Towards stable access to EU markets for the Beninese shrimp chain : quality, legal and marketing issues

Quality and Innovation in Food Chains

Adékambi, S.A.; Dabade, D.S.; Kindji, K.; Besten, H.M.W.; Faure, M. et al

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10. Towards stable access to EU markets for the Beninese shrimp chain: quality, legal and marketing issues

S.A. Adekambi[1], D.S. Dabade[2], K. Kindji[3], H.M.W. den Besten[4], M. Faure[3], M.J.R. Nout[4], B. Sogbossi[5] and P.T.M. Ingenbleek[1]*

[1]Wageningen University, Marketing and Consumer Behaviur Group, Hollandseweg 1, 6706 KN Wageningen, the Netherlands; [2]Laboratoire de Biochimie Microbienne et de Biotechnologie Alimentaire, University of Abomey-Calavi, 01 B.P. 526 Cotonou, Benin; [3]Maastricht European Institute for Transnational Legal Reserach (METRO), Maastricht University, P.O. Box 616, 6200 MD Maastricht, the Netherlands; [4]Laboratory of Food Microbiology, Wageningen University, Bornse Weilanden 9, 6708 WG Wageningen, the Netherlands; [5]Université de Parakou, Faculté des sciences économiques et de gestion (FASEG), BP 123, Parakou, Benin; paul.ingenbleek@wur.nl

Abstract

Traditionally, the economy of Benin has strongly depended on a single crop, namely cotton. Since 2006, the Beninese government has aimed to diversify exports, in particular focussing on high-value export products such as shrimp. Stable market access for shrimps is, however, hindered by their microbiological and chemical characteristics which influence product quality and safety. In the international market, these quality aspects have legal implications, potentially leading to import bans if safety standards are not met. This chapter examines the quality and legal issues of the Beninese shrimp chain and discusses the responsiveness of the chain to these issues. Using an interdisciplinary analysis, the chapter draws preliminary conclusions on how a stable access of Beninese shrimps to the international market can be achieved.

Keywords: shrimp quality, legislation, market integration, institutions, value chains, Benin

10.1 Introduction

Connecting small-scale producers to export markets has become a popular development policy strategy to improve the livelihoods of small-scale agricultural producers (Gulati *et al.*, 2007). Traditionally, the export positions of many developing and emerging countries depend heavily on one or two export commodities, which makes them vulnerable to price shocks of those commodities on the world market. Diversification into high-value export products has therefore become an important policy to sustain growth and food security and to alleviate poverty (Weinberger and Lumpkin, 2007). Evidence from Asia has shown that such policies encourage

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innovation (e.g. Deshingkar *et al.*, 2003; Pokharel, 2003), enhance farmers' incomes and stimulate exports (e.g. Birthal *et al.*, 2007; Pingali and Khwaja, 2005).

However, creating access to the world market is a difficult process for any value chain. Prior research has shown that success is not guaranteed (e.g. Diaz Rios and Jaffee, 2008; Kambewa, 2007; Jongwanich, 2009). In fact, the ability to meet increasingly more stringent food safety standards on developed country markets has become a major challenge for developing country exports (Jongwanich, 2009). In this regard, food standards are significant impediments to trade for many developing countries (Henson and Loader, 2001), resulting in adverse effects on competitiveness, and hence on market access (Diaz Rios and Jaffee, 2008). Kambewa (2007) shows, for example, how the establishment of an export chain for Nile perch from Lake Victoria eventually deteriorated the livelihoods of fishermen and the ecological sustainability of the lake. The case is particularly interesting because fish is not only a high-value product as compared to traditional commodities, but also a vulnerable product that gets easily contaminated, especially in environments with ambient temperatures and the absence of resources and institutions that can secure its quality, like refrigerated transport and laboratories that can check safety and quality. Evidence from other, yet comparable, export chains would help to create a deeper understanding of the factors that should be taken into account when establishing export connections to high-income markets like the European Union (EU) or North America, for valuable, yet vulnerable food products.

This chapter analyses the efforts of the Beninese shrimp chain to connect to the EU market. Benin is a country in sub-Saharan West Africa. Poverty reduction is the key focus of its economic and social policies as 75% of the Beninese population earns less than 2 US dollars a day (World Bank, 2010). Agriculture is the most important economic sector in the country, not only because of the number of active people employed but also for its contribution to exports. Approximately 70% of the active population gain their revenue from agriculture, and this sector contributes up to 80% to export revenues (SCRP, 2007). Cotton constitutes the primary export commodity with about 40% of gross domestic product (GDP) and over 80% of official export receipts (Aregheore, 2009; PSRSA, 2010). The cotton sector is, however, vulnerable to price volatility due to, among others, trade interventions like foreign subsidies (Baffes, 2011), leading to foreign currency losses and livelihoods deterioration. In 2006, the Beninese government therefore aimed to stabilise its export position by increasing the exports of high-value products, including shrimps. Increasing shrimp exports is a valuable strategic choice considering the past importance this sector had in the economy of Benin. As the second export product after cotton, shrimps were essential for their beneficial effects in terms of employment, foreign currencies earnings, and tax revenues. However, the shrimp export sector has been in decline over the last ten years due to difficulties in complying with the requirements of the EU, its major market. Therefore, it appears crucial that development goals address issues related to such a promising sector, and attempt to restore the conditions that can contribute to its expansion.

This chapter aims at outlining the factors that have contributed to the collapse of the shrimp export sector, and attempts to identify the conditions that would enable a sustainable revival of the sector. In the following, this chapter first provides a short conceptual background and description of materials and methods. Next, it offers a brief description of the chain including a description of its history. This is followed by a discussion of the microbiological quality of shrimps, and a description of the institutional environment that surrounds the shrimp chain. The chapter continues with a discussion of the measures taken for improvement and the responsiveness of the shrimp sector to those measures. The chapter concludes with a discussion section and policy recommendations.

