Quality Requirements and Quality Infrastructure in Value Chains Reaching Out to Developing Countries

Examples from the

Fish/Shrimps, Spices, Wood, and Leather Sectors

Study for the PTB, International Technical Cooperation
Braunschweig
December 2007

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Acknowledgement:

Special thanks go to Dr. Hoang-Lan Ha and Etti Winter who provided valuable inputs to the study.

1 Introduction

Participation in international trade is important for development as it can facilitate economic growth and poverty reduction in developing countries. The recent expansion of international trade has, in fact, offered great opportunities for developing countries. Many of them have been actively participating in this growing trade, deriving important economic and social benefits. The picture is less bright in many other countries that have not achieved integration into world markets and where progress has been very limited.

One of the promising market segments where developing countries have made important inroads are high-value agricultural and food products. Here, developing countries can capitalize on their natural advantages on the one hand and generate employment and income opportunities through primary and secondary processing on the other. The same is true for the processing of wood and other products extracted from forests.

However, changes in the nature of markets and trade for these products in current years have created new challenges. One of these arises from the fact that product and process standards have gained increasing importance in regulating trade. Particularly public and private standards[1] relating to product safety, environmental and social standards have become more stringent and have become a key requirement for access to international marketing channels. Developing countries have to respond to these challenges. The establishment of a well-functioning quality infrastructure is, thus, increasingly important for them.

This study analyses the above mentioned challenge from a value chain perspective. The value chain approach places particular emphasis on the coordination of different actors along the chain of activities involved in the production, processing and distribution of products. Based on a comprehensive literature review, the study focuses on the role of quality infrastructure in the value chains, focusing on global value chains with final products sold on the OECD markets. It examines the effects of the quality infrastructure on the value chains for fish and shrimps, spices, wood and leather products. In detail, the study attempts to tackle the following questions: (i) what are the main characteristics of the value chains for these four products, highlighting their importance for and structure in developing countries ii) what are the most important quality parameters that actors along the chain have to respond to, and iii) what effects does the existence or the absence of a

[1] Private standards are set by individual private enterprises including supermarkets, whereas public standards are standards which have been developed either by international bodies like CODEX ALIMENTARIUS or the International Standard Organization (ISO) at the international level, or they have been set as minimum standards at the national level from public authorities.

functioning quality infrastructure have on the main factors that determine socio-economic outcomes, namely governance and coordination, barriers-to-entry, rents and upgrading opportunities.

From these case studies some general recommendations for national policy makers as well as development cooperation and conclusions for future research will be derived.

The study is based on a literature review and on interviews with selected German experts like importers, traders, or trade associations with knowledge on the above specified sectors.

The paper is divided in six further sections. Section two introduces the concepts of the value chain and quality infrastructure and explains how quality infrastructure is related to the major components of value chains namely governance and cooperation, coordination, barriers to entry, and upgrading in the value chain. Sections three to six then examine the effects of quality infrastructure on the value chains for the individual products. Section seven draws some conclusions on the effects of quality infrastructure on developing countries' competitiveness, points out the major problems faced by developing countries in setting up well-functioning quality infrastructure, and derives some conclusions for the future research agenda.

2 Value Chain and Quality Infrastructure

Several concepts have been utilized, during roughly the past two decades, to first analyze barriers to accelerated private sector based growth in developing countries, and second to identify possible actions to overcome these barriers in order to stimulate economic growth and particularly growth patterns that benefit the poor, as the target group of development policy. Some of these concepts took the special structure of the business sector as the starting point, discussing particularly the situation of small and medium enterprises (SMEs) or the differences between formal and informal companies. Others focused on aspects of territoriality and its impact on the growth of companies, such as the concepts of "Clusters" or of "Local and Regional Development".

During the last years, the concept of the "value chain" has attracted the attention of researchers and policy makers alike, this happened in different notions, such as "global value chain (or *commodity*) approach", value chain mapping etc. In the general understanding, 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 (Kaplinsky and Morris, 2002, p.4). A value chain, therefore, consists of a number of value added links and within

each link of the chain, there are ranges of activities. The attractiveness of this concept has at least two roots:

— First, as a heuristic concept, the value chain allows to map all the relevant actors that play a role in bringing a product from the extraction of raw materials to the final good, sold on the market. This mapping exercise allows identifying missing or insufficiently developed or deficient chain links. Thus, appropriate actions for national policy and development cooperation can be designed.

— Second, the concept has, since about the mid 1990s, been developed to a much more ambitious concept than a mere tool for the adequate description of more or less technical flows of product. Rooted in the work of Gereffi et al. (1994) on global commodity chains, a series of conceptual and empirical studies have been carried out, taking the value chain concept as *"an analytical tool which explains how and why global production networks operate"* (Kaplinsky / Morris / Readman 2001, p.5).

The analysis of value chains goes beyond the firm-specific analysis and focuses on the dynamics of inter-linkages within the productive sectors. In today's world, markets are diversified and production processes are complex and internationally scattered. The value chain analysis allows for an easy uncovering of the dynamic flows of economic, organizational and coercive activities between producers within different sectors even on a global scale (Kaplinsky and Morris, 2002).

The studies following this comprehensive understanding of value chain made clear that in order to understand the developmental impact of value chains and to adequately shape them through national policy making or development cooperation, the special characteristics and the functioning of different value chains have to be analyzed. The research has put into focus some essential concepts related to value chain development and the special position of – mainly small and medium – enterprises integrated into value chains, namely governance and coordination, barriers to entry and upgrading. Before presenting these concepts in more detail, we will briefly sketch the second mayor concept of this study, the Quality Infrastructure (QI).

2.1 Quality infrastructure

Quality standards have nowadays become a key factor in shaping access to global value chains and, thus, to international trade. This has been accompanied by an increased importance of aspects such as quality control and management, traceability and certification. Product and process standards or technical regulations are applied in order to prevent deceptive practices in the value chain as well as to mitigate against health and environmental risks. By providing common reference points for the notions "quality" or "safety", standards and technical regulations also convey useful information about products and services in a way that improves competition and consumer capacity to

choose. Market failures and transaction costs in the value chain are thus overcome and reduced.

Quality infrastructure is a system responsible for the setting up, implementation as well as monitoring of standards and technical regulations[2] in the value chain. The term quality infrastructure refers to all aspects of metrology, standardization, testing and quality management with its components certification and accreditation, which is also widely known as the MSTQ structure (Chaivimol et al., 2004). This includes both public and private institutions and the regulatory framework within which they operate.

Standardization

Standards, technical codes and directives form the central element of a quality infrastructure. They define the properties, dimensions, procedures, etc. of products and services. Standards can be developed from scratch in each country or adopted from international standards such as the ISO standards (which is more common nowadays). While the term "standard" is usually used for voluntary application, the term "technical regulations" is internationally used for compulsory implementation (Chaivimol et al., 2004).

Standardization institutions have the tasks of supporting the standardization process, harmonization and coordination. Such organizations are often run by the private sector, but can also be public institutions. Nowadays, the stock of standards and technical regulations worldwide is estimated well above 100,000 and this number is growing rapidly (UNIDO, 2002). The bulk of these standards has been set by private sector entities, representing the interest of a certain industry or interest group, and many of them are international in scope. Non-governmental organizations (NGO) have also been involved in standard-setting, working with industry and international organizations to develop standards in such areas as corporate social responsibility (WTO, 2005).

Metrology

Measurements and tests required for all production, quality and certification activities must be consistent and correct. A National Metrology Institute (NMI) is thus an important part of a national quality infrastructure, responsible for the development and maintenance of the national measurement standards in physical and chemical quantities, i.e. for the definition, descriptions and dissemination of measurement standards. This

[2] The monitoring of standards refers especially to the testing that pesticide residues do not exceed certain minimum levels but also to the control, often by the buyer or by an accredited certification agency, that certain environmental requirements have been met either during the production or the processing stage.

includes operation laboratories for primary and secondary physical standards as well as certified reference materials for chemical and microbiological purposes; laboratory capacities for legal and industrial metrology; and a framework and system for calibration and material testing (UNIDO, 2002). In general, NMIs are public institutions. However, some of the services can be provided by the private sector.

Testing

Testing refers to the analysis of the properties, ingredients and characteristics of products. Within the quality infrastructure, the testing component ensures that standards and technical regulations are implemented in the production process. Testing laboratories can be set up by the public or the private sector according to the needs in a country (Chaivimol et al., 2004). The credibility of a testing laboratory and thus its testing reports are important for the client's decision to buy. As the setting up and maintenance of test laboratories is costly and difficult, some developing countries also use the testing services provided by internationally recognized test laboratories in other countries.

Certification/Conformity assessment

Certification confirms conformity with requirements defined in written standards by assessment. It goes beyond testing and inspection in the sense that process and product characteristics are assessed against a specific standard, whether mandatory or voluntary (WTO, 2005). A formal attestation ("certificate") that the product meets the required standard or customer specifications is provided and/or the right to use a certification mark on the product/packaging is licensed to the producer. There are two different types of certification: certification of management systems (demonstrates that the enterprise in question has implemented a specific management system, e.g. ISO 9000) and certification of products (proves that production processes, contents, properties, etc. of a product comply with the requirements of a written standard (Chaivimol et al., 2004).

Certifying bodies can be either private or state organizations. In many countries, they are still governmental departments or ministries, which are authorized by law. As the demand for certification is growing, certification activities are commercialized and more private institutions are involving in providing certification services.

Accreditation

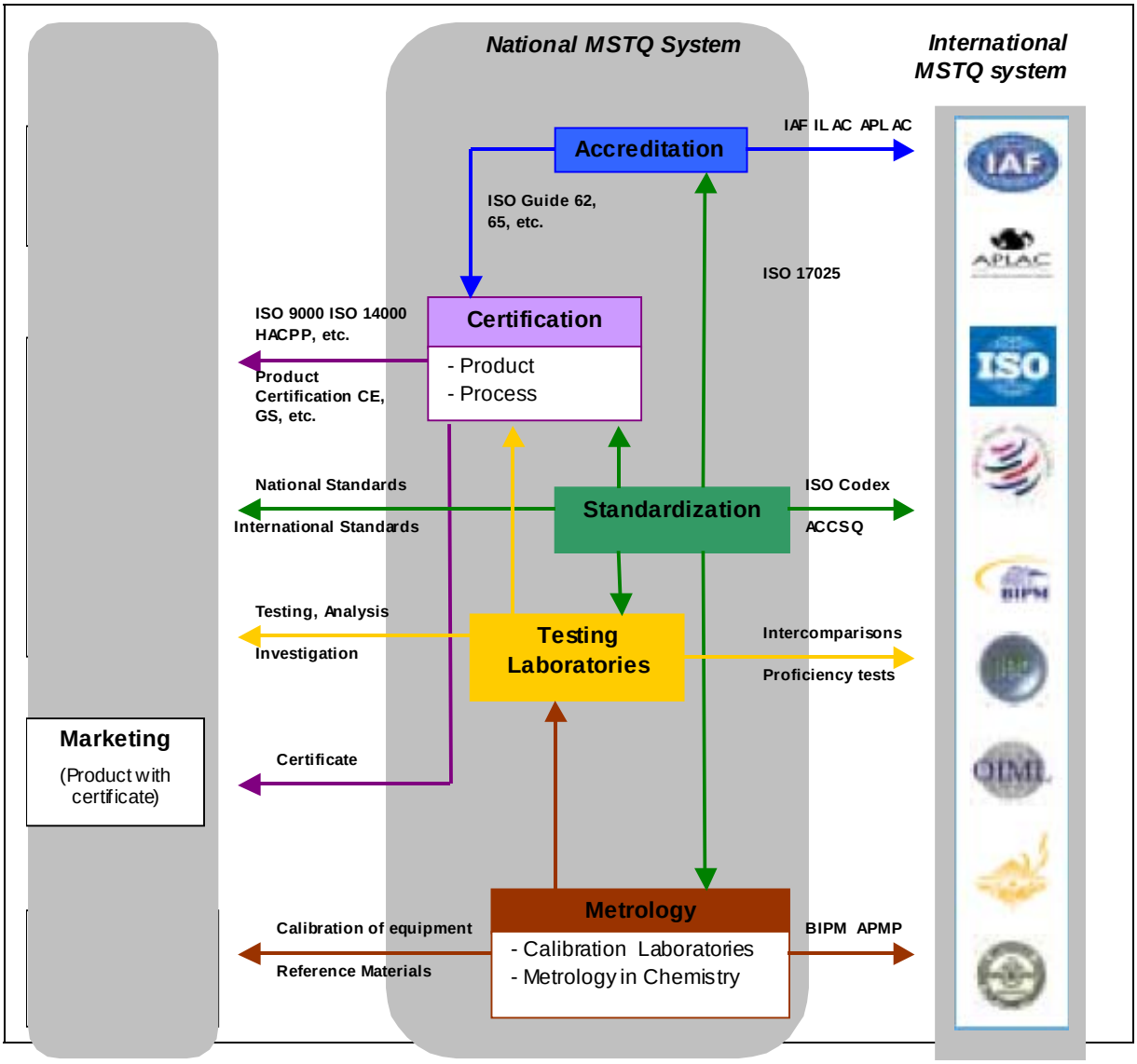
Accreditation is the formal confirmation by an independent third party that a body is competent to perform certain tasks. For example, it evaluates calibration and testing laboratories and other bodies involved in certification of products, systems and processes, with a view to ensuring that testing facilities and methodologies, and thereby the

certification activities satisfy a written standard. Accreditation is particularly important when users (regulating authorities, purchasers or suppliers) are not in a position to evaluate themselves regarding the competence of a conformity assessment provider. It therefore facilitates the mutual recognition of certificates of conformity and promotes international trade (BMZ, 2004).

