

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

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4 Mialhe, F.^a, Morales, E.^b, Dubuisson-Quellier, S.^c, Vagneron, I.^d, Dabbadie, L.^{e*}, Little, D.C.^f

5
6 ^a Department of Geography, University of Lyon, Lumière Lyon 2, UMR CNRS EVS, Lyon, France.
7 Phone: +334 78 77 43 44 email: Francois.Mialhe@univ-lyon2.fr

8 ^b SFP, 4348 Waialae Ave. #692, Honolulu, HI 96816 USA, email: jack.morales@sustainablefish.org

9 ^c Centre de Sociologie des Organisations (Sciences Po/CNRS), 27 rue Saint-Guillaume 75337 Paris
10 cedex 07 France. Phone: +33 1 45 49 76 93 email: sophie.dubuissonquellier@sciencespo.fr

11 ^d CIRAD, UMR MOISA, F-34398 Montpellier, France. Phone: +856 (021) 313 554 email:
12 isabelle.vagneron@cirad.fr

13 ^e CIRAD, UMR 116, F-34398 Montpellier, France. Phone: +39 06 570 56259 email:
14 lionel.dabbadie@cirad.fr

15 ^f Institute of Aquaculture, University of Stirling, Stirling, Stirlingshire, FK9 4LA, UK. Phone: +44
16 1786 467923 email: dcl1@stir.ac.uk

17 **Abstract**

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

33 **Keywords**

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

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* Corresponding author

36 **1 Introduction**

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

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

54 In parallel to their wide diffusion during the last decade in trade between North America and Europe
55 (Bush et al., 2013), a growing concern has emerged that they had the potential to negatively impact
56 local producers and local production, distribution or sharing of resources (Unnevehr and Ronchi,
57 2014; Vandergeest, 2007 ; Holzapfel and Wollni, 2014; Rueda and Lambin, 2013). This is particularly
58 true in the case of export chains, as it is becoming increasingly clear that the socioeconomic benefits
59 are not distributed equally among the different strata of the society, and often result in stronger
60 negative impacts on the poorest (Belton et al., 2011a; Bush et al., 2013; Haque, 2003).

61 Nevertheless, empirical-data based studies dealing with these issues are not yet sufficiently numerous
62 to develop robust conclusions. The goals of this paper are thus (i) to detail the social complexity
63 within an aquaculture system in two particular activities, gleaning and trading, (ii) to describe a
64 process of compliance with a European food safety standard, and (iii) to discuss ways to reconcile or
65 bridge the multi-dimensional and multi-scale processes at stake. The study aims to fill a gap in the
66 literature regarding the dynamics occurring around local aquaculture systems (*e.g.*, Kusumawati et al.,
67 2013), as well as to highlight the (dis)connection between the global and the local processes
68 constituting the aquaculture system. It was conducted in a coastal area located in the north of Manila
69 Bay (Philippines) where aquaculture has been practiced for more than a century and where today
70 extensive polyculture production systems dominate. Such extensive production systems have been

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

73 **2 Study area**

74 2.1 The social and natural environment

75 Fieldwork was conducted in the municipalities of Sasmuan (Pampanga province) and Hagonoy
76 (Bulacan province) (Figure 1), both entirely located in the deltaic complex of the Pampanga River
77 Basin, the fourth largest in the country (~10,000 km²). Topography is flat and elevations are close to
78 sea level. A remarkable geological feature is the presence of the Pinatubo volcano. Its eruption in June
79 1991 had tremendous global and local impacts. Locally, lahars (mudflows made of pyroclastic
80 elements) buried hectares of aquaculture ponds and increased production costs by modifying the
81 physical environment (*e.g.*, changes in depth of waterways). The tropical monsoon climate (*Am* in
82 Köppen classification) is characterized by most of the annual rains falling during the monsoons and
83 typhoons period, *i.e.* between June and December (2,300 mm in average at Masantol weather station).
84 Another hazard is the anthropogenic-accelerated deltaic subsidence (Gaillard et al., 2008; Rodolfo and
85 Siringan, 2006), which induced a rise in salinity that stimulated the conversion of paddy fields to
86 aquaculture ponds (Mialhe et al., 2015). Natural deltaic vegetation is now restricted to small patches
87 of mangrove, stretches of *Nypa fruticans* (*'nypa'*) along the canals and scattered acacia trees on pond
88 dikes (Mialhe et al., 2015).