10.2 Conceptual approach

10.2.1 Market integration

Building on the definition of Maertens *et al.* (2011), export market integration (EMI) refers to the share of products sold to export markets. EMI is perceived in development literature as a way-out of poverty because it might facilitate access to production inputs, enhance improved technology adoption and hence increase farm income (e.g. Bernard *et al.* 2008; Maertens *et al.*, 2011). Yet, EMI remains a major challenge for governments and development organisations in developing countries. Numerous studies have been conducted to examine and deal with the issue. According to most of these studies, three main institutional constraints stand in the way of EMI of small-scale producers: high cost of doing business, such as transportation costs (e.g. Bougheas *et al.* 1999; Buys *et al.*, 2010), lack of access to investment capital like credit (e.g. Nieto *et al.*, 2007; Van Greuning *et al.*, 1998) and limited access to market information (e.g. Marter, 2005). High transaction costs, which are due to the lack of transport facilities and inadequate farm-to-market roads, limit small-scale producers' access to traders and basic market information (e.g. Marter, 2005). Lack of access to investment capital limits small-scale producers' capacity to invest in quality. Lack of access to basic market information reduces the ability of small-scale producers to take effective production decisions. The conclusion in the development economics literature is that these institutional constraints need further improvements to facilitate small-scale producers' EMI. This is particularly important for high-value products.

10.2.2 High value products

High-value agricultural products (HVAP) are non-staple agricultural products with a high return, including fruits, vegetables, flowers, animal products, and fish (CGIAR, 2005; Gulati *et al.*, 2007). Because of their high economic value, they represent an important counterweight to traditional export commodities, such as cotton, coffee, tea, sugar and cocoa. The past decade has witnessed increasing world demand for HVAP due to changing consumption preferences, in particular in developed countries. This demand has gone up by 6-7% per year (World Bank, 2010). Such a growth in

demand for HVAP is explained by shifts in consumers' preferences, sustained rise in income and urbanisation (e.g. Birthal *et al.*, 2007; Gulati *et al.*, 2007).

Diversifying agricultural exports towards HVAP is argued to play a significant role in poverty alleviation, sustainable growth and food security (Birthal *et al.*, 2007; Maertens *et al.*, 2011). HVAP are suggested to support poor communities to make the transition from subsistence to market-oriented agriculture through, for instance, vertical linkages between small-scale producers and their buyers (Birthal *et al.*, 2007; CGIAR, 2005; Weinberger and Lumpkin, 2007) and create opportunities for small farmers to raise their income (Gulati *et al.*, 2005). For example, Maertens and Swinnen (2009) find that HAVP exports have significant and positive effects on poor household incomes in Senegal.

Shrimps constitute one of the HVAP identified in Benin's Growth and Poverty Reduction Strategy to diversify agricultural exports and alleviate poverty (SCRP, 2007). The sector has significant potential for exports as world-wide demands for shrimps are increasing by 3% a year (United State Trade Representative, 2005).

10.2.3 Food safety

Because HVAP are generally more vulnerable than staple products, they often put specific pressure on the institutions that surround the chain. Food safety and quality assurance therefore rank high on the policy agenda (e.g. Ababouch *et al.*, 2005). As a result, there has been an international drive towards reforming fish inspection systems to move away from end-product sampling and inspection into preventive Hazard Analysis Critical Control Point (HACCP)-based safety and quality systems (Ababouch *et al.*, 2005) to ensure that food does not cause harm to consumers. A food chain approach has been developed in which the responsibilities for food safety and quality is shared by all chain members (FAO, 2003). The chain approach calls for integration between chain members and disciplines (Ababouch, 2006). Logically, appropriate legislation must be backed-up by the institutions that ensure an effective implementation of the regulatory requirements.

In the specific case of shrimps, a key challenge is to ensure through microbiological and chemical surveillance that raw shrimps are free from contamination that could affect the safety of the processed product. In the same way, stakeholders must have appropriate skills to implement technical requirements deriving from the regulatory framework. In a nutshell, the development of a modern and competitive agro-food system involves *inter alia* the ability to detect or demonstrate the presence or the absence of biological, chemical or physical hazards, the verification or certification of traded products with respect to established food safety risks, undertaking scientific analysis of hazards, and establishing or maintaining systems for hygienic practices in food product handling and transformation (Jaffee and Henson, 2004).

10.2.4 Informal institutions

Companies in the formal sectors of the export chain, such as exporters, importers, processors, and retailers, are typically influenced by formal institutions like laws and regulations. Primary producers and traders, often constitute informal stages of the chain that are weakly influenced by formal institutions like laws and regulations (Burgess and Steenkamp, 2006; Castells and Portes, 1989). The weak influence of formal institutions brings informal institutions, like cultural norms and value, more to the forefront. One of the typical cultural characteristics of subsistence contexts is embeddedness (e.g. Burgess and Steenkamp, 2006). Embeddedness is referred to as a desirable relationship between an individual and a group that helps to maintain the *status quo* and that limits actions that might disrupt group solidarity or a traditional order (Licht *et al.*, 2005). The question arises how differences in cultural institutions influence the development of the appropriate behaviour that secures food quality and safety.

10.3 Materials and methods

Research can potentially help to accomplish the challenges described above by understanding the microbiological challenges of the product, the legislation that protects consumers from unsafe shrimps, and the marketing mechanisms in the chain that enable small-scale shrimp fishers to respond to these issues. This chapter describes and integrates recent insights from three on-going PhD studies in food quality and safety, international trade law and marketing, respectively. The chapter builds on the material of these studies, which include an analysis of the existing literature in the three domains and additional desk and field research. With respect to the quality and safety part, this chapter draws in particular on a survey conducted in the Beninese shrimp sector, involving 325 shrimp fishers, 128 intermediate traders (vendors and traders), 12 collectors, and 3 shrimp freezing plant managers to determine the conditions under which shrimps are handled at the fishing areas and in the supply chain towards the plants.