Accreditation is commonly seen as a governmental responsibility or, at least, as requiring endorsement by the government (WTO, 2005) and has an independent status. Apart from national accreditation authorities, there are regional and international umbrella organizations for accreditation activities. Examples are the International Laboratory Accreditation Cooperation (ILAC), the International Accreditation Forum (IAF), the Pacific Accreditation Cooperation (PAC) and the European Cooperation for Accreditation (EA).

Figure 1 summarizes and shows the linkages between the product value chains and the national/international QI systems. Quality infrastructure with its five components is applicable to all the links and activities of the value chain. The next sub-section will discuss how quality infrastructure is related to some key factors in the value chain.

Figure 1: Quality infrastructure and the value chain



Source: Adjusted from Chaivimol et al., 2004

2.2 Framework for analyzing quality infrastructure in the value chain

Value chain analysis is one of the most prominent approaches to analyze changing market structures and to develop suitable strategies for private sector development in developing countries. A closer examination reveals that the understanding of what value chain analysis implies, can be rather different, depending on the concrete objective of the study. In fact, the concept can be traced back to different “schools of thinking” of the last decades (see Stamm 2004 for an overview). The approach taken up in the present study

follows the line of research pushed forward mainly by investigators from the UK and the US and directly or indirectly root in the notion of "global commodity chains", developed by Gereffi et al. in the early 1990s. The approach is especially helpful to analyze the socio-economic outcomes and potentials of value chain formation. Three key factors are important in this concept, and all three can be related to the roles of QI:

- Governance and coordination of value chains;
- Barriers-to-entry;
- Upgrading within value chains.

2.2.1 Governance and coordination of value chains

Value chains imply linkage interactions. One of the important findings of the value chain approach is that in the course of economic globalization, the relationships between the actors (producers, processors, traders etc.) are less and less characterized by pure spot market type interaction. This has mainly to do with the fact that the success on the final markets depends less and less on pure price-quantity-relations but rather on a series of additional factors that require higher levels of interaction among chain actors. Gereffi et al. (2005) argue that coordination and governance structures in value chains are determined by three factors: (i) the amount of information that needs to flow along the chain in order to coordinate the various activities within it (i.e. the complexity of information); (ii) the extent to which this information can be codified (i.e. turned from hard to-communicate knowledge into codified information that can be pressed easily from one agent to another); and (iii) the extent to which suppliers are competent to meet the requirements placed upon them (see Stamm et al. 2004, p. 39).

The difference between the coordination and the governance of value chains is that *coordination* occurs in any type of value chains, while power asymmetry is central to value chain *governance*[3]. One of the important findings of research along the value chain approach is that in many value chains highly important in the context of economic globalization (apparel, electronics, fresh fruits and vegetables), there is one or are only few actors (the "lead firms") who set and/or enforce the chain parameters (i.e. product, process, qualifications, etc.) under which others in the chain operate (Kaplinsky and Morris, 2002). Chain governance is therefore defined as "*the process of specifying, communicating and enforcing compliance with key product and process parameters along the value chain"* (Humphrey, 2005).

[3] Parallel to the governance of value chains, governance aspects of quality infrastructure have been elaborated by Grote, 2006.

While important chain parameters are set by lead firms, today a series of externally set standards are emerging that also govern value chains in the sense that the actors along the chain have to comply with them in order to penetrate certain markets or to remain within them. These parameters are either compulsory and confirmed in national laws or similar documents (e.g. EU directives for maximum residue limits in food products), or voluntary but increasingly being considered an essential requirement for a product to circulate on the market, such as certain ISO standards. Some standards also delimit certain market segments, usually with higher prices than mainstream products (e.g. Fairtrade, organic).

Institutions such as testing laboratories, certification and accreditation bodies provide the services to monitor the conformance to standards. For an appropriate and efficient regulation, well-established and internationally recognized QI systems which ensure the transparency and flow of information in the value chain, play a critical role. Compliance with the standards is enforced by a combination of rewards (e.g. access to the supply chain, higher prices and larger volumes) and sanctions (e.g. the threat of exclusion from the supply chain).

From a developmental point of view, it is important that QI has trade-facilitating effects, as it lowers the transaction costs and risks related to the formation of international value chains. For a (potential) buyer or contractor in industrialized countries, it is much easier to start buying or to even invest in the establishment of long-term relationships with suppliers in countries with an effective QI in place, as he or she will quickly receive the required signals about the capabilities of local companies to conform to demanding quality standards.

Increasing trade offers considerable opportunities for growth and socio-economic progress. As we will see in the next two paragraphs, an effective QI has also more direct effects on the socio-economic outcomes and potentials of value chain formation.

2.2.2 Barriers to entry

A key question of value chain analysis is related to the distribution of returns arising from design, production, marketing and consumption. Essentially, sustainable income growth requires the capacity to protect oneself from competition that is to take advantage of, or to construct barriers to entry (Kaplinsky and Morris, 2002).

This ability can be captured by the concept of rent. Rents arise from the possession of or the exclusive access to scarce attributes. Within the value chain, there are a number of types of rent that may arise: Those which are based on firm level actions (technology, training, better organization and marketing), those which are based on chain level actions (better links between firms), those which are based on resources (access to high-quality

materials), and those which are provided by parties external to the chain (effective government policy, infrastructure, financial intermediation).

The quality infrastructure is related to the factor “barriers to entry” in a number of ways. The existence of quality standards and technical regulations may establish some form of barriers to entry in the value chain. If producers cannot comply with the standards and regulations required by the users, they are unable to participate in the value chain, if they are not able to adapt to increasingly tough standards, they will even be eliminated. On the other hand, if they manage to comply with higher standards, they may improve their position within the chain (see 2.2.3 “upgrading”) and their incomes will be less vulnerable to growing competition from other producers and/or countries (Frohberg, Grote, Winter, 2006).

Compliance to standards, however, requires resources and actions not only within the firms (e.g. technology, organization, skilled workers) but also from outside (e.g. testing laboratories, certification and accreditation institutions, effective government policy). Without a functioning quality infrastructure, there is a danger for firms and even a whole country to be disadvantaged or even excluded from the value chain. While stronger actors may “by-pass” national QI (e.g. by sending samples of merchandise to accredited laboratories abroad), poorer nations, small business and farmers who do not have the resources to do so, may suffer most since they may lose their competitiveness and even their access to the global value chain (Jaffee and Henson, 2005).

In value chains characterized by a clear governance structure and, thus, power imbalances, there often also exists a serious information asymmetry, giving lead firms the possibility to even appropriate higher shares of the chain income. An external reference frame, as a functioning QI is, can counteract a sharpened inequality in income distribution.

2.2.3 Upgrading

A key capacity for firms and even a whole country in the value chain is the capacity to upgrade/innovate, and to ensure continuous improvement in product and process development. Upgrading in the value chain therefore means that actors in the value chain improve its original situation through *“changes in the nature and mix of activities, both within each link in the chain, and in the distribution of intra-chain activities”* (Kaplinsky and Morris, 2002, p. 38). Accordingly, there are four categories of upgrading:

— Process upgrading: improving processes, either within a firm, or as a result of a series of linked actions in the relationships between firms, that increases efficiency such that these are significantly better than those of rivals.

— Product upgrading: introducing new products or improving old products faster than rivals.

— Functional upgrading: increasing value added by changing the mix of activities conducted within the firm or moving the focus of activities to different links in the value chain.

— Chain upgrading: moving to a new chain.

The quality infrastructure is related to the factor “upgrading” in the value chain in a number of ways. It provides opportunities for firms and countries and drives them to improve their competitive advantage. Standards are often highly sophisticated technical documents and if they are available locally and in a language dominated by local actors, they constitute an important source for knowledge and technology acquisition.

When it comes to the introduction of new products and processes, an effective and efficient QI can assist companies to achieve higher levels of accuracy, e.g. by providing high quality measurement and testing technologies. The existence of quality standards and a related infrastructure can act as a catalyst for modernizing the supply chains as a whole, thus facilitating trade. Such upgrading may occur in the production processes (e.g. implementing management standards; improving the efficiency of the internal quality control system), in the product development (e.g. launching new, high-quality products) or in other activities/functions (e.g. outsourcing the certification of products). In order to support upgrading in the value chains, a well-functioning quality infrastructure again plays an important role.

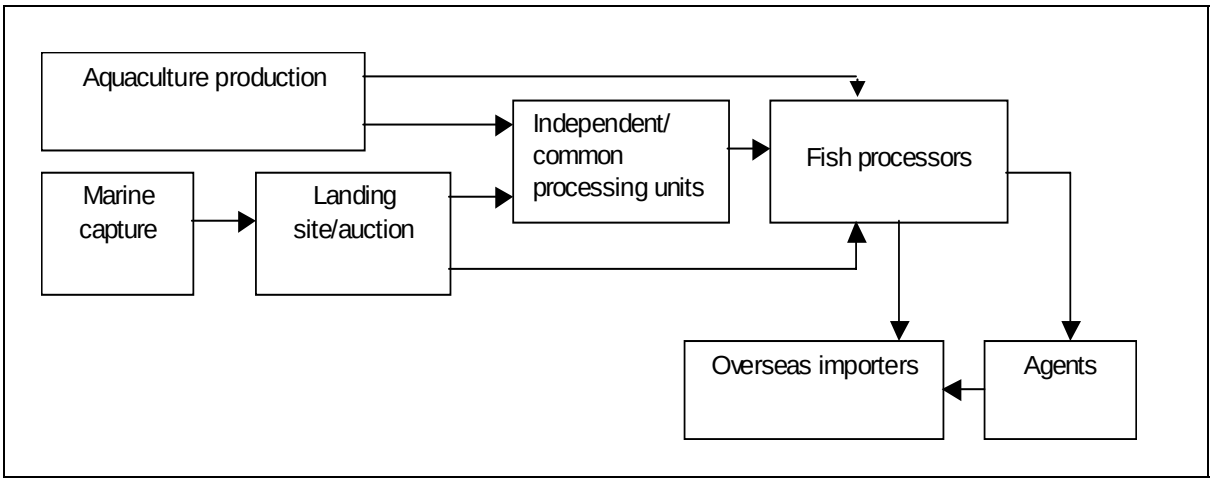
3 The Effects of Quality Infrastructure on the Value Chain of Fish and Shrimp

Fish, shrimp and seafood products provide important trade and livelihood opportunities for many developing countries. The current value of global fish trade is close to US-$ 60 billion, of which developing countries hold approximately 50 percent of the global export value and represent 18 percent of the import value (Ahmed, 2006). The demand for fish and shrimp products is still increasing and for many developing countries, fish/shrimp trade is a major source of foreign currency earnings.

3.1 The value chain of fish and shrimp

In general, the value chain for fish and shrimp products is rather alike in different countries and includes all links from the point of production (point of catch or farm site in case of aquaculture) to the end-user or final consumer. It therefore includes all mechanisms, flows, interchanges, services and operators, which determine the relationships between producer earnings and the supply of the physical product.