89 **[Placeholder for Figure 1]**

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

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

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

108 **[Placeholder for Table 1]**

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

114 2.2 The aquaculture system

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

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

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

142 **[Placeholder for Figure 2]**

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

150 2.3 The European market and standards

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

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

171 In 2005, following the national-level restrictions to export seafood products to the EU, the European
172 market absorbed only 1% of the national shrimp production, while Japan absorbed 52%, South Korea
173 20% and the US 15% (Regidor and Dabbadie, 2007). In 2003, prior to the ban, the EU market share
174 was 15% (Regidor and Dabbadie, 2007) but this market has never been as important as the more

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

178 **3 Method**

179 The findings presented in this paper are based on intensive field investigations conducted between
180 2007 and 2009 by an interdisciplinary research team (agronomy, economics, sociology, and
181 geography). Through a sequence of individual research studies, the team was able to generate broader
182 information regarding the geographical and social setting in the research area. The goal was to
183 generate and collect data about the socioeconomic dimension of the aquaculture system and the
184 compliance process to hygiene standards for export. Data was collected through semi-directive and
185 open interviews, participatory appraisals (Dabbadie and Mikolasek, 2015; FAO, 1999), as well as
186 participatory observations. Interviews concerned a wide range of stakeholders (Table 2). Participatory
187 activities were implemented with focus groups of all local key stakeholders (usually five participants
188 per group and two to four groups per community). During the implementation of the research, the
189 local language (Kapampangan) as well as English and Tagalog were used.

190 **[Placeholder for Table 2]**

191 **4 Results**

192 4.1 The social complexity of trading and gleaning

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

201 4.1.1 The *consignacions*

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

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

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

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

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

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

265 4.1.2 Livelihoods in aquaculture producer communities

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

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

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

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

309 4.1.3 The gleaning system

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

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

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

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

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

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

364 **[Placeholder for Figure 3]**

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

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

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

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

396 4.2 The compliance process

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

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

417

[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

452 50 hectares and above. In total, only six producers were contracted leaving hundreds without access to
453 EU market (Talbot, 2008).

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

458 **5 Discussion**

459 5.1 Links between local specificities and global standardization

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

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

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

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

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

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

522 aquaculture resources for the poor, dependent gleaners (Hansen and Trifković, 2014; Khiem et al.,
523 2010; Reardon et al., 2009; Trifković, 2014).

524 5.2 Roads toward a better compatibility between local specificities and international standards

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

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

553 **6 Conclusion**

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

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

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- 732 **Abbreviations**
- 733 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
Consignacion (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