From the legal perspective, the chapter draws on analyses of the food laws in Benin and the EU. This desk research essentially studied the development in Benin law with regard to trends in EU law and assesses the potential interactions between those two sets of law. The desk research has been supported by five interviews with actors such as officers of the Directorate of Fisheries, shrimp projects managers and the quality manager of one processing plant.

The marketing part has been studied by means of desk research combined with interviews and personal observations. The desk research included an in-depth analysis of, on the one hand, publications in the marketing and development literature, and on the other hand, policy documents, research and project management reports in the

domain of shrimp. We completed the desk research with interviews with five experts including researchers, shrimp project managers and fishing directorate agents.

10.4 The Beninese shrimp chain

Shrimps are caught by small-scale fishermen as an informal economic activity in the southern part of Benin. Shrimps are caught in waters that are connected to the sea, which is essential for their development. The life cycle of shrimp includes several phases divided between the sea and lagoons or lakes. Almost the entire production comes from three main lakes/lagoons in this region: Lake Nokoue, Lake Aheme, and lagoon of Porto-Novo.

The traditional chain is oriented towards domestic consumers and consumers in what can be called the regional market, consisting of neighbouring countries, such as Nigeria, Togo, and Ghana. As most of this trade is informal, there are no official statistics on the shrimp quantities that are exported to neighbouring countries. The chain is mainly controlled by traders who buy raw shrimps from shrimp fishers and/or from vendors. Traders subsequently process the shrimps to increase their shelf life, by smoking, or sometimes by frying or drying them. Social relations exist between several chain actors. Some traders provide fishers or vendors with advance payments to maintain loyalty.

Figure 10.1 shows the Beninese shrimp chain. The sector provides work to approximately 21,000 permanent artisanal shrimp fishers (Délégation de la Commission Européenne au Bénin, 2009), of whom most are men (Le Ry *et al.*, 2007). By 2002, shrimps represented around 1% of Benin's exports (SCRP, 2007). From 1993 to 2003, shrimp exports generated substantial revenues and foreign exchange for the country (STDF, 2008). The export value of the shrimp sector increased from 850,000 Euro in 1999 to 3.3 million Euro in 2002.

10.4.1 Brief history

When the Beninese government recognised shrimp as one of the high-value products that could be exported to high-income markets, an export-oriented chain was set up mainly targeting the European Union (EU) where the country has historical connections being a former French colony. The first exporting company, *Société Beninoise de Pêche*, was established in 1993 and its first exports to the EU followed soon. The export connection was made official with the inscription of Benin for the import of fishery products on June 30, 1998 on part II of the list annexed to the Decision 97/296/EC, after a documentary assessment of the application for approval was sent to the European Commission. About 150 shrimp collectors were trained to buy raw shrimps for the processing plants. They selected the shrimps that fulfilled the export requirements, while the rejected shrimps were sold on domestic markets. The raw shrimps were transported to one of the three processing plants located in

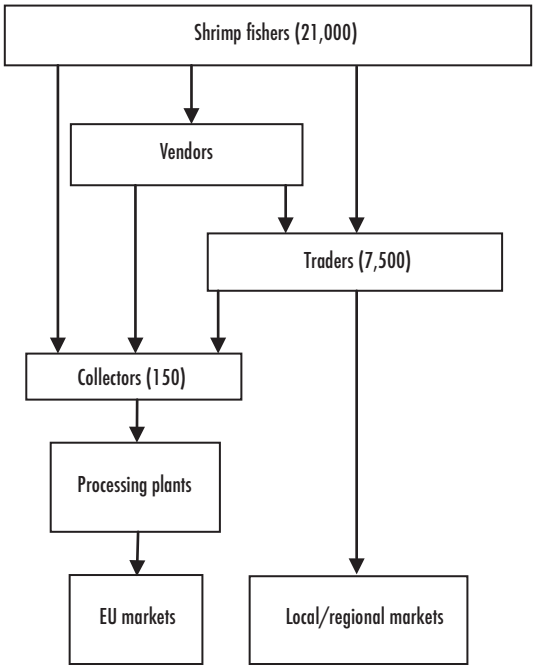

Figure 10.1. The Beninese shrimp chain (2012).

Cotonou, the economic capital of Benin, where they were processed and exported to the EU as raw frozen shrimps.

Until 2001, Benin's shrimp exports grew rather steadily, increasing from 333 tons in 1995 to 734 tons in 2001. After a visit of experts from the European Food and Veterinary Office (FVO) in 2002, the situation would, however, change dramatically. The delegation came to inspect the Beninese export chain for shrimps in order to advise the EU on the potential hazards associated with Beninese shrimps for European consumers. The mission evaluated the 'equivalence of the legislation of Benin with corresponding Community requirements and performance of national authorities for the control of conditions of production and export of fishery products to the EU' (OAV, 2002). The inspection involved the whole production chain, following the farm-to-fork approach. The inspectors visited several fishermen, the fishing ports, the landing sites, the three shrimp processing plants, the National Health Laboratory as well as the Competent Authority (CA). In the end, the mission pinned down deficiencies in

the conditions of production themselves[1], as well as the lack or obsolescence of legal measures[2] supposed to be the basis for a control system aiming at the production of safe end products. As a result, Benin was declared having no legal basis to guarantee and certify the compliance of shrimps exported to the EU with the requirements of Directive 91/493/EEC then in force within the EU.