Figure 2: The value chain for fish and fishery products in India

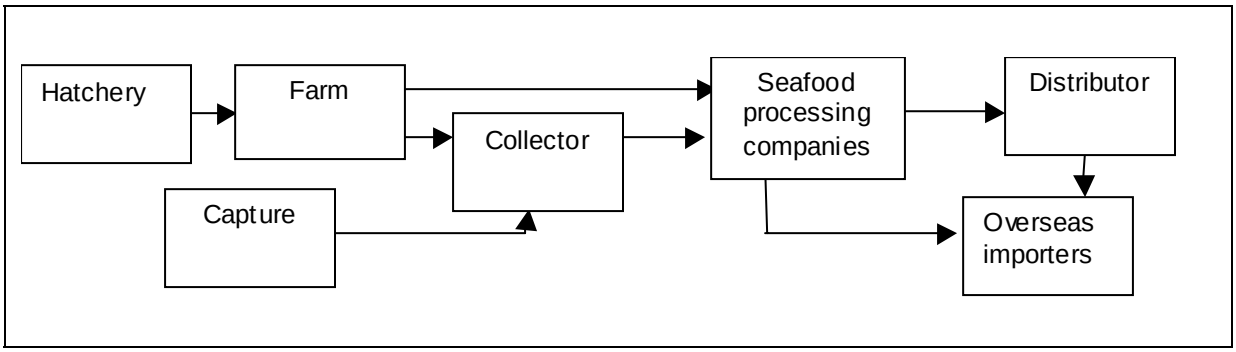


Source: Henson et al., 2005.

An example comes from the supply chain of fish and fishery products in **India**, as shown in Figure 2. In India, fish raw materials originate either from marine capture or aquaculture production. In the case of marine capture, the fish are landed at registered site and auctioned through agents who act on behalf of fishing boats. The processing sector includes both pre-processors and processors, who source raw materials from landing or farm sites. Pre-processing involves cleaning and deshelling the raw material before proceeding to the processor, where the product is sorted and further processed: frozen cooked or uncooked, dried or canned. Fish processors in India have traditionally focused entirely on export markets. They supply buyers in overseas markets or through agents based in India. Such agents may act on behalf of a single buyer or purchase for general export to a range of buyers. Some Indian fish processors have also established offices in their export markets that deal directly with overseas customers.

As shown in Figure 3, the value chain of shrimps in Vietnam is similar to the value chain of fish in India. It includes five main links from hatchery, farm/capture, collector, the processing company and distribution/export. Like in India, the seafood processing companies in Vietnam have strongly focused on export markets.

Figure 3: The value chain for shrimp products in Vietnam



Source: Vo, 2003.

3.2 Quality requirements in the value chain of fish and shrimp

As importers are the major actors who set standards and impose quality controls on fish and shrimp products, the value chain of fish and shrimps can be seen as a buyer-driven chain.

In responding to the evolving requirements on food safety and quality standards on fish and shrimp products, quality infrastructure has been in place in most fish and shrimp producing/exporting countries. In Uganda, for example, a number of public and private agencies are available for the management of standards in the food industry in general and the fishery sector in particular. In most countries, such quality infrastructure covers all aspects of standardization, metrology, testing, certification and accreditation.

In most developing countries, the supply chains of fish and shrimps are first of all export-oriented. The fish and shrimp sector is therefore subject to regulatory and customer requirements not only domestically but also in export markets. The predominant requirements for fish and fishery products relate to *food safety*, in particular hygiene in production and marketing and limits on levels of microbiological contamination in the end product. Further, limits are being applied with respect to environmental contaminants, for example heavy metals and agrochemical residues.

As major importers of fish and shrimp products, the EU, USA and Japan have been the most important drivers of quality and safety control in the fish and shrimp value chain. In recent years, these countries have been applying stricter food safety and other standards on the imports of fish and shrimps, which impose a major challenge on exporting countries. Furthermore, there are considerable differences in the specific food safety requirements and the associated conformity assessment procedures applied by these markets (Henson and Mitullah, 2004).

In Japan, border inspection remains the predominant form of food safety control for fish and fishery products. Few specific regulations have been established for fish and fishery products. Rather, importers must comply with general requirements that food products are safe as well as with some limits relating to levels of microbiological contamination of the final product.

In both the US and EU, imports of fish and fishery products must be processed in facilities that have the standards equivalent to domestic facilities, including the implementation of HACCP. Significant end-product controls of fish products are still carried out when the products cross the borders. Due to the lack of an international agreement on the frequency and stringency of these controls, member countries of the EU e.g. apply their national standards that differ from one country to the other. This means that also the sampling practices in different EU harbors are not the same so that in some cases imports are sent back while in other cases the imports are accepted. Indeed, this has been found to be a major problem faced by exporting companies. So far, only one European microbiological standard has been developed in 1993 for cooked crustaceans and shellfish for which international standards are applied[4].

According to information provided by the Federal Association of the German fish industry[5], fish and shrimp importers receive most of their products from only a few developing countries. Ten developing countries deliver almost 50 percent of the imports, headed by China, Chile, Thailand, Vietnam and Ecuador. New and stricter EU regulations related to food safety and traceability do not seem to have resulted in any problems for German importers and large exporters to Germany, since they adjusted in time to the new framework conditions. Technical solutions were partly implemented by specialized information technology (IT) companies (e.g. Atos Origin IT service company implements solutions for large customers like Unilever). However, the increasingly strict import regulations resulted in a change of the trading system, as characterized by the following:

- spot markets and auctions have decreased in importance,
- long-term trading relationships to countries have been expanded, and
- concentration of trade with fewer large partners has increased.

To ensure sustainable fishing, the Federal Association of the German fish industry recommends the application of the Marine Stewardship Council (MSC) to its members. Imported fish and fish products thus should be MSC certified. The MSC is nowadays an

[4] http://www.fao.org/fi/website/FIRetrieveAction.do?dom=topic&fid=12382 (access: 04.12.2007)

[5] Information provided by Dr. Keller, Manager of the Federal Association of the German fish industry through Etti Winter, IUW in August 2007.

independent, non-profit organisation which was set up to find a solution to the problem of overfishing. It was first established by Unilever, the world's largest buyer of seafood, and WWF, the international conservation organisation, in 1997. In 1999, MSC became fully independent. The MSC has developed in a participatory process with many stakeholders from science and other fields, environmental and also social standards for sustainable and well-managed fisheries.

However, there are also other international standards which have been developed to ensure sustainable fish and shrimp production. According to information from the smaller company Ökofrost[6] which has specialized in the bio-segment, relatively higher requirements related to the production and processing methods are applied, next to the generally applied hygienic and quality standards (HACCP). Ökofrost uses an own label (Biopolar) for their frozen fish and shrimp products but the certification is done through Naturland. They guarantee for the products certified under their own label, that all legal quality criteria from the producers to the retailers have been met. All Biopolar suppliers are also bio-certified. Keeping close contacts with customers, fairness as well as trust belong to the philosophy of the company.

In addition to the requirements imposed by importing countries, there are also agreements and rules relating to food safety and standards within the multilateral trading system, which member countries must apply. The two standards-related agreements in the WTO are the Agreement on the application of Sanitary and Phytosanitary (SPS) measures and the Agreement on Technical Barriers to Trade (TBT). According to the SPS and TBT agreement, member countries are required to establish national enquiry points, which are expected to provide information relating to standards and conformity assessment to the own private sector and other interested members.

3.3 The effects of quality infrastructure on governance, barriers to entry and options for upgrading in the fish/shrimps value chain

As noted in section 2.3.1, the flow of information and transparency are central to the regulation of the value chain. The quality infrastructure can only be an effective chain **governance** structure if it ensures an efficient flow of information and transparency within the value chain. Transparency is, for example, established in many developing countries by an official national enquiry point for WTO SPS and TBT issues.

The experience of some fish and shrimp exporting countries shows that a well-functioning quality infrastructure enhances transparency, thus smoothening interactions

[6] Information provided by Ms. Göbel, Quality control, Ökofrost, Berlin through Etti Winter, IUW in August 2007.

in the value chain. One example comes from the Nicaraguan shrimp sector. Nicaragua has regulations on food safety and quality regarding the production and export of shrimps. These have been consistent with current international requirements and methods, with Codex Alimentarius standards and related food safety requirements in countries receiving Nicaraguan exports. The government agency in charge of food safety and quality conducted appropriate inspections and controls of shrimp farms, processing plants and products. The agency has been recognized as competent authority by major importing countries. Nicaraguan shrimp processors were well aware of shrimp standards requirements and had well-established and proven HACCP programs and related sanitation practices. As a result, the buyers had confidence in Nicaraguan shrimp products and Nicaragua did not have to face any major shrimp safety and quality problems in international trade (Cato et al., 2005).

On the other hand, a non-functioning or poor functioning quality infrastructure may lead to transparency problems in the value chain of fish and shrimps. First, the differences in standards requirements imposed by importers as described in section 3.2.1 posed some challenges to exporting countries. Exporters wanting to maintain access to all markets have little choice but to implement the requirements of all markets. This is a major challenge for developing countries as they usually lack capacities. The lack of harmonization in standards requirements, therefore, was a problem which impeded an effective governance of the fish and shrimp value chain. In fact, according to Ahmed (2006, p.13), "a lack of agreed standards, transparency and predictability in the implementation and verification of standards poses bigger problems than the ability and willingness of countries and producers to comply with the standards".

Second, the national quality infrastructure in several countries has failed to transmit necessary information on current standards requirements, thus hindering smooth interactions in the value chain. An analysis of the management of quality standards in the Indian fishery sector by Henson et al. (2005) showed that the failure to upgrade legislative and other elements of the food safety system across India in line with the development of both international standards and requirements in major export markets had caused difficulties to Indian fish producers. In Kenya, in most cases the legislations were out-dated and not compatible with international standards in 1997, while legislations relating to food safety in the processing and marketing of fish and fishery products were in place (Henson and Mitullah, 2004). Kenyan Nile perch processors and exporters, therefore, had difficulties in getting information on quality parameters and thus complying with the international standards required by importers.

Finally, transparency and coordination problems in the value chain of fish and shrimp may arise from the fact that national quality infrastructure failed to enforce compliance with standards requirements. In several countries, while food safety regulatory measures for the production of fish and shrimp are in place, enforcement is rather weak. In Vietnam, for example, the government issued policies and has established national

programs to control residues of pesticides, veterinary drugs and other antibiotics for shrimp product safety. However, there was a lack of enforcement in the value chain since the implementation of the policies and programs were not taking place synchronously among industries, provinces and food producers. As a result, the effectiveness of the implementation in the value chain was low (Vo, 2003). Similarly, Thailand had many food safety regulatory measures in place, but enforcement was weak and violation of food safety and quality standards in the shrimp sector was therefore still common (Manarungsan et al., 2005). The export supply chain of Nile perch in Kenya was also affected by poor enforcement of the quality infrastructure before the year 2000 (Henson and Mitullah, 2004). For example, although control measures and the certification of fish exports were in place, these were inadequate. Government authorities did not have enough adequate personnel to inspect and monitor compliance on landing beaches and industrial fish processing. In addition, laboratory facilities were outdated and unable to provide tests that could be regarded as valid and reliable.

The existence of strict food safety and quality standards for fish and shrimp products created a **barrier to entry** in the value chain of fish and shrimps. In fact, the experience of fish and shrimp producing/exporting countries has shown that if the countries fail to implement the quality infrastructure and comply with the required standard requirements, they may lose their market access and competitiveness.

The case of the shrimp sector in Bangladesh in 1997 provides a clear example of how non-compliance with EU's standard requirements led to a loss of access to Bangladesh's major export markets in the EU (see Box 1). While shrimp processors in Bangladesh did not comply with the EU's hygienic requirements, there was another weakness in the national quality system whereby the government inspectors failed to exercise quality control. In practice, the cost of non-compliance would have been significantly higher had Bangladesh not been able to divert much of the shrimp to other countries, such as the US and Japan (Ahmed, 2006).

Box 1: The EU bans shrimp imports from Bangladesh

The shrimp export market in Bangladesh was worth around USD332 million in 2000, constituting 70 percent of the country's export of primary products. The shrimp industry in Bangladesh employs over one million people and is targeted exclusively for export markets. Around 40 percent of Bangladesh's shrimp exports was bound for the EU. In 1997, due to a failure of Bangladesh exporters to meet EU safety standards, the EU imposed a five-months ban on shrimp imports from Bangladesh. The ban based on the result of the EU's inspection of Bangladesh's seafood processing plants. Inspections found serious deficiencies in infrastructure and hygiene in processing establishments and insufficient guarantees of quality control by the Bangladeshi government. The ban was estimated to cost the Bangladesh shrimp-processing sector nearly USD15 million from August to December 1997.

Source: Battacharya, Rahman, Khatun, 1999; Cato and Subasinge, 2003; Ahmed, 2006.

