profitable, their strategy was to establish
451 direct contracts with the largest registered producers in the region, *i.e.* those with productive areas of

50 hectares and above. In total, only six producers were contracted leaving hundreds without access to EU market (Talbot, 2008).

At the national level, it was showed that establishments certified for the EU markets more easily gained access to US markets, that they were able to capture new EU buyers, and consequently had reduced product wastage (Ragasa et al., 2011). However, questions about the impacts of these changes for the operators in upstream chain remain unanswered.

5 Discussion

5.1 Links between local specificities and global standardization

An underlying principle of certification schemes is that innovation is stimulated by demand. Indeed, compliance to standards is usually a top down process, largely driven by downstream actors (Gereffi et al., 2005). However, the Philippines' extensively-farmed-shrimp market is clearly supply-driven and this has had consequences for the compliance process (Gereffi and Christian, 2009). In this particular case, the auction houses and processing plants played a pivotal role in the process. In theory, auction houses could be in a weak position towards the producers, if the latter do not supply sufficient volumes to allow *consignacion* to be profitable. Producers could then be tempted to introduce competition between auction houses by selling their shrimp to those offering the highest price but this did not develop because local trading is embedded in a complex social matrix (Granovetter, 1985). This social embeddedness also allowed auction houses to be able to meet demand for large volumes of large-size shrimp, while minimizing risks of producers shift (*i.e.* producers selling their products to another *consignacion*). The local market relations are rigid, making any shift a costly decision for the producers. As a result, the market loyalty of suppliers to their auction houses is rooted in a vast network of social and political ties that create obligations for producers (Granovetter, 1985). The producers' autonomy and capacity to organize are seriously restrained. This makes auction houses strong prescribers of compliance to standards. This embeddedness of the market, organized by auction houses, makes them strategic actors within the supply chain and front-line players in the standard compliance policy.

Another local specificity not considered by the standard is the inseparable character of aquaculture production and gleaning. The long-term privatization of common natural resources for pond building was a typical case of accumulation through dispossession (Harvey, 2003). In this context, gleaning can be perceived as a means to maintain access to resources that were formerly under a common property regime. In spite of some mutual benefits (e.g., ponds cleaning, improved social position), this form of social justice appears to occur at the expense of private operators and for the benefit of the local poor.

The standardization process appears to works in the opposite direction by not acknowledging the uniqueness of the system. Indeed, the process of compliance only considered a simplified vertically

integrated supply chain, with a limited number of EU-approved operators that could be easily traced and controlled. The persistence of gleaning as an integral feature of extensive shrimp farming therefore creates risks for compliance to current standards given the uncertainties it creates. The potential impact, whether positive or negative, on the food safety and production process (*e.g.* reduced use of piscicide, risk of contamination etc.) of gleaners is yet to be documented. Their role in complex systems that ensure the supply of both exported and local food has been poorly understood, compared to the simplified supply from a very limited number of large stakeholders. In this context, the 'safest' option to remain compliant is to discontinue gleaning, but which would clearly disadvantage poorest people in aquaculture communities through reductions of food and cash.

This also raises question about the long-term durability of the changes induced. A recent literature review suggests that successful adaptation to external constraints is in part a function of the flow of knowledge between various stakeholders, and the effective capacity for collective action (Amaru and Chhetri, 2013). Nowadays, the need for widespread participation of stakeholders, flexibility, integrated, place-based and interdisciplinary approaches is increasingly recognized as a requirement for the emergence of effective policies (Amaru and Chhetri, 2013; Gilman et al., 2008; Turner, 2014). Moreover, the consequences of locally-made decisions can also be uncertain, because they developed on many scales and may be undertaken by a variety of stakeholders (Amaru and Chhetri, 2013; Polasky et al., 2011) which may trigger non-linear and hardly predictable dynamics (Hall et al., 2010). Who takes part in the decision process, and who does not, are also tough questions in open, participatory processes (Cooke and Kothari, 2001). By ignoring the local complexity, the standard could result in outcomes in contradiction with its own objectives as was already observed in other areas, following the promotion of a techno-centric development of aquaculture with little understanding of the social processes (Belton, 2010; Belton et al., 2011b). Unfortunately, simple solutions are frequently favored over approaches that try to cope with the local socio-ecological complexity. Many policies and international standards that convey normative values tend to seek common solutions across a wide range of social-ecological contexts, although such one-size-fits-all approaches also frequently fail (Ostrom, 2009, 2007; Turner, 2014).