In reaction to this inspection, Beninese authorities immediately provided the FVO with an action plan with a detailed timetable and submitted an application for funding to the European Commission. However, these guarantees were deemed insufficient, leading Beninese authorities to decide to self-ban shrimp exports to the EU with the aim to undertake remedial measures. The self-ban was maintained for eighteen months up till February 2005.

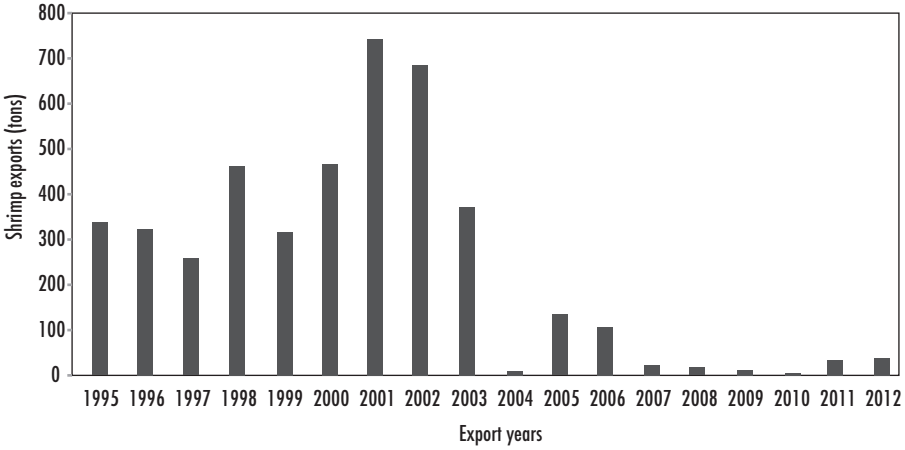

Figure 10.2. Shrimp exports (in tons). Compiled from the Directorate of Fisheries' database (2013).

[1] These refer overall to hygiene and lack of knowledge of good production practices, including the implementation of HACCP principles in shrimp processing plants. HACCP is a systematic and science-based approach that enables the detection of potential food safety hazards in order to take preventive measures. The adoption of a HACCP procedure consists of firstly, identifying the Control Critical Points (CCPs) in preparation, processing and distribution stages as the basis for the control of potential hazards in foodstuffs and secondly, establishing a system for their prevention, elimination or reduction to acceptable levels.

[2] The 6 texts then presented were still in draft form and contained gaps in the definition of essential parameters such as maximum limits for contaminants in the natural environment, histamine and additives, the list of food contact materials, cleaning and desinfection products allowed. Consequently, there was a lack of control procedures with regard to the organisation of landing activities, the collection of freshly caught shrimps, the uneven implementation of production principles, and the use of questionable methods, including hyperchlorination, by operators.

After the self-ban, the exports decreased from 680 tons in 2002 to 96 tons in 2006 and 2 tons in 2009 (Figure 10.2). In that year, a second visit of the FVO to Benin was carried out to assess the reforms and to decide whether the system in Benin had become equivalent to that of the EU. Although this mission acknowledged the significant improvements in the sector since 2002, both in institutional and legislative terms, only the legislation was declared equivalent to EU requirements, while the control system and the functioning of the processing plants were not deemed equivalent to relevant parts of EU law. Despite these non-compliances, the decision 2009/951/EU confirmed Benin as a country from which imports of fishery products for human consumption within the EU is authorised as from January 2010 (EC, 2009).

The burden on the three shrimp processing plants that exported before the ban had, however, been too heavy and they were forced to stop their operations. During the 2012 fishing season, only one processing plant was operational. This plant had been newly established after the ban and, interestingly, it does not just export to the EU, but also to China. With only one factory being operational, shrimp fishers are largely constrained to domestic markets. Based on data collected from 183 shrimp fishers, Adekambi *et al.* (2012) found that about 71% of the total shrimp production in 2012 was sold within Benin. Only 17% of this 2012 production was exported (the remaining 12% was consumed by the fishers, or was wasted).

10.5 Factors affecting microbial contamination

Environmental factors and shrimp handling practices have an important impact on the microbiological quality and safety of Beninese shrimps. Both factors affect the microbial contamination level of freshly caught shrimps and their shelf life.

10.5.1 Environmental factors

Shrimp fishing areas are located in the coastal region of the country characterised by a high population density due to the presence of the most important cities of Benin, such as Cotonou (the economic capital), Porto-Novo (the administrative capital), and the suburb Abomey-Calavi. Waste management in these cities remains problematic. The banks of the channel of Cotonou, which connects the Lake Nokoue to the Atlantic Ocean, are occupied by numerous dumps of garbage and discharge points of industrial waste water (Adeke *et al.*, 2011); Badahoui *et al.*, 2009). The huge Dantokpa fresh produce market near Lake Nokoue is also a source of pollution. The waste produced at this market, which is the trading hub of Western and Central African countries (Dossou and Glehouenou-Dossou, 2007), are drained into the lake through rainwater. Moreover, the population of lacustrine cities (cities established in the lake) in Lake Nokoue without a proper management of solid and liquid waste is increasing. For instance, the high total organic carbon recorded in sediment samples from Ganvie, a lacustrine city located in Lake Nokoue, could be attributed to the fact that all the waste that the inhabitants of this city generate are continuously

thrown into the lake without treatment (Soclo *et al.*, 2002). The lakes and lagoons are thus waste receivers and, therefore, affect the microbial contamination level of shrimps. Obviously, the microbial status of seafood after catch is closely related to environmental conditions and microbiological quality of the water (Feldhusen, 2000). For instance, the high initial microbial contamination load of shrimps from Lake Nokoue and Lake Aheme is mainly due to the water quality of these lakes (Degnon *et al.*, 2012; Dossou *et al.,* 2007).