Over the period from 1997 to 2000, Kenyan exporters of Nile perch also faced a catalogue of restrictions on trade with the EU (Jaffee and Henson, 2005). Due to the poor performance of the national quality system (as described in the last sub-section), violation of quality standards existed in the Nile perch supply chain. In 1996 salmonella was detected in a number of consignments of Nile perch from Kenya (and Tanzania and Uganda) at the Spanish border, and Spain immediately prohibited imports. In 1999, a suspected case of fish poisoning with pesticide was identified in Uganda. The EU subsequently imposed a ban on exports of Nile perch that was not lifted for Kenya until December 2000. As a result, exports declined, fish processors had to reduce their production, some closed and the landed price of Nile perch fell.

Recently, Vietnam faced a threat of a shrimp export ban from Japan after antibiotic residues were found in Vietnamese shrimp shipments to Japan. Thus, there is a danger that Japanese importers may divert to other shrimp exporters. In Vietnam, the shrimp value chain involves several production phases like breeding, feeding and processing, which require a thorough monitoring of the quality. Meanwhile, the capacity of testing facility seemed to be inadequate. Although testing by an authorized institute was made before shipment to Japan, antibiotics were still discovered (VTPA, 2007).

While the quality infrastructure for fish and shrimp value chain can form a barrier to entry in the value chain, it also offers some opportunities for upgrading the value chain. In response to the increasing requirements on food safety and quality standards, several fish/shrimp producers and exporting countries have taken upgrading measures and were able to improve their competitiveness on the market. The upgrading was often initiated by both the government and the private sector. Most of the upgrading in the private sector was taken in the production processes. The public sector, on the other hand, took measures to upgrade the national quality system including legislation on standards, conformity assessment, certification and accreditation, which facilitates a functional upgrading in the value chain.

The Indian fish sector presents a positive case of efforts to comply with stricter food safety requirements in export markets (Henson et al., 2005). Faced with restrictions on exports to the EU in 1997, the Indian government responded rapidly with a number of actions. First, it imposed strict controls on antibiotic use, which have undoubtedly been critical in maintaining market access and in preventing additional restrictions from being imposed, as has happened, for example, to China and Thailand. The Indian government has reformed its regulatory systems to facilitate effective regulation of fish processing facilities and to enable effective responses to emerging issues. Significant investments have also been made in inspection and laboratory testing capacity. Simultaneously, Indian exporters have proactively updated their food safety controls, especially by investing in new processing plants or upgrading their existing facilities. The practice showed that most successful exporters had met the increasing quality requirements in a manner that acted to their competitive advantage.

Box 3: Quality upgrading in the Kenyan value chain of Nile perch

Kenya is an example of long-term efforts to comply with the EU's food safety requirements. Being faced with restrictions on trade of Nile perch relating to food safety concerns, both the Kenyan government and the private sector tried to upgrade food safety controls. On the governmental level, the Fisheries Department of the Ministry of Agriculture and Rural Development was now made the sole "competent authority". Before that, responsibility for regulatory controls was split between the Ministry of Health and the Fisheries Department, creating significant coordination problems. After this change, legislation was quickly revised in line with the EU's requirements. The Kenyan Fish Processors and Exporters Association, formed in 2000, has developed a code of good manufacturing practice in the sector. The fish-processing plants, on the other hand, invested in new production facilities and implemented an HACCP system. Simultaneously, they also began to cooperate with each other to present a united voice to the government and the European Commission.

The efforts of the Kenyan government and private sector eventually paid off, and in December 2003, the EU recognized the controls in place as equivalent to those in the EU. Most exporters regained their access to the EU markets. Furthermore, many exporters were able to diversify their export base and to have major markets in Australia, Japan and the United States. Compliance with the EU requirements helped Kenyan exporters to access and maintain these new markets.

Source: Jaffee and Henson, 2005; Henson and Mitullah, 2004

Similar experience is also found in some other countries, including Kenya (see Box 2), Thailand and Senegal. In all cases, fish and shrimp producers and exporters benefited from the upgrading to comply with quality standards. Reorganization in connection with compliance with standards had a positive impact on producers' productivity and thus on competitiveness. For example, the recruitment of quality control officers in Senegalese fish processing plants contributed to the quest of greater efficiency, and had helped to identify sources of poor quality and reduced these sources to a very significant degree (Niang, 2005). Compliance with standards also improved the hygienic and sanitary quality of products and gave greater credibility to some producers. For instance, the implementation of the HACCP approach created opportunities for some Senegalese enterprises to work with large distributors (e.g. Carrefour, Marks & Spencer).

4 The Effects of Quality Infrastructure on the Value Chain of Spices

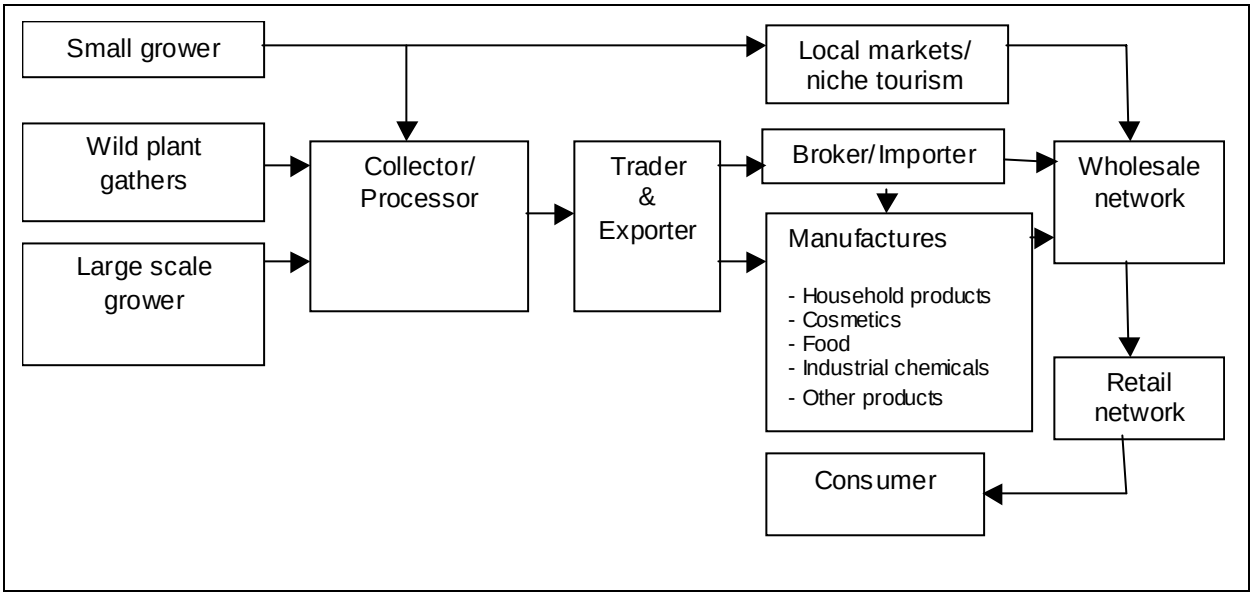
The world market for spices and culinary herbs is large and estimated to be valued at over USD 2.97 billion in 2004 (ITC, 2006). The consumption of spices still continues to increase. The main importers are developed countries (EU countries and USA) which import tropical and sub-tropical spices from developing countries (China, India, Madagascar, Indonesia, Vietnam, Brazil, Guatemala and Sri Lanka). Apart from export markets, the domestic consumption of spices in some exporting countries, for example in India and Sri Lanka, are also considerably large.

4.1 The value chain of spices

The value chain for spices also includes all links from the production to the end-user or final customer. In general, it takes the shape as described by Figure 4. The production of spices includes not only the production of primary products (seeds, fruits, leaves, stems, etc. of the plant material) but also a large number of secondary and derived products (spice mixtures, e.g. curry powder, and compounds extracted from the plant material). Since spice products are used in various industries (e.g. foods, cosmetics, pharmaceuticals and fragrances), the international trade distribution structure of spices, as shown by Figure 4, involves not only the household and/or catering sector but also a number of industrial sectors.

In most developing countries, such as in India and Ghana, the major spice growers are smallholders and small-sized farms (Jaffee, 2005; Schipmann, 2006). In countries like India where spice production has a long tradition, the processing and export of spices are also often undertaken by small-scale, family-based companies (Jaffee, 2005). According to ITC (2001), there have been recently some changes in marketing channels of spices. The industrial and retail sectors are increasing in importance as importers. End-users and retailers trade much less through dealers and brokers, preferring direct contacts with growers/exporters. In some countries, national organizations such as the Spice Board in India, the Spice Council in Sri Lanka or the Pepper Association in Vietnam are indirectly involved in the value chain by providing support to producers/ exporters to the development and marketing of spice exports.

Figure 4: The value chain of spices



Source: Based on Douglas et al., 2005.

4.2 Quality requirements in the value chain of spices

International spice trade has a long tradition. Traditionally, standards requirements on spices products focussed mainly on qualitative and physical characteristics of the products (Jaffee, 2005). Organizations such as the American Spice Trade Association (ASTA) and the European Spice Association (ESA) came out with quality specifications mostly regarding aspects such as the cleanliness or level of defects in spices. Recently, with improved understanding of microbiological and chemical hazards in foods, and with growing consumer concerns about these hazards, the exclusive focus on quality/cleanliness characteristics in spices has come to be regarded as inadequate by regulators and consumer advocates. Hence, the quality requirements on spices now relate also to limits on the level of microbiological contaminants, pesticides and other residues and food additives. In addition, the application of improved hygienic practices and management systems including the adoption of ISO 9000 and HACCP is becoming more important in the quality structure of spices.

While efforts have been made to harmonized international standards in spice products under the Codex Alimentarius, there, in fact, remain significant differences in the specific rules and tolerance levels related to quality dimensions and hazards among the major spice-importing countries. There are also some differences among countries in relation to the procedures used by inspection and other agencies for sampling and testing of imported products (Jaffee, 2005).

Importing companies in Germany see the need to strictly control the imports of spices to protect the consumers but also to protect their own company interests including their image. According to a German importer[7], long-term contracts with suppliers are made to give them planning security for their own investments. In addition, close contacts are kept constantly, and training and social benefits are provided to the producers in the developing countries to ensure a constant upgrading of the quality of the spices. While so-called "fair" prices are paid to the suppliers for the products which are certified by Naturland, the importer in return expects the supply of high-quality products. Strict quality controls of production and processing processes are organized regularly to ensure steady quality of the imported products. Basis of this is the management system IMS which integrates quality management according to DIN ISO 9001/2000, the HACCP-concept for food safety and an environmental management system.

Apart from the regulations applied by the importing countries, international trading of spices, like in the fish and shrimp sector, is also subject to WTO standards-related agreements including the SPS and TBT Agreement.

4.3 The effects of quality infrastructure on governance, barriers to entry and options for upgrading in the value chain of spices

Similar to the value chain of fish and shrimps, the value chain of spices can also be seen as a buyer-driven chain. Major importers of spices such as the USA and EU set conditions on food safety and quality standards on spices and spice products, which exporters have to follow to participate in the value chain.

In countries like India, which have a long tradition in exporting spices, some form of a quality infrastructure has been in place for a long time (Jaffee, 2005). For example, in India, a system of compulsory inspection introduced in the early 1960s helped to ensure consistent and predictable quality of spices sold abroad. This system remained in place until the mid-1980s. The Agmark grades/standards, initiated by India in 1937, were among the most developed spice standards in the world and served as a basis for subsequent ISO standards. While India still had to improve its quality infrastructure recently, awareness of quality assurance had been established in the Indian spice value chain since a long time ago. Other spice exporting countries, especially the least developed countries (LDCs), however, often lack systems of MSTQ required by exporters to ensure their products meet international standards (ITC, 2001).

[7] Information provided by Mrs. Fritsch, quality management, Ulrich Walter GmbH, Diepholz through Etti Winter, IUW in August 2007.

Like in the case of the fish/shrimp value chain, weaknesses in the quality infrastructure can hinder the flow of information and thus reducing transparency in the value chain of spices. In Sri Lanka, for instance, due to an insufficient quality infrastructure, exporters faced difficulties in getting information on importers' quality requirements as well as in providing information on the quality of their exports. A national enquiry point to obtain quality parameters for spices had not been formally established in Sri Lanka. The quality parameters based on Sri Lankan Institute of Standards were not equal to international standards and often lower than that. There was no government-managed system in Sri Lanka to provide compulsory quality certification for spices and the pre-shipment quality testing process is only optional for the exporter (Herath, 2001).

In Vietnam, before 2001, there was almost not official quality system to coordinate the assurance of quality in the country's supply chain of pepper. As a result, understanding of quality standards and certification requirements among Vietnamese pepper producers were very limited or even non-existent (Clements-Hunt, 2004). Similarly, a survey of the spice sector in LDCs conducted by ITC in 2001 showed that, due to the lack of proper MSTQ systems, the majority of LDC exporters of spices were not fully aware of quality and phyto-sanitary requirements in consuming markets in general, and of specific end-users in particular.

