

# 1. Quality improvement in food value chains: searching for integrated solutions

J. Bijman<sup>1\*</sup> and V. Bitzer<sup>2</sup>

<sup>1</sup>Wageningen University, Management Studies Group, P.O. Box 8130, 6700 EW Wageningen, the Netherlands; <sup>2</sup>Royal Tropical Institute (KIT), P.O. Box 95001, 1090 HA Amsterdam, the Netherlands; [jos.bijman@wur.nl](mailto:jos.bijman@wur.nl)

## Abstract

Quality improvement in food value chains offers both opportunities and challenges for farmers in Africa. This chapter introduces the key concepts that are used in the studies presented in this book. It also provides a short description of each of the chapters. Quality is an elusive concept. It has a different meaning for each of the different value chain actors involved in producing, processing, trading and consuming food products. Some of these quality preferences can easily be measured, others are much more difficult to detect. This has implications for monitoring and control, such as in quality assurance systems, but also for providing proper economic incentives for each of the value chain actors. Finally, it has implications for the alignment of quality preferences throughout the value chain. The latter is important because the opportunities for quality improvement can only be understood by analysing the chain as a whole and assessing the motives and capabilities of all chain actors. In this chapter we also explain the interdisciplinary perspective we take on studying quality improvement and innovation. As quality improvement is a type of innovation process, the literature on innovation processes and innovation systems can be used for better understanding the options and constraints for quality upgrading in food chains in developing countries. Based on the recognition that innovation processes involve multiple actors, at multiple levels and engaged in multiple activities, at the end of the chapter we present the co-innovation.

**Keywords:** quality, value chain, innovation, Africa, interdisciplinarity, co-innovation

## 1.1 Introduction

Quality improvement in food chains offers both opportunities and challenges for farmers in Africa. In recent decades, the production, distribution and consumption of food has changed dramatically, particularly in Sub-Saharan Africa. The demand for higher quality of food products is both one the causes and one of the consequences of the major changes. Due to globalisation of food systems, enabled by new technologies and reduction of trade barriers, farmers in Africa have found new market opportunities

in producing for developed country markets. Also the rise of domestic supermarkets, catering for a growing population of middle income consumers, provides new and potentially more remunerative outlets for farmers. These high end markets have increasingly strict requirements in terms of quality, certification, traceability, product uniformity, delivery times and food safety (Reardon *et al.*, 2009). As not all farmers have the resources and skills to produce for the highest quality markets, an increasing differentiation can be seen in the development of food chains, mainly determined by the quality demands in the final consumer markets that these products are targeting.

Quality, however, is not the only concern of the agricultural industry and those supporting this industry. Also quantity is an issue, as obtaining food security for a rapidly growing population, particularly in Africa, is not self-evident. In order to improve food security, the productivity of smallholder farms needs to increase. To induce smallholders to increase production, a combination of pull and push factors needs to be in place. Agricultural support programmes of national governments, international organisations, donor organisations and non-governmental organisations (NGOs) seek to strengthen market access, as the key mechanism to obtain both higher production and better quality.

The main assumption underlying the developmental effort of national and international organisations is that enhanced market access will provide smallholder farmers with the capabilities and incentives to both increase production and produce the right products. Increasing production should come from better access to inputs, credit and technical assistance. Producing the right products implies a better exchange of information between producers and consumers. Being able to produce more and better products is directly depending on access to the inputs and services needed on the farm. Thus, access to input markets and access to output markets are strongly interdependent.

While acknowledging the importance of food security, this book will focus on the improvement of food quality: how can smallholder farms improve the quality of their products and how can this quality be maintained or even upgraded throughout the food chain? Improving quality will lead to higher food chain income, higher consumer satisfaction, and lower environmental impact (as food losses will be reduced).

In answering the question how food quality can be improved, this book adopts an *interdisciplinary perspective*. Improving quality is not just a matter of developing and adoption of new technologies. While technical innovation in cultivation, logistics or processing may generate higher quality and reduce quality degradation, implementing such innovations requires complementary innovations in organisation and institutions. Therefore, this book seeks to explore integrated quality solutions, which combine changes in technology with changes in the food chain organisation and changes in the institutions that affect the decisions of individuals and organisations in the food chain.