10.5.2 Shrimp handling practices

Our investigations in 2011 revealed that shrimp fishing generally takes place at night or early in the morning (4:00-6:00 AM). Among the used fishing nets, the drift net remains the most popular. Using this fishing net, three or four successive captures are realised and poured into the same container. About 4 hours elapse between the first catch and the last one. The most frequently used storage containers by shrimp fishers are their wooden boats. Shrimps are stored in these boats at ambient temperature (±27 °C) before delivery to intermediate traders. Most of the intermediate traders just wash the shrimps using lake or lagoon water, and also keep their products at ambient temperature in baskets during approximately 1.5 hours before delivery to the collectors who finally store them on ice. The collected shrimps are then transported to Cotonou where the shrimp processing plants are located.

There are various shortcomings related to post-catch shrimp handling prior to processing. The practice of dumping caught shrimps in the wooden boats where different catches are mixed does not meet the requirements of European Regulation (European Commission, 2004a), which states that each successive catch must be kept separately. Moreover, storing shrimps at ambient temperature from catch until delivery to collectors is in violation of the requirements of the Codex Alimentarius (CAC, 2003) and European Regulations (European Commission, 2004a) which stipulates that chilling of fishery products should start as soon as possible. In fact, shrimps are extremely sensitive to deterioration (Mendes *et al.*, 2001). Unlike other crustaceans (crabs, lobsters) which can be kept alive until processing, shrimps die soon after capture, and they are often contaminated with bacteria from their endogenous microflora as well as from the mud trawled up with them (Adams and Moss, 2006). Therefore, the storage temperature is crucial (Cyprian *et al.*, 2008; Matches, 1982). For instance, sensory analysis done on fresh samples showed that raw chilled shrimps reached the limit of acceptability (50% rejection) after four days in ice, whereas 100% of the samples stored at room temperature (22 °C) were rejected after 24 hours (Mendes *et al.*, 2001). In addition, the quality of lake/lagoon water used to wash shrimps is not in agreement with European regulation since non-potable water is a source of contamination (European Commission, 2004a).

Also the conditions in which shrimps were processed at processing plants were below standards. The FVO experts revealed several shortcomings including a lack of testing the effectiveness of cleaning and disinfection procedures, a lack of water pipes to drain

used water, the presence of rusty materials, and non-compliance with the HACCP plan (Office Alimentaire et Vétérinaire, OAV, 2002).

10.6 Factors affecting chemical contamination

Shrimps are susceptible to chemical contamination, in particular through environmental pollution and post-catch handling.

10.6.1 Environmental factors

The excessive use of chemical fertilisers and pesticides for cotton production upstream from the fishing areas leads to the pollution of the lakes and lagoons. In fact, the chemical products are drained by rainwater into the rivers, which in turn flow into the lakes and the lagoons (Adeke *et al.*, 2011). For instance, chemical analyses on the flesh of tilapia from the Oueme river which springs out of Taneka hills in the Northen part of Benin and flows into Lake Nokoue, showed that different organochlorine pesticides (including banned pesticides) were present in their tissues (Okoumassoun *et al.*, 2002). The average concentration of cadmium and lead in fish samples, other than shrimps, collected from Lake Nokoue was higher than the allowed limit (Hounkpatin *et al.*, 2012). Kaki *et al.* (2011) found that both in water and sediment from Lake Nokoue, concentrations of some toxic metals such as cadmium, lead, copper, and arsenic were high and sometimes exceeded the standards. With regard to shrimps specifically, research showed that unlike other metals, such as cadmium and zinc, the concentration of lead in shrimps from Lake Nokoue exceeded the standard values (Aina *et al.*, 2012). The analyses of heavy metals carried out in 2007 on shrimps from Lake Aheme revealed that the concentrations of lead, cadmium and mercury were all lower than the allowed limits. However, the concentration of mercury was very close to the permissible limit (Coopéartion Belge au dévelopement, 2007). The lower level of metals in Lake Aheme could be explained by the remote geographical location of this lake, at large distance from the big cities.

The discharge of petroleum-based products in the Lake Nokoue (Dovonou *et al.*, 2011) is another important source of chemical contamination since these products contain polycyclic aromatic hydrocarbons (PAH). Also, the common practice of washing cars at the lake shores contributes to their pollution (Adeke *et al.,* 2011).

10.6.2 Shrimp processing

In order to preserve the freshness of their products, processors use chemical products, such as chlorine and sulphites. During their first visit in 2002, the FVO experts pointed out that it is not allowed to use chlorine to decontaminate raw shrimps in processing plants. They also reported the improper use of sulphite by shrimp processors (OAV, 2002). Even in 2009, the FVO experts recommended that the processing plants should better control the use of additives (OAV, 2009).

10.7 The institutional environment

Some of the factors that lead to the microbial and chemical contaminations are rooted in the institutional environment surrounding the chain. Chain actors face a lack of access to productive resources, lack of institutional support, and legal constraints. Productive resources include, among others, capital, knowledge and skills. Actors in the sector, in particular shrimp fishers, face serious capital constraints which limits their capacity to invest. For instance, in 2012 only 6% of shrimp fishers that we interviewed had access to credit during the previous five years. Furthermore, the literacy level among shrimp fishers is low. About 49% of the shrimp fishers did not receive formal education. For those shrimp fishers that are educated, the average number of years at school is 5, which is equivalent to primary level.

Institutional support includes provision of market information and basic infrastructure, like roads that are suitable for transporting shrimps. The shrimp chain actors in Benin lack information on the preferences of EU consumers. The little information that is available is often not shared between actors, because relationships are weak. This leads to market information asymmetry preventing the chain from responding to market demands. Unlike traders, shrimp fishers hardly know about changes in the market value of their product. Furthermore, only 29% of shrimp fishers interviewed in 2012 reported receiving advice from extension services (Adekambi *et al.*, 2012). Shrimp fishers who have no contact with extension services are lacking market information, as extension services represent one of the main sources of market information for small-scale farmers (e.g. Marter, 2005). Being isolated from basic market information, shrimp fishers also have few incentives to take measures that may improve the quality of the shrimps.