Experience of spice producers/exporters shows that their market access and competitiveness partly depend on the performance of the quality infrastructure. Like in the value chain of fish and shrimps, the performance of the quality infrastructure may become either a **barrier to entry** into the value chain or an opportunity for upgrading in the value chain.

Evidence on the barrier-to-entry effect of the quality infrastructure for the value chain of spices can be found in the case of Sri Lanka (see Box 3). Due to weak performance of the quality infrastructure, the country lost its competitiveness on export markets and suffered from a direct loss in foreign exchange earnings. Also in relation to product quality and SPS matters, the Indian spice industry has faced accumulating challenges since the mid-1980s (Jaffee, 2005). As the national quality infrastructure did not keep pace with the increased scrutiny by buyers and regulators with regard to spice product quality and microbiological or chemical contamination, Indian spice producers and exporters had difficulties in exporting their products. Several consignments of Indian spices were detained or rejected by the importers. Such events had resulted in the temporary disruption of trade or the (sustained) contraction of trade directed to certain markets. Similarly, the study of ITC also showed that due to non-compliance to international food safety requirements such as HACCP and ISO 9000, rejections of LDC spice consignments and lowering of prices because of low quality were quite common (ITC, 2001). This can be detrimental to LDCs' market prospects as importers and consumers may become hesitant about accepting spices processed in LDCs.

Box 3: Sri Lanka's loss of potential spice exports due to lack of quality compliance

Spices and the beverage crop sector is an important sub-sector in the economy of Sri Lanka. It contributes about USD70 million to the country's foreign exchange and provides employment for about 470,000 persons. Over the last years, spice crops showed a steady increase of export volume and major markets for Sri Lankan spices comprises of Europe, the US, South Asia and Middle East.

The quality of spices in Sri Lanka was assessed on the basis of standards set by the Sri Lanka Standard Institute, which was, however, not equal to international standards. The quality of Sri Lankan spices, therefore, often did not comply with the international standards such as the SPS quality requirements. This condition led to a direct loss of potential export volume of spices and beverages, which was estimated at about 5,500 tons during the period 1999-2000. The amount was equivalent to about 34 percent of the total exports of spices and beverages during the same period, causing a loss of about USD 2.9 million in foreign exchange earnings per year.

Source: Herath, 2001.

Upgrading to improve the quality infrastructure is also observed in the value chain of spices in several countries. Like in the case of the fish and shrimp value chain, most upgrading in the spice value chain has taken place in the production and functional processes and was initiated by both the private and the public sector. In order to overcome the image of poor quality in international markets, Vietnamese black pepper producers have taken some actions to comply with international standards. With the help of ITC, ASTA and ESA, Vietnamese producers learn about the stringent quality demands and technical methods to increase the quality of their pepper. ASTA standards started to be applied by some producers. The government played a role in coordinating these efforts. In addition, the Vietnam Pepper Association was founded in order to provide guidance for members on issues related to export markets, quality control and production techniques. As a result, customers became confident in the quality of Vietnamese pepper and Vietnam has recently risen to become the world top pepper exporter (Clements-Hunt, 2004).

In India, the private sector had invested substantially in upgrading its production facilities for standards compliance (see Box 4). While the economic return of such efforts has been modest in the near term because of the prevailing conditions in international markets and the modest level of premium awarded to cleaner and safer spices in the Indian domestic market, it provides a good platform for the future development of the spice supply chain in India (Jaffee, 2005).

Box 4: Quality upgrading in the value chain of spices in India

Over the past decade, Indian spice producers have invested approximately USD 14.5 million in quality assurance and food safety facilities and systems. The largest investment have been in various types of cleaning and sterilization equipment and in associated quality assurance management systems (a portion of the investment costs was covered by the Spices Board as part of an ongoing program to encourage investments in technology upgrading). Most of the medium-sized and larger companies developed and implemented one or more certified quality-management systems, including HACCP, ISO 9000, and others. Nearly one hundred spice companies now had their own labs. Smaller companies tended to outsource the testing services provided by the Spices Board, the capacity of which has been enhanced over the years. India's Export Inspection Council conducted more stringent inspections of commodity exports and gave certification (which has been recognized by the US) to exporters.

The result of such upgrading efforts was that firms with certified management systems reported having reduced frequencies of consignment inspection, associated inspection fees, and other transaction costs. Enhanced laboratory testing capacity has also been a contributing factor to reduced incidence of Indian product rejection abroad.

Source: World Bank, 2005.

Importers from industrialized countries like Germany have been found to be actively involved in the upgrading of the quality of spices; they keep close contacts and intensive controls next to offering training and other benefits to the actors involved in the value chain in the producing countries.

5 The Effects of Quality Infrastructure on the Value Chain of Timber and Wood Products

Wood, together with non-timber forest products (NTFP) plays an essential role in many developing countries, particularly for a development that corresponds to the principles of sustainability in its three dimensions (economic, social, ecological). Many developing countries have few natural resources other than large forested areas. UNIDO estimates that nearly 30 percent of the world's population relies on wood and non-timber forest products for the basics of life and as a means to support economic subsistence. Furthermore, people living in and by the forests often belong to the very poor strata of their societies and thus to the target groups of developing countries.

At the same time forest areas of developing countries – most of them located in the tropical climates – play an essential role for global biodiversity and as a regulating element in the global CO_2 balance. Deforestation can, thus, be considered one of the most pressing problems of our times, seriously challenging global sustainability. Taking into consideration that population growth remains high in most developing regions and considering the huge unmet demand for decent income and living conditions, a strategy against deforestation cannot solely build on protection of forested areas. One of the mayor causes of forest resource depletion are poverty driven utilization practices with very low levels of value addition, such as slash-and-burn agriculture. Thus, complementary to protection, a sustainable utilization of wood (and NTFP) is an essential element in the context of preservation of forested areas.

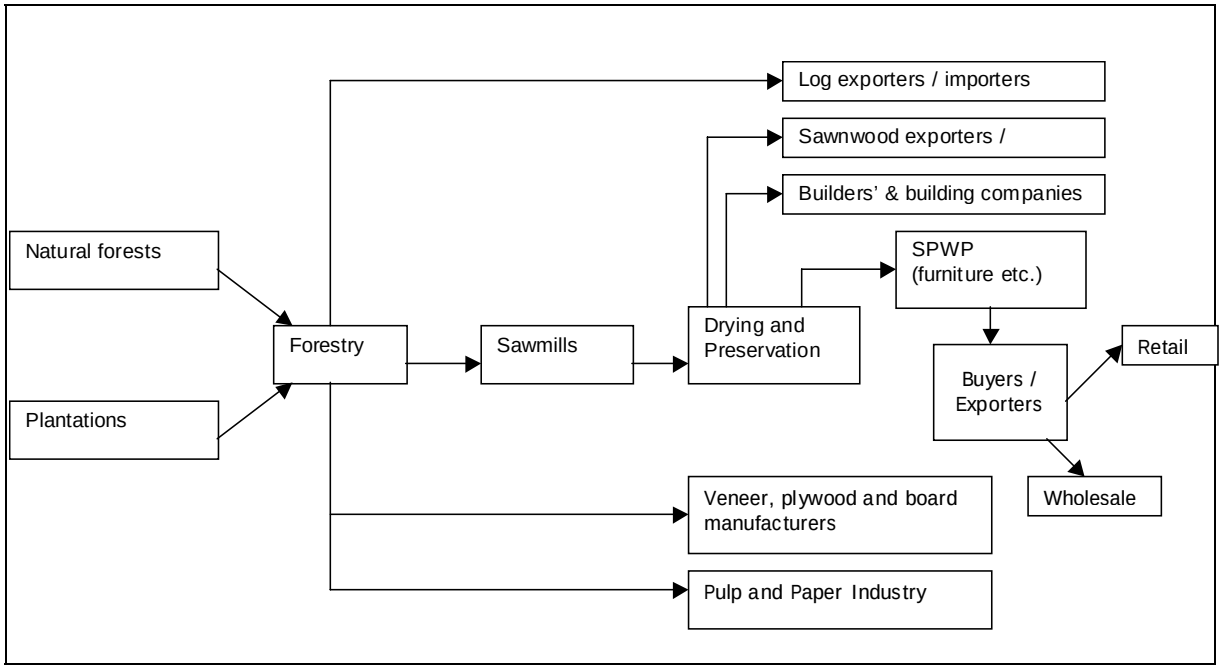
The proper use of wood, based on sustainable extraction technologies and high levels of value addition has, thus, important socio-economic as well as ecological benefits. In the dynamic perspective, wood as a raw material offers important opportunities for secondary processing, allowing important learning processes along the value chain that may trigger important spill-over-effects to other manufacturing sectors.

5.1 The value chains of wood

Figure 5 gives an overview of the wood value chain. Even this rather complex picture simplifies the reality as it can be found in many developing countries. We highlight formal and international value chains as they have the highest potential to trigger a sustainable development. We follow the classification of wood products used by the International Tropical Timber Organization (ITTO), an association of timber exporting and importing countries. ITTO provides access to rather detailed data on the international trade in wood products. The following product groups are important in the global wood

trade: 1) logs; 2) sawnwood, 3) veneer, 4) plywood and 5) secondary processed wood products (wooden furniture and parts, builders' woodwork, mouldings, pallets etc.).

Figure 5: The value chain of wood



Regarding the **production of the raw material**, two main patterns can be distinguished: The extraction of wood from natural forests and the systematic growing of trees in plantations. The differences between the two production systems are manifold.

— Natural forests are typically mixed cultures and these are – especially in the tropics – characterized by a high number of different species and a low number of individuals per species (measured per area unit). Generally, the extracted woods are of slow growth. These two aspects together imply that the unit value of the extracted wood is relatively high and that an optimal usage of the volume and scrap avoidance is of special interest. Regarding the unit size, natural forests are often controlled by smallholders, but also medium, large and very large units (private and state forests) can frequently be found.

— Plantations are usually monocultures or characterized by few species. On the other hand, the density of the productive trees and thus the number of individuals per area unit are high. Species produced in plantations usually produce a significant volume of wood in rather short time. Plantations are often the first step of the production of

pulp and cellulose (species such as *Gmelina Arborea*), but also for the extraction of sawn wood or material for secondary processing (Teak, *Tectona Grandis*). Plantations are often part of large and vertically integrated companies (e.g. from the pulp and paper sector), but can in some cases also be owned by medium or even small enterprises (e.g. in the context of reforestation schemes).

After the extraction, the trees are cross-cut into units that can be removed from the plot and either sold and exported directly (as is still the most common practice, see below) or further processed. The **primary processing** of the logs is usually carried out in fixed sawmills or in some cases in mobile sawing units. For the production of veneer and plywood special industrial equipment, e.g. for peeling and slicing, gluing and jointing are required. This requires high levels of capital investment and is thus mainly controlled by large or very large companies.

On the other extreme, **secondary processing** of wood in developing countries is very often done by small or medium enterprises. Often they produce furniture, windows, doors etc., either on behalf of clients or in small series that are sold in local shops. Capital investment is limited, the know-how often passed on from generation to generation or from workshop owner to workers that subsequently start their own business.

Different is the situation in the case of companies that are export-oriented. On the international markets, Kaplinsky et al. (2003) identify three major types of buying agents, implying different government structures:

- Large multi-store retailers, with outlets and suppliers in many countries. The Swedish IKEA, for example, in the first years of the new century sourced from around 2,000 suppliers in 52 countries and had more than 300 outlets in three continents. In 2006 the overall employment of the IKEA group surpassed 100 000.
- Small-scale retailers, which buy directly from a finite number of suppliers in a limited number of countries.
- Specialized medium-sized buyers, which source from many countries and sell on to retail outlets, usually in a single country or region. These buyers may have over 1,500 suppliers, located in many countries. Even the smaller specialized buyers will typically source from more than 100 suppliers.

The size of international markets for the different product groups can be estimated, based on the data for trade among ITTO members. These data to a certain extent underestimate the global trade volumes, as a number of important wood producing countries are not members of ITTO, such as Costa Rica and Nicaragua in Latin America or the Republic of South Africa. The following Table 1 reflects the data for the first four product groups. Regarding the volumes, logs still represent the mayor part of exported wood among ITTO members. This implies that a very considerable proportion of wood is exported with very low levels of value addition.