This is not specific to aquaculture: for example, agro-food firms tend to favor sourcing from larger farmers and eschew smaller farmers in scale-dualistic contexts (Reardon et al., 2009). Here, auction houses sourced their products from a range of producers (in terms of scale and practices), in a mutually beneficial commercial relationship. How the requirements for farms in terms of registration will affect this situation and, incidentally, what will be the consequences on the decisions made by farmers regarding the gleaning remain critical questions. Although it was temporary, the direct supply of shrimp by larger pond operators to processing plants to ensure compliance with EU regulations has distorted the more balanced traditional arrangements and eschewed small-scale farmers. Ultimately, what is at stake is the exclusion from the market of the smallest producers and from the access to

aquaculture resources for the poor, dependent gleaners (Hansen and Trifković, 2014; Khiem et al., 2010; Reardon et al., 2009; Trifković, 2014).

5.2 Roads toward a better compatibility between local specificities and international standards

This case study gives the opportunity to enunciate some recommendations to reconcile or bridge local and global processes. A first is the need is to initiate open, place-based and interdisciplinary research. As this study show, the critical elements about the complexity of an aquaculture system are not limited to its agronomic components. While not exclusive, social networks, embeddedness, informal activities, history are all important aspects of an aquaculture system that need to be considered. An open assessment of the system may also help to identify local actors with the potential to participate and continuously influence the certification process. Thus, wide involvement and communication at the local level appear to be important drivers of success, especially to avoid the knowledge asymmetries that might tend to favor some players against others. In this case, the large-scale farmers were indeed the main beneficiaries because they were the only ones who could supply the large volumes of shrimps needed for registered exporters to be profitable. The process was not introduced outside the established social networks that already tended to exclude smaller farmers and players of the informal sector for various reasons, e.g., access to information, transaction costs, or economy of scale. If not considered, the process would therefore tend to reinforce insidious previous inequalities. The inclusion of all the actors, especially those outside the radar, is clearly necessary and underpins the rationale for field investigations.

The compliance process did not take into consideration farmers' expectations and values, and in this sense is a typical example of a top-down technocratic process. Reconnecting producers with consumers is a not new process (Kirwan, 2006; Padel and Gössinger, 2008) but to do so on a global chain remains a challenge. It also appears important to identify social values involved in the productive system. Much local production are geographically embedded in settings where social values play a significant role in how individuals interact and make decisions. Recognition rather than avoidance of such factors may contribute to their conservation. In this case study, the values associated with gleaning could be put forward in a process of transparency and communication about the production conditions but this remains a complex task with uncertain consequences. At the other end of the chain, consumers could consider these values through their consumption decisions. The implementation of such a framework remains a problem to solve. Alongside these values, efforts could be made to share expectations of both producers and consumers.

6 Conclusion

This paper focused on two components of an aquaculture system, i.e. the global process of standardization, and the local complexity of social interactions in relation to the historical

development of aquaculture and its resource base. Based on a case study, the main objective was to understand how the two components functioned and then to show that they have remained independent and disconnected during process of meeting new standards. The *a priori* assumption was that the implementation of international standards does not consider local practices and social norms that govern production locally. The case study focused on a territory on the north shore of Manila Bay, dominated by extensive polyculture of shrimp, milkfish, crabs and tilapia. The local social complexity was interpreted on the basis of an analysis of auction houses and the gleaning system revealing (i) previously unidentified actors, (ii) numerous original interactions between agents (producers, gleaners, auction houses, etc.) and (iii) more generally the embeddedness of trading. It was also showed precisely what were the changes made following the compliance with food standards of the European Union. Two points were finally discussed: (i) the links between local specificities and international standards, and some (ii) roads to improve compatibility between standardization with the local. This paper is therefore a contribution in the scientific field of study that focuses on the regulation of agri-food commodity chains and their interaction with the local social-environmental context.

