Designing a feasible plan to involve smallholders in seafood export supply chains

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Abstract: This paper reviews the main theoretical and empirical literature related to the involvement of smallholders in seafood export supply chains. Using a farmer perspective as the point of departure, aspects of how to link farmers to export markets are examined and discussed. Food quality management is a key issue in export supply chains. The paper presented a fundamental reorganization of smallholders production system and business relationships among chain actors to provide opportunities to smallholders to adjust their supply to meet global food quality standards.

Key words: smallholders, quality standards, seafood supply chains

I. INTRODUCTION

During the last half of the 20th century the complexity of agro-food supply chains has increased considerably. Raw materials are obtained from sources worldwide, an ever-increasing number of processing technologies are used, and a broad range of products is produced. In addition, consumer expectations are continuously changing, demanding more convenience, and fresher foods with more natural ingredients. Hence, food quality management has become increasingly important in the agro-food sector (Spiegel et al., 2003), due to changing consumer requirements, increasing competition, environmental concern, and governmental interests. Higher consumer demands regarding the quality, traceability and environmental friendliness pose the challenges for primary producers, especially smallholders in the developing countries (Henson et al. 2000; Humphrey and Oetero, 2000).

The implementation of quality management has evolved from quality control to quality assurance, and finally to Total Quality Management (TQM) (Deming, 1982; Juran, 1989; Dale and Plunkett, 1990; Dalen, 1996; Zhang, 1997). TQM has the potential to enrich quality management through more motivation and participation-oriented approaches (Pfeifer, 2002), but is not widely applied in the food industry (Kramer and Briel, 2002; Hendriks and Sonnemans, 2002). At this moment, the food industry applies various (combinations of) quality assurance systems such as Good Practices (e.g. GMP, GHP, GAP), HACCP, ISO, BRC, TQM, etc., and the combinations of these systems are applied in order to assure food quality (Luning et al., 2006).

II. LITERATURE REVIEW

Luning et al. 2006 defined quality control as a combination of technological and managerial quality functions. In an established food supply chain the quality control should be implemented in the process and product of each member. To guarantee quality, these control activities have to be directed to critical control points (CCPs). According to Reilly and Kaferstein (1997), the following CCPs which are in quality control at aquaculture farm level must be monitored: site selection, water supply, production and harvest. In addition, the CCPs for fish quality will be controlled by processing firms. The way quality is controlled will have consequences for the performance of the chain.

Quality assurance (QA) focuses on system quality instead of product quality. The system must be audited to ensure that it is adequate both in the design and use. Food products are not only tested on their product characteristics, but also on production, packaging, handling and distribution. Quality control is embedded in quality assurance. Control activities form the basis of QA systems, such as HACCP (safety guarantee by using critical control points). The implementation of quality assurance systems, especially in the agricultural-food business, is an issue of the greatest importance. There are several characteristics of food chains posing challenges to the QA system: agricultural products are often perishable and subject to rapid decay due to physiological processes and/or microbiological contamination; most agricultural products are harvested seasonally; products are often heterogeneous with respect to desired quality parameters, such as the content of important components (e.g. antibiotics), size, and color. These issues depend on cultivation differences and seasonal variables, which are hard to control. Moreover, primary production of agricultural products is undertaken largely by farms operating on a small scale, e.g. fish culture (Khoi, 2007). It is against this background that the total food supply chain has to assure and demonstrate that the highest standards of quality and safety are maintained (Hoogland et al., 1998).

Technological and Managerial approach in food quality management

Food quality management involves the complex characteristics of food and their raw materials, such as variability, restricted shelf life, potential safety hazards, and the large range of chemical, physical and microbial processes. According to Luning et al. (2006), food quality management is complicated because it deals with dynamic and complex food systems and people systems involved in realizing food quality. Poon et al. (2003) also mentioned that food quality...
management embraces the integrated use of technological disciplines as well as the integrated use of managerial sciences. Both the use of technology to understand behavior of living fish materials and the use of managerial sciences to understand human behavior is needed. Hence, both technological aspects (i.e., fish characteristics and technological conditions) and managerial aspects (i.e., human behavior and administrative conditions) should be managed in order to improve food quality products.

Luning et al. (2002) proposed a techno-managerial approach for food quality management as a way to analyze and solve the complex quality issues. The approaches differ in the extent to which they integrate managerial and technological sciences. Technological measures for solving quality issues are, for example, obtaining a better understanding of the chemical mechanisms, the development of more sensitive (e.g., microbial) analyses, or reducing defects by genetic modifications. Managerial measures concern human behavior and its working environment that can affect food safety. The techno-managerial approach stresses that it is necessary to integrate the technological and managerial aspects in order to predict food systems behavior, and to generate improvements of the system.