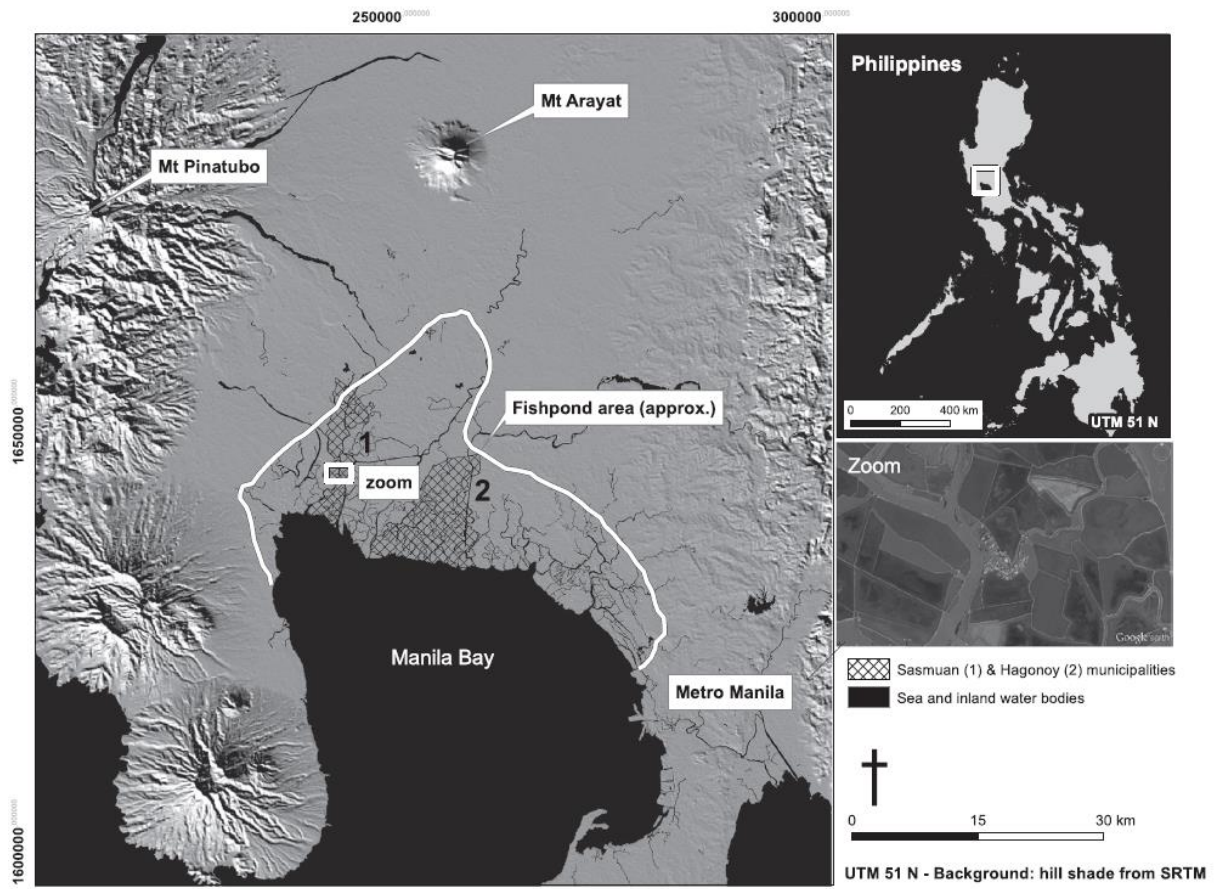
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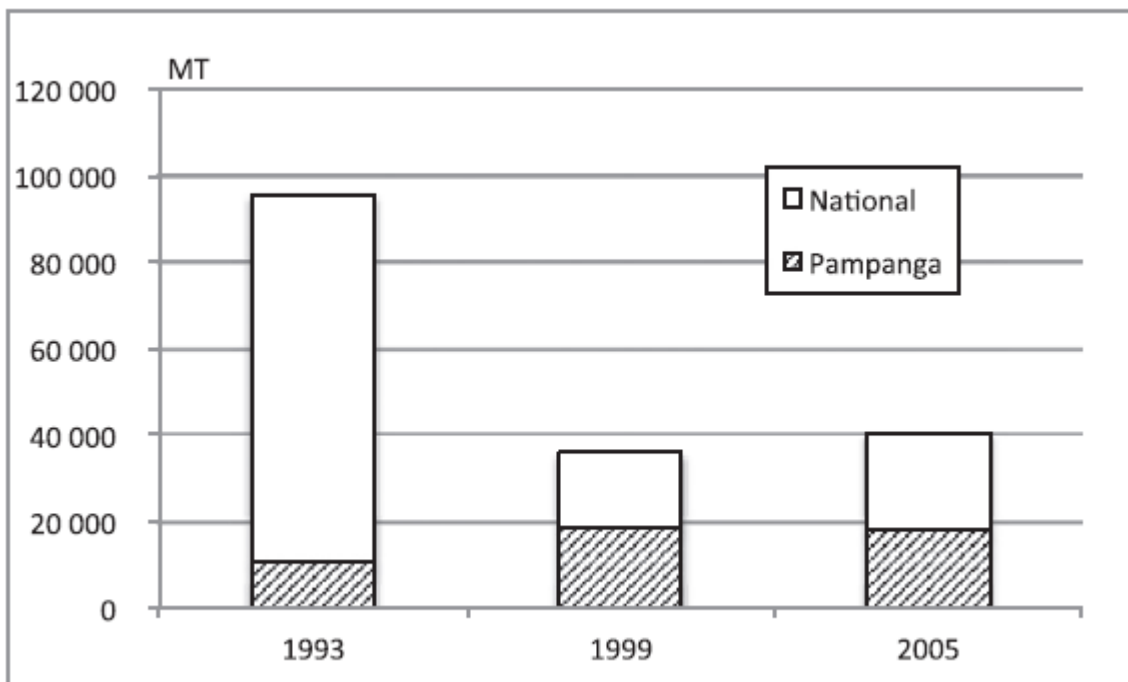
752 Figure 1