Acknowledgments

The authors are grateful to the M.Sc. candidates who contributed in the collection and analysis of data: Sarah-Jane Parker from the University of Stirling, Gonzalo 'Jun' Coloma from BFAR, Anne-Laure Chaigne from Montpellier SupAgro, Anne-Charlotte Talbot from the University of Clermont-Ferrand, Pascal Levy from ISTOM, Damien Ollivry and Bertha Iris Argueta from Science-Po Paris. They are also grateful to the staff of the Sasmuan Municipal Office and the staff of the BFAR Central & Region 3 Offices for their continual support and help in the collection of the data and in particular, Marita Ocampo, Amor Diaz, Jun Coloma, Lilia Pelayo, Simeona Regidor, Sonia Somga and Malcolm I. Sarmiento (Director of BFAR during the investigations).

Finally, the authors are grateful to Cirad that funded this research.

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Abbreviations

FVO: Food and Veterinary Office

734 BFAR: Bureau of Fisheries and Aquatic Resources

735 EU: European Union

736 **Figure captions**

737 Figure 1 – Study area

738 Figure 2 – Production of black tiger shrimp in the Philippines at the national level and in the
739 Pampanga delta between 1993 and 2005 (BFAR, 2006, 2000, 1994)

740 Figure 3 – Seasonality of activities and incomes of gleaners in Malusac and Batang Dos villages
741 (Parker, 2008)

742 Figure 4 – Actors of the studied aquaculture system and their relations during the process of
743 compliance

744 Figure 5 – Example of practices before and after the compliancy of auction houses

745 Table 1

Barangays	Land-use (ha)			Households	Population
	Total	Fishpond	Residential		
Batang Dos	232	231	1	356	1647
Mabuanbuan	328	327	1	135	919
Malusac	640	638	2	350	1956
Sebitanan	147	145.5	1.5	196	1149

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Table 2

Stakeholders	Number
Key informants persons (*e.g., village Chairman, village health worker, village council member, youth leader and elderly villager*)	9 to 12 per barangay
Producers (*Extensive systems farmers*)	110
Gleaners (*mangangapa*)	28
Leader of gleaners (*Degaton*)	8
Consignacions (*Operators and the employees*)	13
Processing plants (*Operators of processing and export plants*)	5 including 2 UE approved
BFAR (*The Competent Authority for compliance process*)	Top management (Regional director, Head of Fish Plant Inspection Unit, Head of Fish Health Unit) and field staff