In search of integrated quality solutions, this book presents a collection of case studies based on field research in various African food chains. By analysing the experiences of different chains, different crops and different countries, the book aims to generate and disseminate practice-oriented knowledge concerning quality and innovation in food chains. The lessons learned and insights obtained from the case studies will help to find practical answers to some of the key challenges that the agricultural sector in Africa is currently faced with. Based on the findings of each chapter, the book will also provide directions for further research.

All of the chapters of the book utilise a *food chain perspective*. A food chain comprises the subsequent activities and actors that are involved in producing, transporting, processing, trading and consuming food products (Trienekens, 2011). Using this perspective implies acknowledging that quality improvement is the result of the coordinated activities of different actors producing and handling the food products. This implies that quality improvement activities of the farmer will only be successful in changing his/her livelihood situation when the objectives of these activities are implicitly or explicitly aligned with the objectives of the other actors in the chain. Thus, our chain perspective covers both the coordination of operational activities, such as logistics and information exchange, and the alignment of the economic interests of each of the chain actors.

Throughout the book, we use an *innovation perspective*. We conceptualise quality improvement as a process of innovation, thus paying attention to issues inherent to all innovation, such as cognitive challenges, entrepreneurial attitudes, market opportunities, competitive pressure, organisational support, institutional barriers and technological advances. More specifically, we use an innovation systems perspective, which means that innovation is always the result of the interplay of many actors and many processes (Hall *et al.*, 2001). In order to be successful, innovation requires collaboration among actors from business, government and NGOs, to jointly generate and implement new knowledge (Sumberg, 2005).

This introductory chapter presents the main concepts that are used in this book. The structure of the chapter is as follows. First, we will discuss the concept of quality and its different definitions. Particularly relevant here is that different actors involved in producing, processing, trading and consuming food products may have diverging demands for the quality of these food products. Second, we will present our food chain perspective, as opportunities for quality improvement can only be understood by analysing the chain as a whole and assessing the motives and capabilities of all chain actors. Third, we will explain our interdisciplinary perspective on quality improvement and innovation. As quality improvement is a process of innovation, the body of knowledge on innovation processes and innovation systems provides a better understanding of the options and constraints for quality upgrading in food chains in developing countries. Based on the recognition that innovation processes involve multiple actors and multiple activities, we develop the concept of co-innovation. Finally, we present a short outline of each chapter of the book.

## 1.2 Defining food quality

Food quality is an elusive concept as it has different meanings for different actors in the food chain. In the academic literature, a wide range of definitions of quality prevail based on the perspective adopted by various disciplines. Reeves and Bednar (1994) distinguish between four broad approaches to quality: quality as excellence; quality as value; quality as conformance to specifications; and quality as meeting and/or exceeding customers' expectations. In the marketplace and hence in the context of market access and competitiveness, quality is usually viewed as 'perceived quality' and ultimately depends on the judgement of the customer (Oude Ophuis and Van Trijp, 1995; Reeves and Bednar, 1994). Quality as satisfying customer expectations implies that it is time and location specific (Luning and Marcelis, 2006). While for professionals in handling food products quality means the extent of conformance to specifications, often customers do not know how well a product or service conforms to those specifications (Reeves and Bednar, 1994). This implies that quality includes both subjective aspects, such as consumer preferences, as well as objective aspects, such as the measurable compliance with specific quality requirements (Ruben *et al.*, 2007).

Steenkamp (1989) posits that overall quality judgement is based on intrinsic and extrinsic quality cues. Intrinsic cues refer to the physical product properties, such as colour, shape and size, whereas extrinsic cues are related to the product, but are not physically part of it. Extrinsic cues include, for instance, the brand name and the social and environmental conditions of the production and distribution process, such as the number of food miles (Coley *et al.*, 2009).

The marketing literature has identified three types of perceived quality attributes: search, experience and credence (Darby and Karni, 1973; Nelson, 1970). Search attributes are the quality attributes known at the moment of the purchase; for instance, the apple has no external sign of decay. Experience attributes are known after personal experience; for instance, the apple has a good taste. Finally, credence attributes are quality attributes that cannot be verified through search or experience: for instance, the apple has been produced in an organic production system, thus without the use of any chemical pesticides. In the domain of agriculture and food this distinction into search, experience and credence attributes is extremely relevant, because of the emotional attachment of people to specific foods, the importance of quality for human health<sup>1</sup>, and the increasing importance of sustainability in the food chain which leads to credence attributes becoming more important.