Lack of access to proper infrastructure, such as connections with main roads and markets, constitute another impediment to the integration with export markets. About 63% of shrimp fishers interviewed in 2012 lived at least at 5 km from the nearest main market, and 35% of those lived at least at 10 km from the market. Likewise, 92% of the surveyed shrimp villages were about 4 km from main roads (Adekambi *et al.*, 2012). Despite this proximity to main roads, the accessibility of villages still remains an issue. For instance, 32% of the shrimp villages surveyed by Adekambi *et al.* (2012) are entirely surrounded by water and 45% of them are difficult to access during the rainy season. Such difficulties in accessing main roads hamper the market information flow to shrimp fishers and prevent them from engaging in more distant markets because of high transaction costs.

Legal barriers for Benin producers derive substantially from the normative requirements imposed by the EU, the main export market. The current EU food regulatory regime was established in 2002 by the regulation EC No 178/2002, commonly called General Food Law (GFL) that entered into force in January 2004. The GFL is a comprehensive and integrated approach to food safety, which covers any stage of production, processing and distribution of food, following a farm-to-

fork approach. In 2004, a set of complementary regulations was adopted, commonly referred to as the 'food hygiene package'[3]. EU food law combines requirements derived from transparency and proportionality with, wherever applicable, measures based on the principles of risk analysis, which include risk assessment, risk management and risk communication. When following an assessment of available information, the possibility of harmful effects on health is identified but scientific uncertainty persists, provisional measures must be adopted as part of risk management. The GFL establishes the primary responsibility of Food Business Operators (FBO's) to ensure that food placed on the market meets the requirements of food law, therefore entrusting them for the implementation of HACCP principles, including the obligations of traceability and own checks thereon.

With regard to third countries, 'Food and feed imported into the Community for placing on the market within the Community shall comply with the relevant requirements of food law or conditions recognised by the Community to be at least equivalent thereto or, where a specific agreement exists between the Community and the exporting country, with requirements contained therein' (European Commission, 2002). For products of animal origin, the most important import standard is the formal approval requirement of the third country or a part of it. In that respect a list of authorised countries is drawn up and updated by the Community according to a wide range of criteria generally comprising the ability of the legislation to comply with general and specific Community requirements, the financial and material capacity of so-called Competent Authorities to implement, enforce and properly control rules set up by that legislation (European Commission, 2004c). The detection of excess of contaminants and residues, the non-compliance with relevant legislation on organoleptic, chemical, physical or microbiological elements, the presence of poisons are all sufficient grounds to declare a fishery product unfit for human consumption. It is therefore in view of these principles that the EU regularly delegates missions to assess the compliance of exporters with its standards. To be granted access to the EU, the Competent Authority of the exporting country should control and inspect all stages of the chain.

[3] Food hygiene refers to 'the measures and conditions necessary to control hazards and to ensure fitness for human consumption of a foodstuff taking into account its intended use'. (Reg. 852/2004, art. 2.a). The current hygiene legislation comprises the Regulations 852/2004 (setting basic rules and principles applicable to food business operators throughout the food chain), 853/2004 (defining specific hygiene rules to be applied to food of animal origin), and 854/2004 (setting the rules to be applied by national authorities for the control and enforcement of food hygiene policies), along with Regulation 882/2004 (defining an EU-wide harmonised approach to the design and implementation of national control systems).

10.8 Measures for improvement

10.8.1 Legislative measures

Originally, Law 84-009 on the control of foodstuffs, adopted in 1984, was applicable to shrimp consumed in Benin and exported from Benin. However, due to the lack of implementing decrees, this law was never properly applied. Confronted with the ambition to export to the EU and after the shortcomings indicated by the FVO, at the beginning of this century, Benin was compelled to adopt and implement a more effective food law. Considering the needs of the moment, regulatory steps, instead of defining a broad framework for food products in general, were rather focused on fishery products. The radical changes that ensued cover both the legal and institutional environments, even though doubts still persist about their effectiveness.

Triggered by the FVO mission, legal reforms in Benin evolved following a process in two phases. The first phase built upon Law 84-009 on the control of foodstuffs. It started by the adoption in 2003 of the Decree 114 on the quality assurance of fishery products to implement the Law 84-009. Quality assurance is defined as all the concerted and systematic measures necessary to obtain reasonable assurance that a product or service meets given quality requirements. In that respect, this decree defines the regime of the health rules for fishery products, their conditions of processing, preservation, and marketing, as well as the tax system related to these products. It paved the way for the adoption of a set of seven other orders in the same year that deal with questions related to processing plants, hygiene, good laboratory practices and to limits of certain substances in fishery products. The violations by establishments of relevant provisions are sanctioned by a withdrawal or suspension of approval (République du Bénin, 2003b). It is worth noting that these texts were aiming at complying with Directive 91-493 (European Commission, 1991) which was in force at the time of the first FVO inspection in 2002.

Following the change in EU law in 2004 (more particularly the adoption of the GFL), the second phase of legal reforms in Benin departed from the former pattern and covered a broader set of laws applicable to all foodstuffs in general. This process resulted in 2009 in the adoption of five new texts, which literally copy EU current legislation, therefore subscribing to all its requirements. This step was made necessary due to the holistic approach introduced in EU law through the GFL. It proved essential to integrate law concepts, such as risk analysis or traceability in Benin, and better define responsibilities with regard to food safety.