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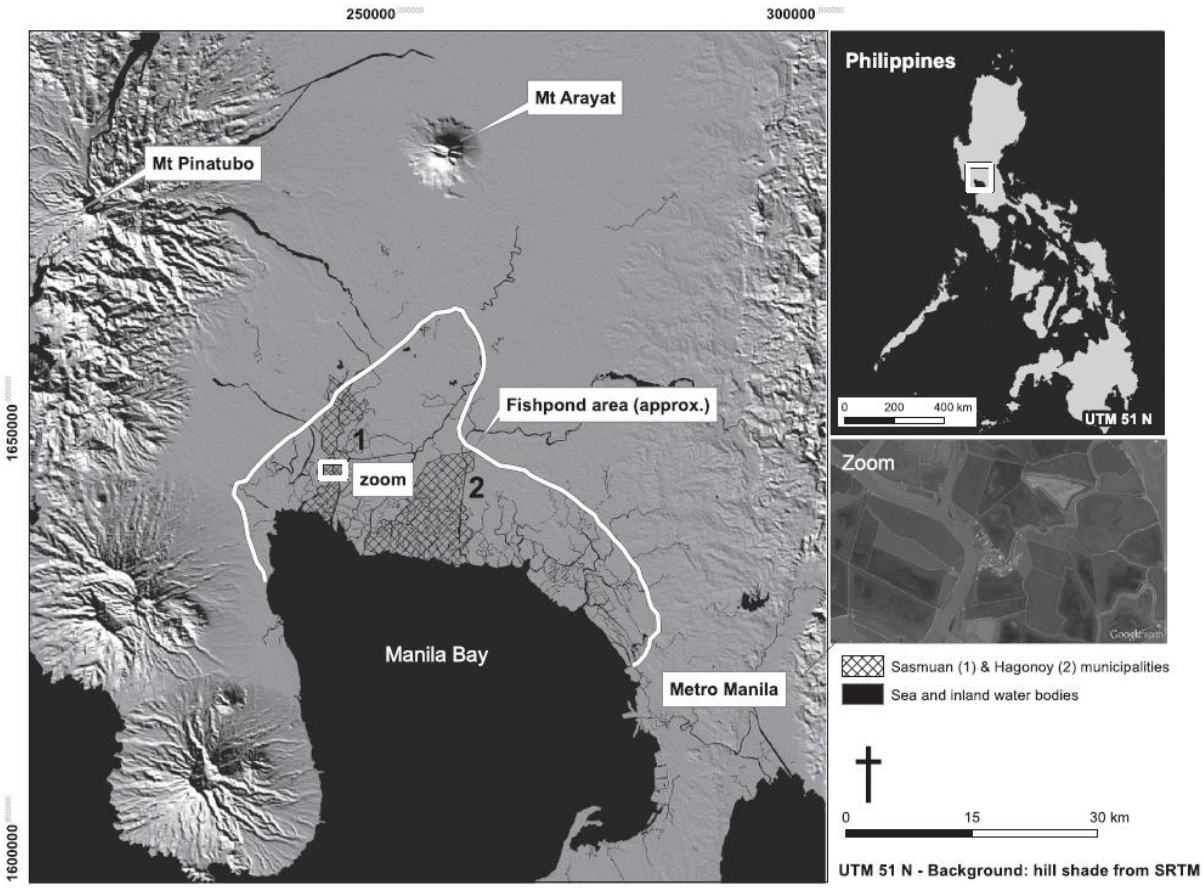
752 Figure 1



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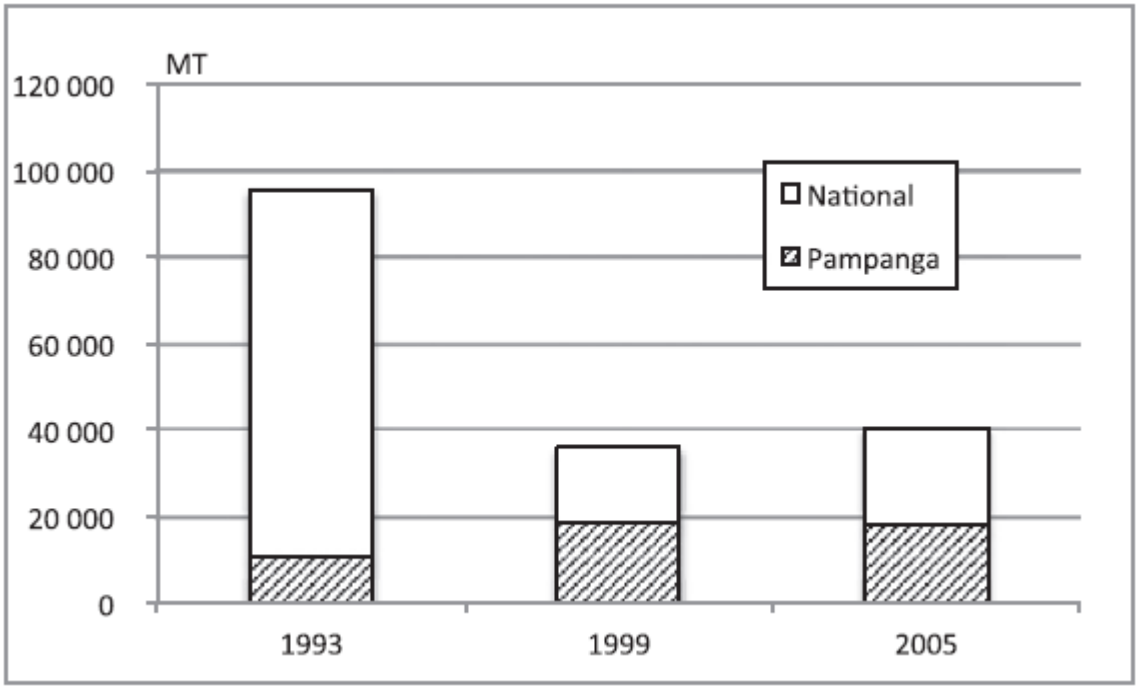
754