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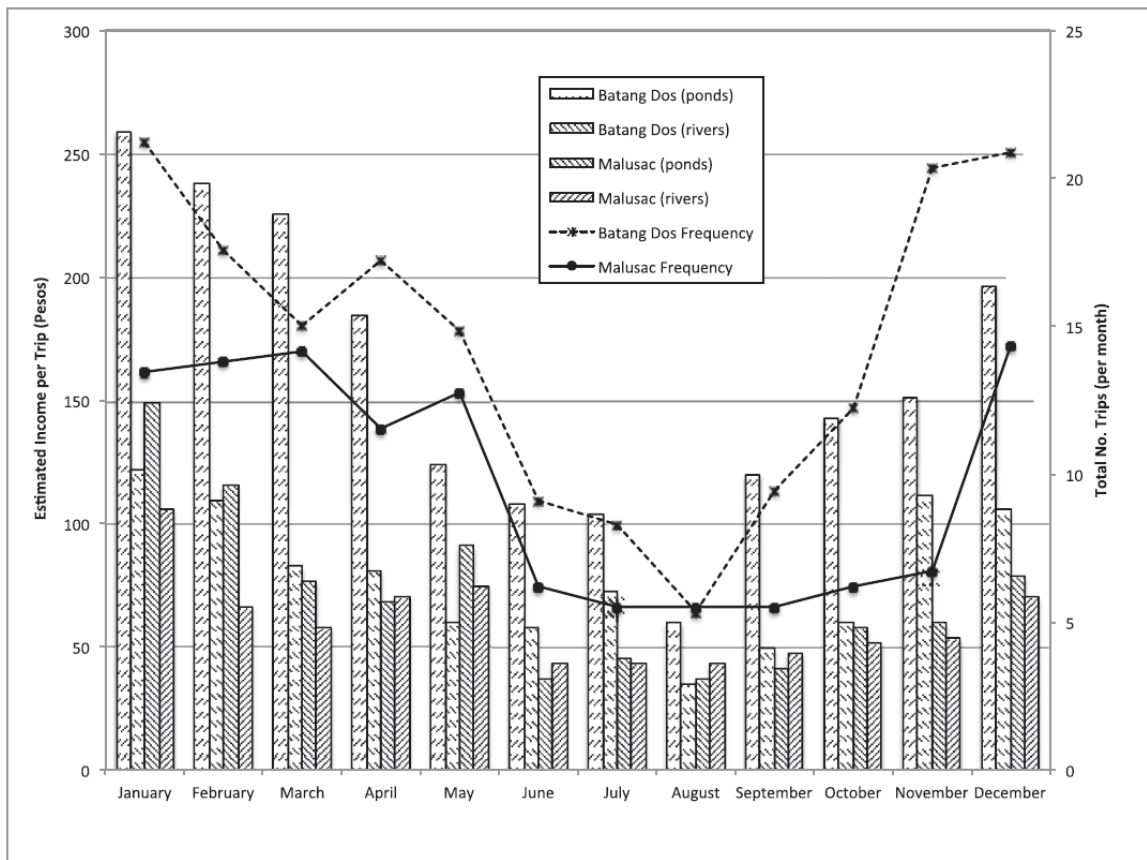
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755 Figure 2