Institutional economics

Institutional economics has been very useful for the study of how agro-food chains are organized. Institutions are defined by North (1990) as “the humanly devised constraints that shape human interaction” and form the “rules of the game” needed to limit transaction costs. Transaction costs are simply the costs of using the market (Coase, 1937), the costs of running the economic system (Williamson, 1985). The costs of acquiring product and market information constitute the major part of transaction costs.

Smallholders must be able to meet market conditions if they are to become players in this game. Moreover, institutions delineate the rules of the game within which a governance structure actually operates. Menard (1995) argued that an institution is manifested in a long-standing historically determined set of stable, abstract and impersonal rules, crystallized in traditions, customs, or laws, so as to implement and enforce patterns of behavior governing the relationships between separate social constituencies. Institutions concern formal arrangements such as property rights, contracts, authority; and informal arrangements such as norms and social ties in governing a transaction (Granovetter, 1985; Powell, 1990). Formal mechanisms can be divided into two categories: contractual or outcome-based mechanisms and organizational or behavior-based mechanisms. These formal mechanisms based on rules, incentives, and authority support inter-organizational transactions by reducing governance problems both ex ante and ex post. Informal mechanisms, also referred to as social control and relational governance, relate to mechanisms of identity (Kogut and Zander, 1996), embeddedness (Granovetter, 1985), trust (Nootenboom, 2002), and routines (Nelson and Winter, 1982). For a long time, new institutional economics (NIEs) and sociology approaches have developed separately, with some authors even claiming that formal and informal institutions should be considered as substitutes (Ghoshal and Moran, 1996, Dyer and Singh, 1998). Most recently researchers have focused on the dynamic interaction between formal and informal mechanisms of governance (Woolthuis et al., 2005; Lazzarini et al., 2001). They concluded that over time a differential mix of formal and informal mechanisms may lead to the most efficient outcome.

Global value chain

The value chain literature views inter-firm co-operation within the chains as the source of competitive advantage (Porter, 1985; Humphrey and Schmitz, 2000). In agri-food business, the value chains are organized linkages among groups of producers, traders, processors and service providers who join together in order to improve quality and the value added of their activities (Johnson, 2005). According to Porter (1985), the value chain describes the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use. Every firm is part of the value system, and by effective cooperation the entire performance of the value system can be improved.

III. THE ROLE OF SMALLHOLDERS IN THE FOOD SUPPLY CHAINS AND MAJOR CHALLENGES OF THEIR INCLUSION IN FOOD EXPORT CHAINS

Smallholders face numerous challenges in accessing food markets for their products. Stringent quality standards in global markets hinder smallholders to participate in export chains (Umesh et al., 2009; Kambewa, 2007; Van der Meer, 2006). A concern for smallholders is the emerging quality standards will be excluded from the export markets because smallholders lack technical capabilities to comply with the quality requirements or the cost of compliance will erode their competitive advantage (Van der Meer, 2006). In addition, retailers and supermarkets vigorously pursue a global sourcing strategy by using their buying power to impose safety and quality standards on their suppliers. As a result, it creates the challenges for smallholders who are unable to meet the standards (Doland and Humphrey, 2004; Henson and Jaffee, 2006).

Some researches emphasize that small-scale farmers lack knowledge about modern technology, proper use of modern inputs and access to credit (Van der Meer, 2006; Key and Runsten, 1999; Segura, 2006; Kambewa, 2007). Key and Runsten (1999) show that efficient production requires knowledge about the optimal production techniques – when and how to apply veterinary drugs, when to supply water, rotate crops, etc. Efficient production also requires that farmers have knowledge about the needs of the export firm –
regarding the supply of raw materials; which veterinary drugs are permitted in the production process to meet export standards. However, the costs of modern technology and inputs are too high for smallholders to procure. Moreover, the quantities smallholders produce are small and heterogeneous in quality. Therefore, smallholders can suffer from diseconomies of scale, which make it difficult to utilize certain types of technologies and services, since banks and buying firms prefer to transact in large quantities rather than deal with many small production units (Key and Runsten, 1999; Henson et al., 2008). This also constitutes major constraints for the adoption of technological innovation (Ruben et al. 2007; Umesh et al. 2009; Segura, 2006) due to lack of access to credit (Danson, 2004; Umesh et al. 2009; Kambewa, 2007). As a result, smallholders usually fail to meet the required standards on primary production which involves quality control and quality assurance at farm level (Kariuki, 2006; Bijman, 2007; Page and Slater., 2003; Henson et al., 2008). They do not have the opportunities for harmonizing existing local standards with required international standards.