10.8.2 Control system measures

Without a well-organised and properly functioning Competent Authority, there could be no possibility of granting a country or its producers the authorisation to export food to the EU. In Benin, the most important institution remains the Directorate of Fisheries, acting as the Competent Authority according to the appellation required

by the EU. In this respect, the Competent Authority must ensure the registration of shrimp fishers, the implementation of hygiene rules at landing sites, the proper functioning of processing plants, and organise the necessary check of end products so as to deliver the health certificates that authorise the export to the EU.

A new system of shrimp collection is also being implemented, termed Improved System of Shrimp Collection for Export (ISSCE). Two types of landing sites have been constructed, a so-called Plat-Form of Transfer (PFT) and the Bases of Compulsory Check (BCC). The latter are larger and better equipped than the first. According to this new system, shrimp fishers that have cooling boxes are supplied with ice at PFT level before going out to fish. The captured shrimps are immediately stored on ice in the cooling boxes. After fishing, shrimp fishers return to PFT to sell their catch to intermediate traders or collectors. At this level, shrimps are washed, sorted and put on ice in standardised isothermal boxes. The packed products are forwarded to the BCC where a qualified inspector checks them and delivers a basic sanitary certificate. The boxes are then transported to the processing plants where they are cleaned after the unloading of the shrimps. The cleaned boxes return to the BCC where they are filled with ice and sent to the PFT where the Standardised Isothermal Boxes (SIB) are filled with the catch bought by the collectors or intermediate traders and the cycle resumes. So far, two BCC and 12 PFT have been built at the shores of Lake Aheme. Only 3 PFT and 2 PFT are under construction at Lake Nokoue and the lagoon of Porto-Novo, respectively.

10.8.3 Measures at processing plants

Processing plants play a crucial role in the system, considering that ultimately the whole production process remains under their responsibility. They must carry out their own organoleptic checks while receiving supply of fresh shrimps from collectors, put in place a functioning traceability system, and implement HACCP principles.

The self-ban on exports was not without consequences for the companies. For one and a half years they were cut off from their main market, while at the same time investments (more particularly in order to comply with EU requirements) were demanded. In 2005 the EU again allowed imports of Beninese shrimps, but not after it demanded one more sacrifice from the processing plants, namely to destroy all their stocks as precautionary measure. As a consequence, 189 tons of shrimps valued at 700 million CFA francs (about 1.1 million Euros), were destroyed in early 2005. While 175 tons were nevertheless exported in 2005, exports fell to 32 tons in 2006. The following years, however, were not successful, with respectively 54.6 and 6.2 tons exported in 2007 and 2008. The main cause of the drop of exports seems the financial position of the companies that had been seriously affected by the self-ban. In 2009, one processing plant had closed down, the premises of the second were seized by the tax administration, and the third one was closed for renovation. In 2012, all processing plants that were active before the self-ban closed down and only one,

newly established, processing plant was exporting shrimps. Interestingly, this new processing plant not only targets the EU, but also the Chinese market.

The state of the processing plants also affected control practices. Although during their last visit in June 2009, the FVO experts noted considerable progress, they also raised shortcomings related to the adoption and application of HACCP plans (OAV, 2009). In addition, four notifications (three in 2005 and one in 2006, all from Spain) from the Rapid Alert System for Food and Feed of the EU, mentioned a too high content of sulphite in frozen whole raw shrimps (*Penaeus* spp.) (RASFF, 2011). However, to date, no analyses have been carried out on exported shrimps to evaluate the health risks associated with their consumption (Le Ry, 2007).

10.8.4 Responsiveness of the shrimp fishers to the measures

In the end, the effectiveness of the processing plants depends not only on their own practices, but to a large extent also on the practices of the shrimp fishers whose behaviour substantially influences the quality and safety of the shrimps.

A study by Adekambi *et al.* (2012) gave a deeper insight in the patterns of responsiveness of shrimp fishers, as well as on their drivers and consequences. This study measured reactive and proactive attitudes of fishers towards the market. It found that shrimp fishers' (reactive) responsiveness was 2.13 on a 5-point scale, indicating that shrimp fishers on average respond modestly to processing plants' demands (Adekambi *et al.*, 2012).

The results also show that the reactive behaviour is embedded in strong social relationships with traders. In most developing countries, regulative institutions, such as governments and legislation are less effective in managing illicit aspects of the marketing system (e.g. Burgess and Steenkamp, 2006). Shrimp fishers and traders generally rely on each other's trustworthiness to run and sustain their businesses. Traders generally share market information with the shrimp fishers they trust. Furthermore, traders actively train these trusted shrimp fishers in specific fishing, treatment and handling skills. They also provide trusted shrimp fishers with loans at the beginning of each fishing campaign and offer fixed purchasing prices to their shrimp providers. Such relationships enable shrimp fishers to take effective fishing decisions, such as adopting cooling boxes and ice to meet their customers' expectations. Fishers who do not have such trust-based relationships with traders or whose ongoing relationships do not provide such support take a more proactive attitude in order to engage in a partnership with a more trustworthy trader.

The behaviour of both reactively and proactively market-oriented shrimp fishers is supported by the norms and values of the communities in which they live. Such support is important, because shrimp fishers live at or near subsistence levels and depend on social relationships for their investments in fishing gear and extra labour. In particular, the communities that are better connected to the road system have

developed such supportive cultures. As their physical connection to the export market is easier to establish, they have probably benefitted more from the exports in the past and thus developed a culture that supports fishers that aim to comply with the standards of exporting companies. For instance, peers who keep telling shrimp fishers to understand and satisfy customers' wants, are associated with a high level of shrimp fishers' responsiveness to customers' expectations.