Table 1: Exports of wood products by ITTO members (2005, volumes, values, unit values)

Product category	Volumes exported	Value of exports	Unit value ($/ m³)
Logs	12.7 million m³	US-$ 1.5 billion	122
Sawnwood	10.2 million m³	US-$ 3.6 billion	353
Veneer	ca. 1 million m³	US-$ 726 million	686
Plywood	8.8 million m³	US-$ 3.1 billion	368

Source: ITTO 2006: Annual Review and Assessment of the World Timber Situation 2006, Yokohama, page 6 and appendix 1

What a transition towards the exportation of processed wood may imply for developing countries is made evident by the fact that exportation of sawnwood, while in volume nearly 20 percent lower than the selling of logs, gave a gross revenue 2.4 times higher. In 2005, sawnwood was sold at roughly US-$ 353 per m^3, while logs at an average price of US-$122/$m^3$ and veneer at $ 686/m^3 (plywood only slightly higher than sawnwood). These data have to be treated with caution, as they average different species and producing regions. Nevertheless, they are highly indicative, regarding the potential that a deepening of the forest-based value chain may imply.

The most promising product group with regard to value addition and the creation of employment are, what ITTO classifies as SPWP. This product group consists mainly (62 percent) of wooden furniture and parts and builders' woodwork (16 percent). ITTO does not provide data on unit values for SPWP, but following a different source of information (Kaplinsky et al. 2003, p.5), EU import prices are around € 2670 per ton of products in the category of "All wood furniture Products (WFP)".[8]

Table 2 shows that the world market is quickly expanding, from around US-$ 45 billion in 2001 to over US-$ 68 billion in 2005. At the same time, it clearly shows the huge challenges for developing countries, as they hardly start to tap this important market segment. In 2005, the producer countries within ITTO (33 tropical developing countries including Brazil, India and Indonesia) as a group exported not more than US-$ 1.1 billion in SPWP, while the "consumers" (mainly OECD countries but also China) exported SPWP worth nearly US-$ 60 billion. Thus, the markets for furniture and similar products are still largely under control of the Northern countries, including China. China is rapidly rising as a major supplier of processed wood products. In 2006, China exported forest products worth US-$ 27.7 billion, whereof 32 percent wooden furniture, 13 percent wooden products and 11 percent plywood. China is today the world's largest exporter of wooden furniture (49 percent of global exports) and plywood (30 percent of world's exports).

[8] The conversion of volume to weight is difficult due to the variety of woods with different densities. Examples are: 545 kg/m^3 for Honduran mahogany or 630–720 kg/m^3 for Teak, http://www.simetric.co.uk/si_wood.htm

Table 2: Global exports of SPWP products 2001 – 2005 (ITTO data)

	2001	2002	2003	2004	2005
Exports (world)	45,6 billion $	49,2 billion $	56,5 billion $	66,8 billion $	68,4 billion $
Exports ITTO producers	0.8 billion $	0.8 billion $	0.9 billion $	1.0 billion $	1.1 billion $
Exports ITTO consumers	39.9 billion $	43.1 billion $	49.2 billion $	58.6 billion $	59.4 billion $

Source ITTO 2006, appendix 5

5.2 Quality requirements in the value chain for wood products

Most wood in developing countries is extracted from the natural forests in a knowledge extensive way and potentially high value wood is used as firewood or for basic construction purposes. There are several structural problems that hinder the establishment of efficient value chains for the production of high value goods. For decades or even centuries, forests have not been considered a long-term source of valuable resources, leading to deforestation or the degradation of forests. Where forested areas are owned by poor people, short-term needs often prevail and prevent a long-term strategy of optimizing the value of a given parcel. Further, if a plot is not adequately connected to the potential markets by road or possibly rail infrastructure, transport costs can easily be prohibitive for a commercial utilization of the wood resources.

Where the basic conditions for a commercial forestry and subsequent wood processing industry are given, two different types of quality standards are essential for an efficient organization of the value chain and the selling of high value products on demanding markets:

- quality standards related to the physical properties of the wood;
- quality standards related to a sustainable production and extraction of the material.

Along the value chain (starting with the cutting of trees) four physical parameters have to be controlled, implying the needs for adequate measurement instruments and methods:

- dimensions (lengths, breadths, height, volume) of cubical and cylindrical wood bodies;
- humidity (water content in % of net weight);
- temperature (in the context of drying of the wood;
- weight and density in relation to certain water contents.

Control of **dimensions** is important at several steps of the value chains. Wood producers are being paid, based on the volume of material delivered to the buyer, thus an exact measurement is essential to allow for a fair price being paid and thus for the financial incentives for the producer to continue a sustainable production. In primary and

secondary processing, controlling exact dimensions is important for the production of high quality products, e.g. where wood elements have to fit to pre-determined measures (construction of windows and doors) or where identical units are important (cross-sills, parquet). In the production of veneer and plywood, controlling the thickness of the units is also essential for the quality of the final product. Where dimensions are not well controlled, unnecessarily high levels of scrap are being produced.

Controlling **humidity, temperature, weight and density** are all important in the process of preparing primarily processed wood for further processing or for commercialization as sawnwood. Wood has to be dried down to an adequate level in order to maintain its exact dimensions even a long time after secondary processing and to avoid the formation of cracks and other forms of damages.

The most prominent standards related to the **sustainable management of forestry** is the list of management standards developed and implemented by the Forest Stewardship Council (FSC). FSC promotes responsible management of the world's forests and develops standards to assure this in practice (see Box 5). It accredits independent third party organizations which can certify forest managers and forest product producers to FSC standards. Through a trade mark and product label, consumers worldwide shall be able to recognize products sourced within sustainable forestry systems.

Box 5. FSC Mission Statement

1. The Forest Stewardship Council A.C. (FSC) shall promote environmentally appropriate, socially beneficial, and economically viable management of the world's forests.

2. Environmentally appropriate forest management ensures that the harvest of timber and nontimber products maintains the forest's biodiversity, productivity, and ecological processes.

3. Socially beneficial forest management helps both local people and society at large to enjoy long-term benefits, and also provides strong incentives to local people to sustain the forest resources and adhere to long-term management plans.

4. Economically viable forest management means that forest operations are structured and managed so as to be sufficiently profitable, without generating financial profit at the expense of the forest resource, the ecosystem, or affected communities. The tension between the need to generate adequate financial returns and the principles of responsible forest operations can be reduced through efforts to market forest products for their best value.

Source: FSC Social Strategy, Version 2.1 February 17, 2003 (www.fsc.org)

Over the past 13 years, over 90 million hectares in more than 82 countries have been certified according to FSC standards while several thousand products are produced using FSC-certified wood and carrying the FSC trademark. FSC operates through a network of national initiatives in 43 countries. Market shares are rising. In 2005, 13 percent of all timber for construction and carpentry in the Netherlands was FSC-labeled, in the same year the total turnover from sale of FSC products in Switzerland was over 150 Mio Swiss Franks.

Even if concern about deforestation of tropical woods was the main driver behind the establishment of timber and wood product certification, till now, the mayor part of certified forests are located in Western Europe, where in 2005 around 56% of all forests had been certified by one of various forest certification schemes, followed by North America (28% of all forests certified. In developing countries, the certified areas are still a minor percentage of total forest areas. Cashore et al. (eds., 591f) conclude that the still poor dynamics in developing countries is mainly consequence of unclear signals from the global markets, combined with limited governance capacities and lack of civil society action.

5.3 The effects of standards and quality infrastructure on governance, barriers to entry and options for upgrading in the wood value chain

As illustrated in figure 5 and explained in 5.2 there a large number of value chains based on wood, implying very different **governance** structures. In many cases, the exploitation of the forest resources cannot really be labeled a "value chain" at all, as it consists of a rather basic gathering of fire wood and the eventual cutting of trees for own consumption or for local markets. In many cases these activities are also undertaken informally or even illegally, when realized e.g. in state forests.

In other chains, no clear governance can be confirmed, understood in the sense of unequal power structures, information asymmetries and an unilateral setting of parameters. This is, for instance, the case in the pulp and paper industry, where several chain links on large economic units are present and vertical integration is rather common.

From a development perspective, probably the most important value chains link wood producers to intermediaries or representatives of sawmills. This chain is directly relevant for poverty reduction as well as for the goal to achieve sustainable patterns of forestry. Most often, these chains are clearly buyer-driven. Many wood producers are in a poor bargaining position as they are smallholders, belong to particularly poor strata of the population and lack information about prices actually paid on the wood markets. On the other hand, sawmills are most often larger units, as their establishment requires rather high capital investment.[9]

The dominant player can easily interpret aspects of log size and wood quality to his favor, putting the less powerful into the position of a price taker. The geographical isolation, often combined with poor infrastructure makes the forest dwellers especially vulnerable and puts them in an especially bad bargaining position. Not only do they have to accept the prices set by the buyer, but they are in many cases only able to sell the proportion of the wood, that can easily be identified as of high quality.

[9] There are exceptions, e.g. where the primary processing is done by mobile sawmills.

This situation of power *and* information asymmetries is aggravated by a lack of clearly defined norms and an easily applicable quality system. The case of Chile (see Box 6) indicates that the mere definition of a norm (in this case for classification of wood defects) is no effective solution to this problem if the knowledge about its existence is not sufficiently spread among the actors and thus, does not reach the weaker players.

Box 6: The value chain of wood products in Chile

In Chile forested areas comprise around 15.6 million hectares (ha), whereof 13.4 million ha are natural forests and 2.2 million ha plantations. However, around 90 percent of the processed wood comes from plantations and goes mainly into the pulp and cellulose industry. Only around 35 percent of the logs cut in the natural forests is processed in sawmills and goes into the local furniture industry, the rest is also processed by the pulp and cellulose industry and to a large part used as fuel wood. Thus, developing a sustainable value chain based on the natural forests bears a huge development potential. It is estimated that in the long run, the export potential of this value chain may reach US-$ 900 million. The mayor barriers that hinder the development of dynamic value chains are efficient structure for the supply of raw materials and a deficient quality assurance. One of the characteristics of the natural forests is that more than two thirds are made up of small and medium landholders. Many smallholders belong to the poorest population strata of Chile.

Quality problems start on the parcels themselves that have been poorly managed for decades, mainly due to a lack of knowledge about the value of forest resources. Thus, the amount of high-valued wood is low, less than 10 percent of the cut wood is eligible for the production of sawnwood. The lack of knowledge about the availability of certain species and an uncontrolled marketing led in several occasions in the past to failures in the fulfillment of contracts and to a poor image of Chile's natural wood exporters.

The **second major** problem is the absence of a transparent system to measure the quality of logs and lumber. This makes the smallholders dependent on what the buyers are willing to pay and lowers the efficiency of the whole value chain, due to a poor basis for cost calculations. Since 1978 there exists a norm for the classification, terminology and measurement of wood defects. However, few actors are aware of this norm and thus it is not applied in day-to-day transactions.

The **third barrier** is the lack of adequate sawing, drying, milling etc. facilities, especially among SMEs that process large parts of the domestic wood.

The **forth** important factor is the lack of adequate methods and instruments to determine important parameters of the value chain, that in the past led to complaints on the national markets and to the disruption of commercial relations.

A project implemented by the University for Applied Science of Rottenburg, together with PTB in the IIX:, IX. and X. region of Chile analyzed the mayor deficiencies of the wood value chain and the potential role of QI in its upgrading.

In the relationship between primary and secondary processors of wood, the main governance related problem consists in information asymmetries related to the quality aspects of the wood. There are important quality related parameters that cannot be easily checked by the buyer, e.g. the important question, whether the wood has been adequately dried. The effects of an inadequate primary treatment do often only show up some time after the wood has been sold, incorporated into the final products. In these cases, the secondary producers have to face eventual complaints by the final buyers.

Regarding the governance of international chain links, i.e. the structures and functioning of commercial relations between producers of logs, sawnwood, veneer, plywood and SPTP based in developing countries and international buyers, these can be characterized as buyer-driven chains, in nearly all cases. An inexistent or insufficiently developed QI and thus an inability to measure the above mentioned parameters with precision levels of international standards, does not just aggravate given power imbalances but clearly acts as **barriers to entry**. Large retail companies etc. will not source products from producers, regions or countries that cannot deliver in a reliable manner high quality products or parts. In the case of Chile, discontent by international buyers has in the past even led to the disruption of formerly existing commercial relations (see Box 6).

Finally, an adequately developed QI is essential for the necessary task of **upgrading of wood value chains**. As explained above, high value addition based on the wood as raw material is an important pre-condition for a sustainable forestry and thus, for the maintenance of large forested areas in many developing countries. Not the cutting of trees as such leads to deforestation but the lack of appreciation given to the trees, leading to large-scale depletion and transition of forested areas into arable land and pasture. Upgrading can happen at the different stages of the value chain. Better cultivation and cutting practices may be seen as the first step. Primary cutting of logs can be improved in order to avoid unnecessary scrap and assure an optimum utilization of the raw material.