The inclusion of smallholders in export chains reflects both their own capability to fulfill quality requirements and the willingness of exporters to purchase from them in the context of their particular regulatory (Humphrey, 2006; Henson et al. 2008). Some authors identify that strict quality standards by global markets; the lack of infrastructure (cultivable land, irrigation, transport links) hamper smallholders entry to high value markets (Kambewa; 2007; Ruben et al., 2007; Henson et al., 2008; Page and Slater, 2003; Reardon et al., 2005, Sriwichailamphan, 2007). Quality standards of global markets are challenged for smallholders to The lack of infrastructure can make smallholders’ production costly or high transaction costs to meet exacting the quality requirements of buyers (Henson and Jaffee, 2006; Poulton et al., 2006).

In conclusion, there are many constrains of inclusion of smallholders in global value chains. The literature reviews show that smallholders who want to participate in the export markets must find ways to obtain (1) quality standards of global markets (food safety and quality requirements; (2) production technology knowledge (training, good aquaculture practices, proper veterinary drugs); (3) market information (incomplete and inefficient information, high transaction costs, ; (4) economies of scale; (5) access to credits; infrastructure (farmland, transportation) (see table 1). These challenges of smallholders are related to the scheme of Gerrefi (2005) as product quality specifications are not easy to codify and the capability requirements of suppliers are high to access market. Hence, the relational governance type can apply in this study and it is necessary to establish efficient coordination between global chain actors and smallholders in order to enhance the competitiveness of smallholders, and facilitate their entry into global markets.

Table 1 Challenges of inclusion of smallholders in global value chains

<table>
<thead>
<tr>
<th>Challenges of inclusion of smallholders in global value chains</th>
<th>(1) Strictly quality standards in global markets</th>
<th>(2) Technologies and infrastructure</th>
<th>(3) Market information</th>
<th>(4) Financial access</th>
<th>(5) Vertical coordination</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Food safety and quality (heath risks, microbial pathogens and other contaminants (antibiotic residues).</td>
<td>- Umesh, 2009; Kambewa (2007); Henson and Jaffee (2006); Henson et al., 2008.</td>
<td>- lack of quality control and quality assurance of milk at farm gate.</td>
<td>- high transaction costs (related to poorly developed infrastructures)</td>
<td>- asymmetric information from buyers</td>
<td>- lack of access to credit</td>
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<td>- Traceability</td>
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<tr>
<td>Francesconi (2009) (PhD thesis)</td>
<td>Cooperation for competition ( Linking Ethiopian farmers to markets (Dairy cooperatives)</td>
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<tr>
<td>Van der Meer (2006) (Agro-Food Chains and Networks for Development, Wageningen)</td>
<td>Exclusion of small-scale farmers from coordinated supply chains</td>
<td></td>
<td></td>
<td>- lack of knowledge about markets, technology and quality inputs</td>
<td>- access to credit</td>
</tr>
<tr>
<td>Henson et al., 2008 (Policy research working paper, World Bank)</td>
<td>Linking African smallholders to high value markets</td>
<td></td>
<td></td>
<td>- lack of market information</td>
<td>- lack of farmers’ organization</td>
</tr>
</tbody>
</table>
Henson and Jaffee. (2006)  
(The European Journal of development research, Vol. 18, No.4, pp.593-621)  
Food safety standards and trade: enhancing competitiveness and avoiding exclusion of developing countries  
- food safety standards  
  - techno-managerial functions related to food safety.  
  - high costs of compliance with regulatory food safety requirements

Sriwichailamphan (2007)  
PhD thesis  
Global Food Chains and Environment: Agro-Food Production and Processing in Thailand  
Case of Frozen Shrimp Chain in Thailand  
- food safety and environmental requirements  
  - good aquaculture practices  
  - drugs residues  
  - limited availability of farmland to construct waste water treatment system.  
  - lack of credit

Bijman (2007)  
In book of Tropical food chains: Governance regimes for quality management, Wageningen  
The role of producer organizations in quality-oriented agri-food chains  
- market access  
  - economies of scale  
  - bargaining power  
  - high transaction costs  
  - low technology innovation

Ruben et al. (2007)  
Wageningen Academic publishers  
Tropical Food Chains: Governance Regimes for Quality Management  
- lack of quality control and quality assurance at farm gate  
  - stringent quality demands  
  - economics of scale  
  - lack of market information  
  - low investment in advanced technology  
  - coordination constraints

Source: Literature on smallholders’ challenges of participating in global markets.