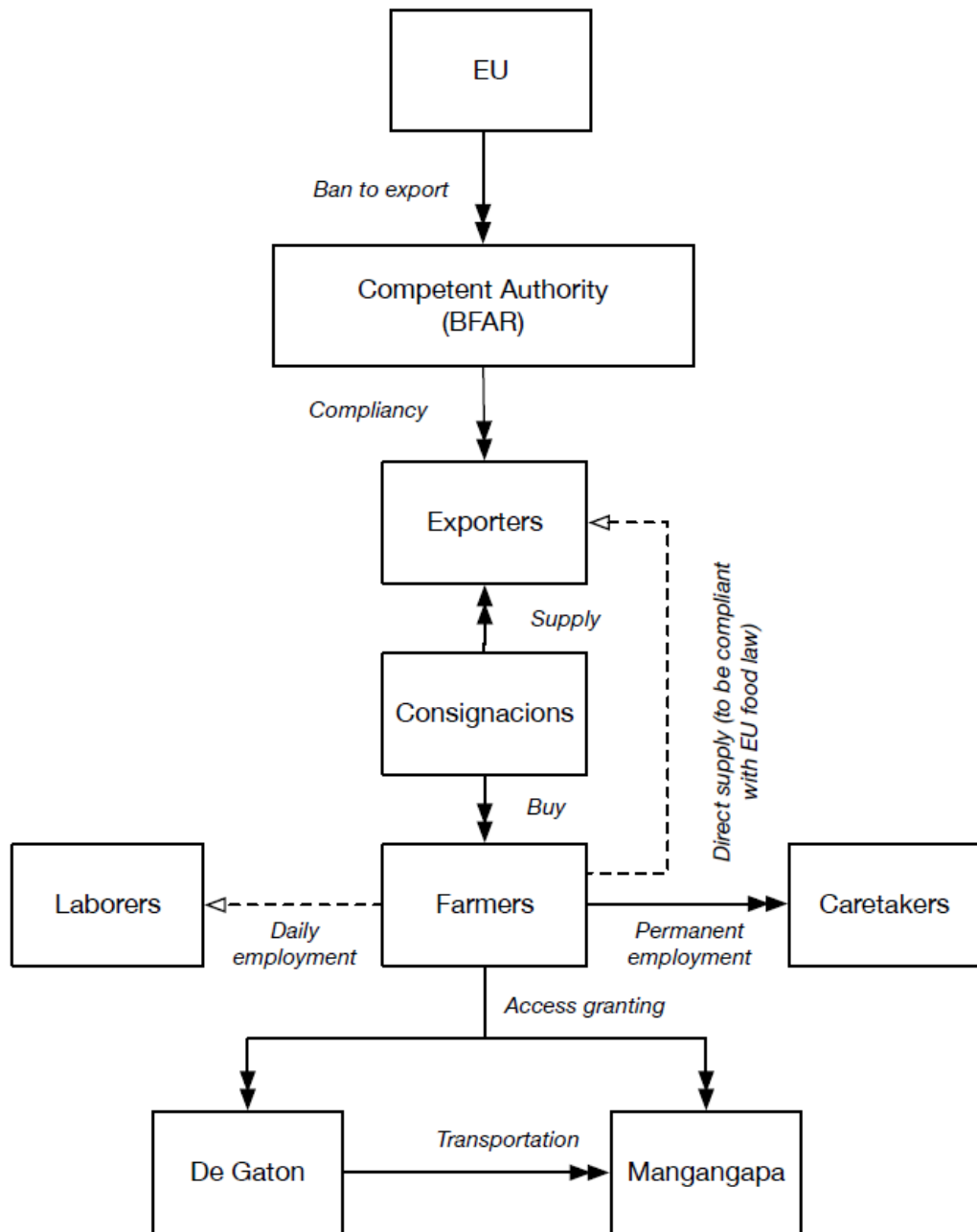
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757 Figure 3



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759 Figure 4



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767 Figure 5

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