Upgrading in the primary and secondary processing stages of wood go often hand in hand. Transition from low end to middle and high end segments of national and finally international markets in the areas of door, windows or furniture production require parts cut to exact dimensions and dried to precise levels of humidity.

6 The Effects of Quality Infrastructure on the Value Chain of Leather

The production of leather and leather products is a highly relevant economic activity in many developing countries, as

— they host a considerable proportion of the global bovine, sheep and goat herds and

— the production of leather goods is rather labor-intensive and thus of high relevance for local labor markets.

In this chapter we will mainly focus on the skin/hide to shoes value chain, in order to decrease levels of complexity. Shoes are by far the most important single leather based products. FAO estimates that between 1997 and 1999, 57 percent of light bovine leather production and 41 percent of leather from sheep and goats was used for the production of shoes, and the remainder for garments, furniture and travel-goods, also a growing market. It estimates that the world output of shoes with leather uppers exceeds 4,200 million pairs (2000-2001), with a 148 percent growth in production of this type of shoe in developing

countries between 1982-2000, representing an increase in their share of global output from 35 percent to 72 percent (FAO 2001). As is the case with many other labor intensive products, most of this increase is concentrated in China, today by far the largest shoe producer on earth. In 2005, China exported shoes worth US-$ 19.1 billion, followed by Italy (US-$ 8.9 billion, Hong Kong (US-$ 6.1 billion), Belgium and Germany (US-$ 2.5 billion and 2.4 billion).[10]

6.1 The leather value chain

The leather production-consumption chain has three processing stages, each requiring different combinations of material inputs, labor and capital and with special quality requirements:

- The first stage is the recovery of raw materials, mainly from slaughter houses.
- Leather tanning and finishing is the second stage that involves relatively capital-intensive operations.
- The third stage, which is the production of leather products, is a more labor-intensive activity, thus giving rise to significant income opportunities.

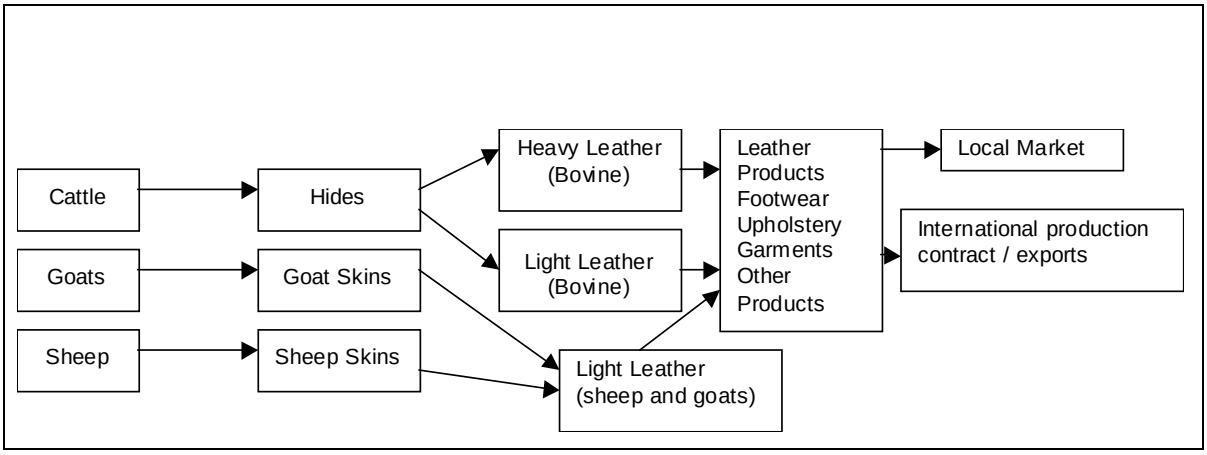
These three processing stages are linked to key commercial components of the chain, the marketing of intermediate inputs, components and end products, and trade and consumption.

There are three main types of raw materials for the leather industry: cattle hides, goat and sheep skins (see Figure 6). Developing countries host a large part of the world goat, bovine and sheep herds. The ratio of output to livestock number in the case of bovine herds is much lower in developing countries, compared to developed countries. As even the weight per unit is considerably lower, developing countries account for only 54 percent of world hide output (livestock: 78 percent). The quantitative relations are much more favorable in the case of sheep and goat skins.

For a long time, the raw material for the leather industry has merely been considered a low value by-product of the meat industry, what partially explains the low output levels in developing countries. Only recently, raw hides and skins are considered a commodity commercially traded on international markets.

[10] Data provided by the International Trade Centre, www.intracen.org, accessed August 26, 2007.

Figure 6: The leather value chain



The **production of leather** from hides and skins involves the treatment of raw materials, i.e. the conversion of the raw hide or skin, a putrescible material, into leather, a stable material. The production processes in a tannery can be divided into the following four main categories:

1. Hides and skins storage and beam-house operations. Upon delivery, hides and skins are sorted, trimmed, cured and temporarily stored. The following processes are typically carried out in the beam house of a tannery: soaking, de-haring, liming, fleshing (mechanical scraping off of the excessive organic material) and splitting (mechanically splitting regulates the thickness of hides and skins, splitting them horizontally into a grain layer, and, if the hide is thick enough, a flesh layer).
2. Tannery Operations. Typically the following processes are carried out in the tannery: de-liming, bating, pickling and tanning. Once pickling has been carried out to reduce the pH of the pelt prior to tanning, pickled pelts, e.g., sheepskins, can be traded. In the tanning process the collagen fibre is stabilized by the tanning agents so that the hide (the raw material) is no longer susceptible to putrefaction. The two main categories of tanning agent are mineral (trivalent chromium salts) and vegetable (quebracho and mimosa). The tanned hides and skins, once they have been converted to a non-putrescible material called leather, are tradable as intermediate products (wet blue).
3. Post-Tanning Operations generally involve washing out the acids that are still present in the leather following the tanning process. According to the desired leather type to be produced the leather is retanned to improve the feel and handle of leathers, dyed to produce even colors over the whole surface of each hide and skin, fat liquored and finally dried. After drying, the leather may be referred to as crust, which is a tradable intermediate product.

Operations carried out in the beam house, the tannery, and the post-tanning areas are often referred to as *wet processing*, as they are performed in processing vessels filled with water to which the necessary chemicals are added to produce the desired reaction. After post-tanning the leather is dried and subsequent operations are referred to as *dry processing*.

4. Finishing Operations. The art of finishing is to give the leather as thin a finish as possible without harming the known characteristics of leather, such as its look and its ability to breathe. The aim of this process is to treat the upper surface to give it the desired final look. By grounding, coating, seasoning, embossing and ironing, the leather will have, as desired by fashion, a shiny or matt, single or multi-colored, smooth or clearly grained surface. The overall objective of finishing is to enhance the appearance of the leather and to provide the appropriate performance characteristics in terms of color, gloss, and handling, among others.

The **manufacturing** of footwear and other leather goods can be divided into the traditional craft sector and modern industrial facilities. In most parts of the world, with the clear exception of China, footwear industry consists of rather small units. Humphrey and Schmitz (2002, p. 28f) analyzed the footwear cluster in the Sinos valley of Brazil, where "By the late 1980s, a significant number of firms were large by shoe industry standards, employing more than 500 people".

In the past, most leather footwear was fabricated on behalf of individual clients, traded locally or at most on national markets. During the last decades, however, the footwear market is also subject to a quick internationalization. Many producers in developing countries are being integrated into global buyer-driven value chains, manufacturing footwear, following design and process specifications of large retailers or e.g. sportswear companies. On the other hand, local markets in Africa and other low income countries, are increasingly been flooded by footwear produced in large-scale operation in China and also by second-hand footwear. The level of total import penetration of shoes is 73 percent for the whole of Africa (UNIDO, "Blueprint", no year, 41).

6.2 Quality requirements, regulations and standards in the leather and leather goods industry

In order to assure a high quality of the final products, on the different steps of the value chain special care has to be taken and dedicated measures are required. This starts with **good animal husbandry**, taking care of nutritional aspects and disease management, as the quality of skins and hides can easily be affected by parasites, insects or animals coming in touch with spiny plants. Branding, common in many developing countries to identify ownership of individual animals or herds of animals, also affects negatively the quality of skins and hides.

Slaughtering practices and the techniques of recovering the skin from the carcass also have a direct impact on the quality of the raw material to be processed. Very often, these aspects are not sufficiently been taken care of, mainly because the animals are essentially bred to provide farmers and markets with milk and meat, while the skin most often is considered a low-priced by-product. Quality problems also arise because of insufficient transport and storage of the fresh skins, leading to putrefaction.

Once the skins and hides reach the **tanneries**, an industrial process starts, where the exact measurement and control of physical and chemical parameters is of high relevance for quality assurance, mainly:

- moisture,
- temperature,
- salt concentration,
- pH.[11]

Quality assurance in the **manufacturing** of leather products is especially complex because of the large variety of materials used, including uppers, linings, threads, insoles, adhesives, soles and heels as well as components and grindery. Specialized quality assessment companies, such as the British SATRA (www.satra.co.uk), test properties such as strength, durability, color-fastness and flexibility of the different materials and sole attachment, seam strength, strength of straps, flex resistance and water resistance of the complete shoes and their parts. Mandatory tests, responding to European Standards, such as slip resistance are being carried out for special footwear, basically industrial footwear and protective shoes.

The leather value chain is subject-matter of a wide range of compulsory and voluntary **regulations and standards**. ISO publications in 9 cases refer to raw skins, hides and pelts, in 32 cases to leathers and furs and in 17 cases to footwear (UNIDO 2002, Appendix 4). This makes access to demanding markets a challenge for producers in developing countries.

In the last decades, the most important quality regulations were related to **environmental** and **consumer health and safety** aspects. Thus, a European Union Council Directive from 1976 and its amendments put limits on chemical residues in leather goods, such as Pentachlorphenol (PCP, limit value 5 to 1000 ppm) and Cadmium (75 to 100 ppm). In some OECD countries, national legislation bans products that contain residues of a number of other substances, e.g. certain azo dyestuffs, hexavalent chromium and Formaldehyde.

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[11] See Intracen, The Leatherline Online Guidebook, accessed 2007-08-19.

Residues in leather have also been affected by four other EU Directives. The aquatic environmental directives and the Integrated Pollution Prevention and Control directive (IPPC) imply indirect regulation of various substances in raw hides or wet blue leather, such as biocides used in animal husbandry or for the conservation of the raw hide. Council Directive 88/378/EEC limits the maximum content of extractable chromium in leather used in toys to 60 ppm. Finally, since 2000 a Council Directive regulates the disposal of end-of-life motor vehicles and requires that e.g. leather upholstery shall not contain hexavalent chromium or cadmium, among other heavy metals.

Apart from these mandatory measures, twelve eco-labeling schemes have been established that include criteria for leather or leather products. While the EU Directives shall protect mainly the European consumers against exposure to dangerous substances mainly through direct contact to the skin, eco-labels follow a more comprehensive objective, mainly the protection of the environment where the leather is produced, minimizing air and water pollution, among others (see Box 7 for the EU Eco-Label).

Box 7: The EU Eco-Label for footwear

In April 2002, new criteria became effective for footwear to circulate in the European Union with the EU Eco-label. They determine, among others, that for footwear to qualify for the award of the eco-label:

- the average concentration of residues of Chromium (VI) in the final product is not to exceed 10 ppm;
- no residues of arsenic, cadmium or lead are to be found in the final product;
- the amount of free and partially hydrolysable formaldehyde should not exceed 75 ppm (for textile components) or 150 ppm (for leather components);
- tannery waste water should contain less than 5 mg Chromium (III) per litre;
- pentachlorophenol and tetrachrolorophenol should not be used (previously, no requirements were applicable to tetrachrolorophenol);
- no azo dyes that cleave to any of the 22 aromatic amines set out in the eco-label criteria should be used;
- certain N-nitrosamines should not be detected in rubber footwear components;
- another new provision dictates that C10-C13 chloralkanes are not to be used in leather, rubber or textile footwear components;
- the use of volatile organic compounds during the final assembly of footwear is not to exceed the limits specified;
- footwear is not to contain PVC;
- footwear is not to contain any electrical or electronic components;
- cardboard packaging for footwear is to be made of 80 percent recycled material, and plastic packaging out of 100 percent recycled material
- the footwear must meet certain durability criteria specified by the Commission

Source: http://www.tdctrade.com/alert/eu0208d.htm, accessed 2007-08-25

A further level of private regulations that is gaining momentum in the global leather products markets are codes of conduct that oblige suppliers not only to comply with good production practices regarding product quality, health and environment related aspects, but also to the treatment of factory workers according to international minimum standards, usually derived from the ILO core labor standards.