IV. FEASIBLE SOLUTIONS TO BE INCLUSION OF SMALLHOLDERS IN GLOBAL VALUE CHAINS

There is increasing evidence that producer organizations offer one way for smallholders to participate in the market more effectively (Francesconi, 2009; Bijman, 2007). Small-scale farmers should establish producer organization (PO) to facilitate them to meet the market demands. Horizontal coordination through farmer organizations, smallholders may be in a better position to reduce transaction costs of market information. Bijman (2007) states that producer organizations can help their members to obtain the market information, negotiate prices with buyers, and learn from international best practices. The producer organization will train farmers on production technology knowledge, drugs application, disease control and overall management of the production to ensure that quality products are produced (Umesh, 2009; Francesconi, 2009). Umesh (2009) reveals that the organization of farmer groups through collective action become attractive to buyers who are looking for ways to ensure traceability and reduce transaction costs. As a result, farmers can improve their bargaining power with their buyers. Internal economies of scale can be also reinforced through the establishment of farmers’ associations (Ruben et al., 2007). Higher food-quality and safety standards can also be better met if farmers make joint investments and are willing to exercise mutual control on free-riding. Consequently, smallholders can compete with larger farmers and access into high value markets (Henson et al., 2008; Humphrey et al., 2006).

Integration in global food chains mainly depends on coordination (Gereffi et al. 2005; Humphrey et al., 2006). Small-scale farmers depend on downstream parties in the chain such as input suppliers, exporters and creditors. In order to guarantee the quality standards vertical coordination between small-scale farmers and their chain actors are crucial (Ziggers, 1999; Hobbs and Young, 2001; Borger, 2001; Schulze et al., 2006). Vertical coordination are important when examining ways to reduce transaction costs. Hobbs and Young (2001) states that reduction in transaction costs through vertical coordination is beneficial to the firm and the farmers mutually. The firm gets an assured and timely supply of the desired raw material. On the other side, the farmers get an assured market for their produce. Moreover, they have a more reliable access to production inputs, capital, technology and market information (Han et al. 2006; Hobbs and Young, 2001; Ruben et al., 2007). Therefore, smallholders can remain involved in using different strategies for improving vertical and horizontal coordination (Kaplinsky and Morris, 2000; Henson et al. 2008; Key and Runsten, 1999).

Finally, public-private partnerships can play a key role in facilitating farm to market linkages that can satisfy the market demands for food safety and quality while retaining smallholders in the supply chain (Henson et al., 2008; Humphrey, 2006; Dannson, 2004). The government and the private sector can help smallholders expand and upgrade their capabilities and practices to meet the quality requirements of global markets. There is a decisive role to play for institutional environement in guaranteeing the legal framework and defining transparent rules for conflict settlement (Key and Runsten., 1999; Ruben et al. 2007; Amanor, 2009). Small farmers can only make the required investments to improve delivery frequency and quality when they can be relatively certain regarding available market outlets. Key and Runsten (1999) indicate that contract farming provides best outcomes under conditions where public surveillance is guaranteed. The current paradigm perceives government as enabler creating the conditions that facilitate and encourage the private sector to structure its supply chains to involve smallholders (GTZ, 2003; Henson et al. 2008). The role of government is important in establish regulatory control programs for ensuring food quality at the primary production level. The private sector’s role is to invest in supply chain
In conclusion, there are three possible solutions to inclusion of smallholders to global markets (1) horizontal coordination among smallholders (producer organization); (2) vertical coordination among chain actors; and (3) intervention of public and private sectors (see table 2).