Notably, export market integration still pays off for the fishermen. The shrimp fishers that sell a larger share of their shrimp catch to the export-oriented marketing channel, exhibit higher levels of livelihood in that they report to be wealthier and happier than others (Adekambi *et al.* 2012). Shrimp fishers that export their shrimps receive higher prices than those that sell to domestic marketing channels, because exporting companies are willing to pay premium prices for good quality shrimps. Such higher prices lead to higher income that, in turn, contributes to improved livelihoods (see also Maertens and Swinnen, 2009).

10.9 Discussion

Looking back, the Beninese export chain for shrimps made a false start because of a mismatch between the safety levels required by the EU and the level that the Beninese chain members could jointly deliver.

The inconsistency between the provisions of the laws and their implementing decrees has been indicated as the main weakness of the food safety law in Benin (Amaskame, 2010). These accusations, however, neglect that the step from meeting the requirements for a local market and those of the EU market, may have been too big to make at once. On hindsight, the food safety and quality problems should probably have been anticipated when the chain was created in the 1990s, because repairing the system afterwards appeared a painful process in which much of the prior investments were destroyed.

Undoubtedly, the protection of consumers is a legitimate objective, and such a vision must be shared by all countries regardless of their level of development. However, as far as developing countries are concerned, an approach that better balances their needs and priorities should be advocated. A strategy by which the chain could improve step by step, developing from local, via regional (other African), to high-income export markets like the EU might have been a more sustainable approach to overcoming the constraints arising from EU requirements. At the very least, this would not have led to the near disappearance of the shrimp export sector. The recent start of exports to China is in that respect probably a wise decision as it makes the sector less dependent on a single export market.

While most reforms were supported by the financial and technical assistance of the EU, they would have certainly be more beneficial with complementary economic and

marketing expertise that would better frame their implementation. Looking back, the desperate attempts to comply with EU requirements to re-establish market access have probably done more harm than good. Ironically, with a substantial part of the chain being destroyed, the EU market has opened up again. Whether the access is sustainable is another question. Several measures will be necessary to prevent that history will repeat itself.

10.10 Recommendations

It has been widely acknowledged that standards are increasingly acting as important assets to enhance economic welfare. International standards may lead to greater efforts at capacity building for developing countries (Charnovitz, 2002), thereby modernising export-oriented chains, and improving health standards at national level, with positive spill-over effects on competitiveness and market access (Jaffee and Henson, 2004). It emerges that only an actual improvement of production and inspection conditions could guarantee and sustain international market access. In the case of Benin, some steps are still necessary to ensure the efficiency of the shrimp export sector.

To maintain access to the European market, it is first of all important to better manage the solid and liquid wastes around the lakes and the lagoon. The Competent Authority should pursue the implementation of monitoring plans for aquatic contaminants. Shrimp handling conditions should also be improved. In this respect, the recently implemented system of shrimp collection (ISSCE) will be useful.

Second, investments will be necessary both in the private and public domain. It is recommended to pursue investment in infrastructure in order to situate the landing sites as close as possible to the fishing areas to improve shrimp handling practices. Laboratories must exist with the relevant capacities to carry out chemical and microbiological tests to certify compliance with safety rules. A further step would be to work towards accreditation of those laboratories to gain reliability on the international market. Work in progress such as the census of shrimp fishers must be fully completed to facilitate the implementation of the traceability requirements.

In the private domain, shrimp fishers themselves need to develop the appropriate competencies, i.e. knowledge and skills, not only to generate and exploit knowledge about customers' needs and wants, but also to deploy their scarce resources in more competent ways. Besides, to further boost such competencies, traders should reconsider their relationships with shrimp fishers. The development and maintenance of strong relationships, may be a productive strategy in enhancing shrimp fishers' integration with export chains. Moreover, traders could equally enforce quality standards upon the fishers, thus providing better guarantees of compliance with the stringent requirement in the EU or other targeted export markets. Finally, activities

that encourage communities' emphasis on responding to customers' needs and wants must be supported by policy makers and/or NGOs and development projects.

Third, the training of actors in Good Hygiene Practice, Good Fisheries Practices, and audits on implementation of HACCP procedures, should be regularly organised by the authorities in charge of the sector. This is of importance for shrimp processors. In addition to enhance food safety and thus confidence in food trade, the benefits of applying the HACCP system include better use of resources and more timely response to production systems (Moy *et al.*, 1994).

Fourth, research could also play an important role in improving shrimp quality. Little is known about the specific hazards associated with shrimps that could threaten consumer's health. To our best knowledge, the main pathogenic bacteria associated with Beninese shrimps are yet unknown. In addition, the real threats of heavy metals and pesticides related to the consumption of Beninese' shrimps have not yet been elucidated. In fact, the results of the technical inspection carried out by the FVO experts prompted the national government in 2003 to self-ban the shrimp export as a precautionary action. To date, no analyses have been carried out on exported shrimps to evaluate the health risks associated with their consumption (Le Ry *et al.*, 2007). Also a mathematical model describing the effects of temperature and time in the chain on the concentration of relevant microorganisms associated with shrimps could be developed. Such a model will facilitate advising stakeholders on the most effective measures to be taken in the chain to improve safety and quality of shrimps. Furthermore, from both resource-based and marketing perspectives, there is a need to reconsider shrimp fishers' relationship to market integration by investigating competence values that might enable them to develop capabilities and accumulate resources necessary to identify and satisfy customers' needs and wants.

Fifth, aquaculture could be a good option for Benin. This will enable not only a better control of the quality of its products, but also ensure the continuous operation of shrimp processing plants. In fact, the current seasonal character of the fishing of wild shrimps does not make it possible for processing plants to ensure the full use of their processing lines.

Lastly, it might be interesting to raise more awareness about the safety of food at the national level. This will generate from the inside the demand for the law, and bring stakeholders together towards the same goal of a better implementation and enforcement of the food law. Only in such a way could the past lethargy be avoided, and the EU and other export markets be 'captured' sustainably.

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