One last international regulation to be mentioned with high relevance for international trade of leather and footwear aims at protecting endangered species of animals (and plants). In 1973, the Washington Convention established guidelines for the trade and industry with the purpose to save certain species from extinction. CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between Governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. CITES works by subjecting international trade in specimens of selected species to certain controls. All import of species covered by the Convention has to be authorized through a licensing system. Roughly 5,000 species of animals are protected by CITES against over-exploitation through international trade. In a large number of developed countries it is a criminal offence to possess hides or skins or leather products made from protected hides and skins, unless accompanied by or traceable to a CITES certificate.

6.3 The effects of standards and quality infrastructure on governance, barriers to entry and options for upgrading in the leather products value chain

As we have seen, the leather products value chain is subject to a great number of regulations. Compulsory product requirements are of higher relevance than in other product areas, especially

- because products potentially dangerous for the health have been or are used in the early processing steps (chromium for tanning and azo dyes for coloring) and
- the fact, that the final consumer is often directly exposed to the product that may contain unhealthy levels of residues.

Other risks are also related to footwear (accidents through slipping, breaking of heels etc.) and an importer or contractor may face liability if e.g. injuries can be traced back to defective or inadequate production processes or raw material. Thus, a large number of physical and chemical laboratory tests are required on the different steps of the value chain, if a producer, producer groups or country wants to become or to remain part of global footwear chains. It has to be stated that in many cases, such as hexavalent chromium and azo dyes, the limit values specified by some national regulations or e.g. the EU correspond to the detection limits, implying that high precision measurements are required. Furthermore, each newly banned substance means that additional laboratory tests have to be carried out.

A study published by OECD on the effects of environmental regulations on the leather industry in leather exporting countries concludes that "... the problems that these countries have encountered relate to lack of information, inadequate testing facilities, and difficulties in obtaining alternative technologies or chemical inputs" (OECD 2006, p. 3). In detail, the effects have been largely unequal. Especially for smaller units in poorer countries the requirements have acted as **barriers to entry**.

Adaptation by the largest tanneries in developing countries was facilitated by a special form of **governance**, namely vertical ownership by, or contractual linkages with, transnational companies headquartered in Europe. In some cases, these provided aid in the form of training and know-how transfer in order to secure that their subcontractors in developing countries were complying with the new environmental standards.

The situation was less easy for some less active countries and especially the smaller units. The already mentioned OECD study confirmed for the case of Zimbabwe, that the two big and modern tanneries in the country were able to comply with European regulations, and prohibited substances have been eliminated from their leather. Many of the country's small tanneries, however, remain non-compliant.

Testing for residues was a particular problem in the years immediately following the introduction of chemical-residue limits affecting leather. Since the 1990s, a number of testing facilities have been built in order to help the exporters confirm, if their products contained any banned substances and to trace these contaminants back to their origin. In India, for instance, with the help of government and donor agencies, specialized testing facilities were created in different parts of the country to test leather for PCP, azo dyes etc. In 2000, India introduced an eco-labeling scheme for finished leather. Among the parameters included in the scheme are the contents of PCP, hexavalent chromium, formaldehyde and the prohibited dyestuffs (Wiemann et al., 1994).

In the case of the footwear industry in developing countries, literature does not allow a clear assessment, to what degree the presence or absence of a functioning QI affects their possibility to enter global value chains, and/or **upgrade** processes and products, e.g. to penetrate more demanding markets. Empirical studies are not available. Access to high-level laboratory services are indeed essential, if demanding international markets shall be reached. Having to send products samples to laboratories abroad increases overall costs and – thus – lowers international competitiveness. In recent years, this problem has been interfered by much more serious barriers to entry, mainly the very tough competition by Chinese manufacturers that provide manufacturing services at very low prices. Due to the clustering of manufacturing in China, laboratory and other testing services can be delivered with significant economies of scale.

7 Conclusion

In industrialized economies, QI (i.e. MSTQ structures) has been developed and continuously improved, since industrialization and mass production requires harmonized procedures. MSTQ systems in developed countries nowadays are competent and performing well and have achieved multilateral recognition, a fact that significantly eases trade and division of labor among these countries. In many developing countries, especially in the smaller and less developed ones, QI systems are incipient or only partially developed, implying that the recognition of products and underlying production processes remain an important challenge.

For some time, this might have been considered a minor problem, because the links of these countries to international markets were few and quality requirements on the national markets low. Two trends have put "quality" much higher on the development agenda in recent years:

— First, the establishment of global value chains increasingly offers developing countries the possibility to participate in global value addition, based on the one hand on basic manufacturing capabilities and low labor costs, on the other hand on specific climatic advantages for agriculture.

— Second, as documented for four value chains, quality requirements in their different dimensions are growing on the international markets, especially in products that are of high relevance for developing countries, such as food and non-food agri-based products.

The second aspect might be regretted by some, as it clearly complicates developing countries' market access and might, thus, be considered a new form of non-tariff trade barrier. However, it has to be stated that many of the new quality requirements respond to legitimate interests of consumers regarding their health and safety as well as environmental concerns. Large retail companies and other integrators of global value chains will continuously less embark on trade relations that may – in the case of non-compliance of suppliers with standards – jeopardize their reputation on the markets and oblige them to carry out expensive callback actions of deficient products. Increasing quality requirements are a matter of fact that will even in the future pose an important challenge to developing countries' producers. Thus it may be concluded, that a well-functioning QI is a pre-condition for a fair globalization and broad-based growth in developing countries.

7.1 Quality infrastructure and global value chains

The analysis of this study shows that QI is important for the value chains. On the one hand, it facilitates interactions in the value chains by coordinating and governing the assurance of quality and standards for the goods produced and traded. It considerably

lowers transaction costs and, thus, facilitates trade. To the degree that voluntary standards and compulsory regulations are becoming more and more widespread in international value chains, existence or absence of a functioning QI may have **differentiating** effects on value chain formation. For a global buyer or contractor, the possibility of potential suppliers to easily, quickly and reliably demonstrate compliance of delivered parts and products (including the underlying processes) with established standards and technical requirements is becoming a more and more essential selection criterion. For this, it is important to consider the QI as a whole system which also includes e.g. accreditation of laboratories and other testing bodies, or accreditation of certifiers.

Differentiating effects can be found on the level of individual units, of regions and of countries. If a country or a region does not provide private companies with access to relevant and state-of-the art services, this implies serious **barriers to entry** especially for small producers. Larger companies may more easily establish laboratories in-house, due to the scale of their operation and access to required capital. Similarly, they may be in the position to send product samples abroad, because the costs related to it are covered by larger volumes of products. In many developing countries – mainly LDCs – small or medium companies may be the only units of the private sector that can join international value chains. Here, QI is an especially important element of the business environment. Its absence may contribute to the marginalization of whole regions or countries from global markets.

QI also establishes the basis for **upgrading** efforts in developing countries, because producers will more easily embark on the costs and risks of introducing new technologies, processes or products and of penetrating more demanding markets, if the business environment assist them by providing them with the required information. Next to capacity building promoted from the outside, integrating certain elements of the national QI in international networks might also be a solution for ensuring a cost-effective testing and implementation of standards or other technical regulations.

However, the case studies also indicate, that a lack of opportunities for exact measurement and a reliable demonstration of compliance with given standards, is in most cases *only one* barrier to integration into international value chains. The establishment of an effective QI should, thus, not be considered as a stand-alone solution, if world market integration shall be achieved. As demonstrated in the cases of wood and leather, quality management often has to start at the upper end of the value chains, where it is not directly related to high precision measurement or the traceability of testing results, but with good animal husbandry, a knowledge-based management of forest plots etc. Similarly, as shown in the case of fish and shrimps, in many cases the lack of information about newly introduced standards can be an important bottleneck.

In other cases, even if QI-systems are in place, producers may not be able to change their processes or management practices to correspond to standards or regulations. The reasons for this might be found in more general capacity constraints, a lack of access to relevant

production technologies, investment capital or more adequate inputs. In other words, new demand conditions on the large and demanding markets, in many developing countries face comprehensive supply constraints, with a lack of QI as one of the often neglected aspects, but by no ways the only relevant aspect.

7.2 Problems faced by developing countries in setting up a well-functioning quality infrastructure

It was not the purpose of the study to assess the existence, performance and potentialities of QI in developing countries. However, some relevant information came up when analyzing the available literature on standards and conformity assessment in the four analyzed chains. In most developing countries, some elements of a QI-system are in place. In some of the larger and more advanced countries (e.g. India), the present situation comes very close to that in industrialized countries. Here, QI establishment has often received significant donor support.

In smaller and poorer countries, QI is most often much less developed. On the one hand, these countries face severe constraints, e.g. regarding qualified personnel for the management of QI systems and its main elements, such as laboratories, accreditation agencies etc. Capital for public and/or private investment in the often expensive equipments in testing facilities or even metrology organizations is nearly by definition scarce in these countries.

But problems arise also from the demand side. For a long time, in many poor and small developing countries there was no tangible need to establish quality infrastructure, due to a lack of quality orientation on the national markets and a lack of international linkages. Now, opportunities arise to integrate certain numbers of producers into global value chains. Their striving for competitiveness should be accompanied by adequate quality services, however, while their number is limited, establishment of a complex QI system is expensive in relation to the value added in national value chain links. The backflow of fees paid by private sector clients starts on a low level.

Decisions have to be taken regarding the sectoral orientation of QI. As we have seen e.g. in the case of the leather industry, quality requirements in different products need often very specific high precision measurement capabilities, such as pH, temperature, humidity, chemical residues of very different kind. Regarding the cost-benefit ratio of the investment in QI, sound decisions have to be taken, of where to set priorities without discriminating other producers or sectors, leaving them without access to relevant services.

Considering that market failure is pervasive with regard to the establishment of QI, governments of developing countries have to play an active role. A major problem faced by them is the lack of information on international developments in quality requirements

as well as information on the country's own needs. Thus, the level of awareness and/or understanding of MSTQ measures among the country's producers and regulators in many cases is still low. The functioning of quality infrastructure is often also affected by the institutional capacity of the governments that hampers the establishment of an effective quality control system and/or leads to a poor enforcement of relevant legislation. Very often, there is a lack of coordination between different government institutions within the quality infrastructure.

This implies that also in the future, international donors have an important role to play. Investment of ODA resources is clearly justified by the trade-facilitating, and thus, poverty-reducing effects of an effective QI and also by the goal to establish, under conditions of globalization, an "as level as possible" playing field for companies of different sizes and located in different world regions and countries. Institution-building and promoting the integration of national QI systems in international networks are thus valuable approaches to strengthen the QI in a sustainable way. After all, it has to be considered that QI includes many elements which contribute to the promotion of good governance in a country.[12]

As has been confirmed by the four case studies, QI is one important and often neglected, but never the only pre-condition for effective value chain integration in developing countries. Wherever possible, the support to national QI systems should be embedded in more comprehensive "quality offensives" or similar approaches by national governments and/or international donors. In poorer regions, where the number of actors actually requiring high-level QI services is low, regional approaches are very pertinent, as they can avoid the high costs of establishing a complete QI in each single country, while generally providing companies with access to the services.

7.3 Final considerations considering available literature

Literature on the role that QI plays for value chain formation in developing countries is extremely scarce. While in the last years, some authors have been focusing on the role of public and private standards for trade and production in developing countries, most of them deal with generic product and process standards, such as organic agriculture, Fairtrade, ISO 9000, among others. More technical standards and the whole field of conformity assessment have largely been neglected by development research.

Thus, the research agenda regarding value chain formation and QI is long. Empirical work should cover micro-economic cost-benefit analysis of companies adjusting to new and more demanding markets. Little is known about the willingness of lead firms to help suppliers adapt to new quality requirements, providing them with the relevant

[12] For a more detailed analysis on this, see Grote, 2006.

information, training, advice and access to QI services. How can it be assured that small and medium companies in developing countries have access to laboratories and testing facilities to a non-prohibitive cost? Here a lot can probably be learned from the debate on Business Development Services (BDS). Additionally, it seems important to do research on the interrelations between the state of economic development and diversification of a country or region on the one hand, and the specific requirements of the QI on the other.

But research should not only concentrate on international markets. Also, little is known about the diffusion process of international standards on local markets in developing countries. How and to what extent they affect consumers and companies in developing countries are relevant and important questions.

Finally, as a growing number of value chains are being integrated by non-OECD based lead firms, it is of interest, how quickly these companies are adopting private standards and technical regulations and what this implies for the structure and functioning of QI in producing countries.

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