755 Figure 2



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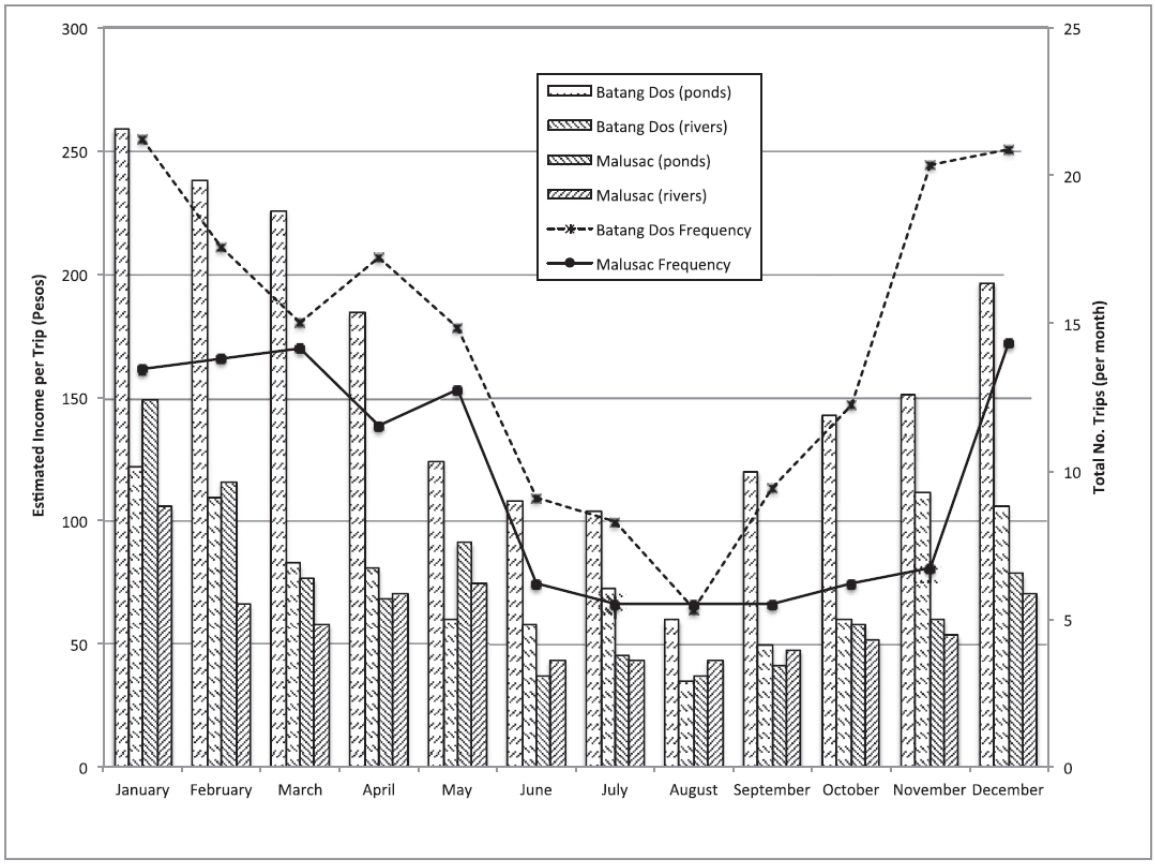
757 Figure 3