<table>
<thead>
<tr>
<th>Author</th>
<th>Remarks/Solutions of inclusion of smallholders in GVCs</th>
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<tr>
<td>Umesh et al. (2009)</td>
<td>Organize farmers into cluster (aquacultus) to share resources, empowered small-scale farmers, increased stakeholder interaction and involvement within the clusters, and adopt better management practices (BMPs).</td>
</tr>
<tr>
<td>Kambewa (2007) PhD thesis</td>
<td>Vertical coordination between small-scale fishermen and processing firms by contract. Contract is a mechanism to stimulate sustainable and quality-enhancing practices. The contract provides production facilities, price information, bring fishermen closer to international channels and allow private policy enforcement of sustainable practices.</td>
</tr>
<tr>
<td>Francesconi (2009) PhD thesis</td>
<td>Collective action (horizontal coordination) by cooperatives upgrades production quality, minimizing drawbacks in terms of production quantity and productivity. Ethiopian cooperatives help (1) to improve quality control at the farm gate, and (2) to improve farmers’ access to land and market information on quality management.</td>
</tr>
<tr>
<td>Dannson (2004)</td>
<td>Horizontal coordination by establishing cooperatives and vertical coordination between cooperatives and export firms to access global markets. In addition, the support provided by local authorities in the farm-agribusiness linkages to develop effective smallholders’ organization.</td>
</tr>
<tr>
<td>Sáenz-Segura (2006) PhD thesis</td>
<td>Vertical coordination by contract farming as a market institution between smallholders and agro-processing firms in Costa Rica. Contracts provide an important device for improving security and enhancing the involvement of smallholders in international marketing chains. Farmers delivering under (in)formal contracts with processors/exporters have better access to credit, critical inputs and information, enabling them to benefit from economies of scale and scope. Moreover, governmental support is required for supply chain coordination towards product and process upgrading are of utmost importance.</td>
</tr>
<tr>
<td>Van der Meer (2006)</td>
<td>Coordinated supply chains are commercial tools in competitive strategies. Development of producers’ organizations and training farmers about modern markets. Government provides adequate laws, regulation and enforcement necessary for doing business, in particular in food supply chains in which small-scale producers are involved. Important areas of attention are regulation of markets for pesticides and veterinary drugs. Moreover, government facilitates market access for smallholders in organization, technology, and training.</td>
</tr>
<tr>
<td>Henson et al., 2008</td>
<td>Public and private sector play the important role in facilitating the inclusion of smallholders to global markets. The roles of government are cast as providing the economic, political, and infrastructural conditions necessary for private investment. The private sector, in turn, is tasked with the responsibility for driving the integration of small-scale producers into higher value markets via business relationships and associated provision of market information, technical advice, and logistical and other services.</td>
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<tr>
<td>Sriwichiilamanphewan (2007)</td>
<td>- role of governments, NGOs, processing firms in facilitating farmers to adopt quality assurance system (GAP, HACCP). - contract farming or advice from relevant companies had the largest impact on the adoption of food safety and environmentally-friendly production practices by farmers (vertical coordination) - the bank provides loans to those farmers who had been certified by the Department of Fisheries.</td>
</tr>
<tr>
<td>Key and Runsten (1999)</td>
<td>Vertical coordination through contract farming offers many benefits for smallholders including access to new markets, technical assistance, specialized inputs, and financial resources. Contracts can also reduce crop price variation, helping farmers bear the risk of food crop production. Producer organizations, such as marketing cooperatives, could serve to lower contracting transaction costs for small-scale growers.</td>
</tr>
<tr>
<td>Bijman (2007)</td>
<td>Producer organization support farmers to overcome governance problems (food quality requirements, safeguarding specific investment, coordinating independent activities)</td>
</tr>
<tr>
<td>Ruben et al., (2007)</td>
<td>Smallholders can remain involve in export chains by improving vertical and horizontal cooperation with chain partners.</td>
</tr>
<tr>
<td>Zeggers and Trienekens (1999)</td>
<td>Vertical coordination between smallholders and chain partners to assure quality in food supply chains. Partnerships are likely to extend across food supply chains from input supplier through primary producer to processor and distributor. In addition, the costs of producing the quality product demanded by consumers likely will be lower in a more closely coordinated system.</td>
</tr>
<tr>
<td>Hobbs and Young (2001)</td>
<td>Closer vertical coordination among primary producers and their partners to reduce transaction costs and risks related to the changes in technology, and increased needs by small-scale farm operations for capital and managerial skills.</td>
</tr>
<tr>
<td>Schulze et al. (2006)</td>
<td>Vertical coordination between producers and processors to improve traceability and secure higher and more consistent quality of pork.</td>
</tr>
<tr>
<td>Amanor, 2009</td>
<td>Vertical coordination between export firms and smallholders to enhance efficiency to participate in global markets. Large companies can provide credit, security and risk-assurance for smallholders. They can organize the provision of cost-effective inputs for smallholders through institutional innovations related to linkages with farming groups or cooperatives. In addition, the government and private sector can help smallholders expand and upgrade their farming practices to meet the new quality requirements of global markets. Public-private efforts to promote collective action and build the technical capacity of farmers to meet the new quality standards.</td>
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</table>

Source: Literature on possible solutions to be inclusion of smallholders in global value chains
V. CONCLUSION

This paper reviews the main theoretical and empirical literature related to food quality management, global value chains and the inclusion of smallholders in seafood export supply chains. It starts with an overview of quality management development, as this is the most critical issue in the role of the smallholder in export chains. Subsequently, it gives a short introduction in institutional economics and global value chain. The global value chain approach is used to analyze the challenges and feasible plan in integrating smallholders to export chains.

REFERENCES