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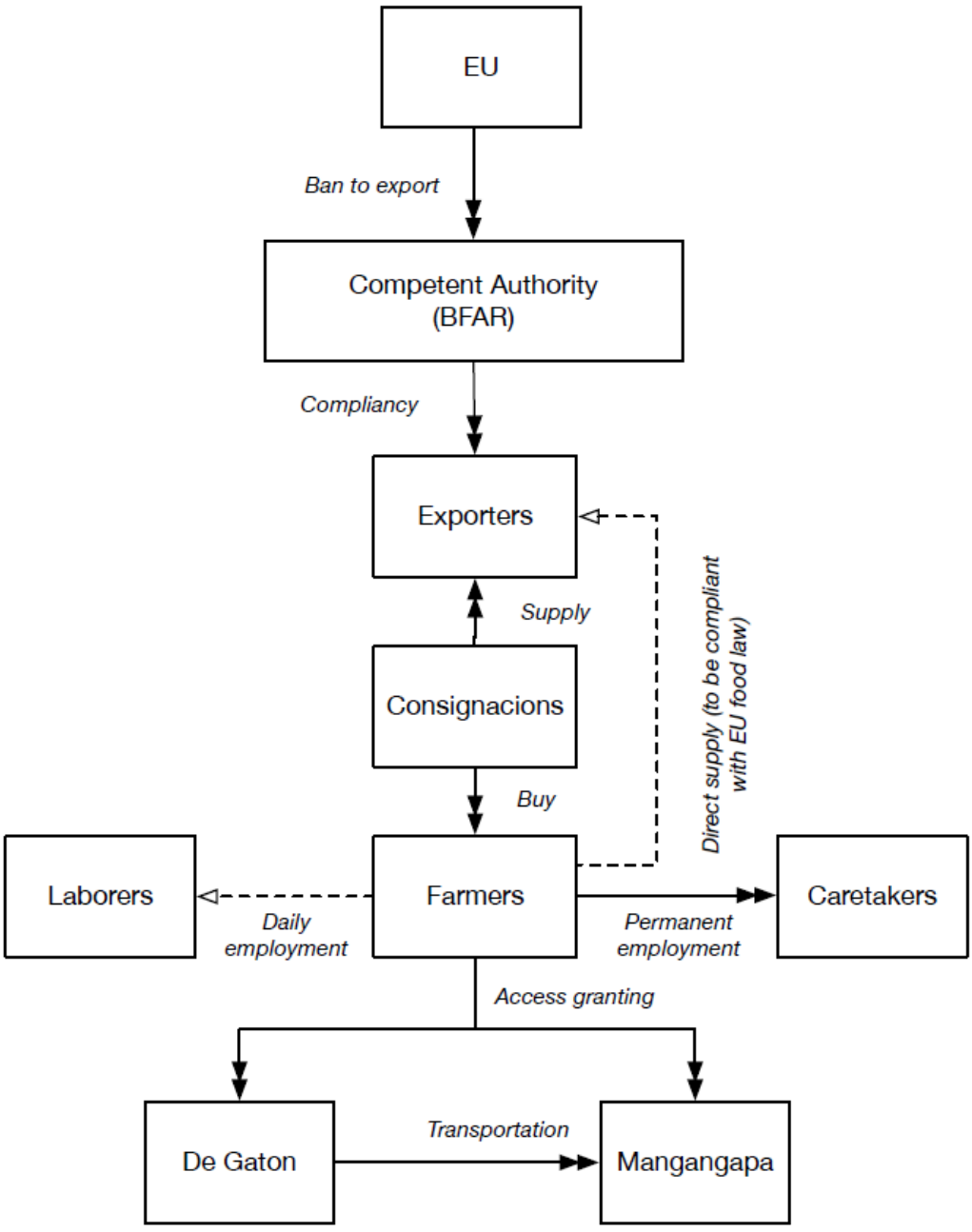
759 Figure 4



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767 Figure 5

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