From a food chain perspective the various preferences and interpretations of food quality of different actors in the chain need to be aligned. For instance, the quality attributes that might be important to producers, such as yield and disease resistance of a crop variety, may matter little to retailers who are more concerned about the shelf life and appearance of a food product. For a processor the uniformity of products and the

<sup>1</sup> In the Codex Alimentarius (FAO/WHO, 2006) food safety is an integral part of food quality.

time of harvest are crucial quality variables for the optimal alignment of production and processing activities. Finally, the consumer may particularly be interested in the healthiness and convenience of a product. Table 1.1 shows the different interpretations of quality by different actors along the food chain. The challenge for the food chain as a whole is to reconcile these different interpretations of quality (Ruben *et al.*, 2007). In other words, chain alignment requires the implementation of information exchange and joint decision-making structures that can deal with the divergent and dynamic preferences of all chain actors.

From a public policy perspective, food quality concerns traditionally focussed on food safety issues (Luning *et al.*, 2006). More recently, also nutritional quality has been recognised as an important public issue. Nutritional quality (or nutrition security) goes beyond availability and safety of food products, as it emphasises both the availability of specific nutrients necessary for particular groups of consumers (such as infants and elderly) and the balance among various food ingredients. For instance, consumers that have more income to spend usually shift their diets from carbohydrates to protein and animal fats, which entails a less healthy consumption pattern (Popkin, 1999). While food safety and nutritional quality are (or should be) basic conditions for food products, this book focusses on those quality issues that lead to differentiation among products and markets and thereby to differentiation among food chains.

### 1.3 Different perspectives of food chain analysis

In the world of international development, value chain analysis as a research tool and value chain development as an intervention strategy have become popular among NGOs, consultants and applied researchers (Donovan *et al.*, 2015; Trienekens, 2011). Within the academic literature, no consensus exists on the exact definition of a value chain or value chain development. Researchers from management and business, often influenced by the literature on Supply Chain Management and Strategic Management, conceptualise the value chain as a set of activities that need to be aligned in order to get efficient logistic processes, effective coordination between production and distribution, and efficient information exchange, such as through tracking and tracing

Table 1.1. Interpretation of quality by various food chain actors (Ruben *et al.*, 2007: 30).

Actor	Quality aspects
Breeder	vitality of seed, yield
Grower	yield, uniformity, disease resistance
Wholesaler	shelf life, availability, sensitivity to damage
Retailer	shelf life, diversity, exterior, low losses
Consumer	taste, healthiness, perishability, convenience, constant quality

systems. In research on and managing of the food value chains, improving quality and innovation is one of the focus activities (Fritz and Shiefer, 2008; Trienekens, 2011).

A value chain has also been conceptualised as a strategic network (e.g. Lazzarini *et al.*, 2001). Value chains are networks of collaborating but independent business organisations with the joint objective of providing final consumers with good quality products. The emphasis in the strategic network literature is, on the one hand, on seeking ways of collaboration that support joint innovation but maintain individual entrepreneurship, and, on the other hand, on competition among different networks that supply similar products to the final customer. Thus, the idea of value chains competing against each other is in line with this strategic network thinking.

Yet another approach, often taken by both orthodox and political economists, emphasises the value chain as a set of actors. Each of these actors has its own objective function, often profit-driven. For the value chain as a whole, the challenge is to align the interests of all participating actors in such a way that each actor has sufficiently strong incentives to participate and to continue to contribute to total value generation. Value chain analysis, then, focusses on describing the actors involved, calculating the gross margins or even net margins at each stage of the chain, and explaining the contractual linkages that are used for the bilateral transactions among chain actors. The political economy strand of value chain analysis also studies the power relationship among chain actors in order to find out which actor is most influential in moving the whole chain. In other words, it investigates which actor has the most power to determine what quality improvements will be required and enabled.

In the Global Value Chain literature applied to food chains it has been shown that particularly large multinational food companies as well as international supermarket companies are the dominant actors in food chains (Humphrey and Schmitz, 2002). These companies have a strong influence on whether and what type of innovations in the chain will be adopted (Saliola and Zanfei, 2009). The food quality and safety standard GlobalGAP is often presented as an example where large (originally European) supermarket companies have set the private standards that all suppliers of fresh produce have to comply with (Hatanaka *et al.* 2005) The introduction of these standards by large supermarket companies has greatly supported the introduction of sustainable production methods. But it has raised many concerns about the inclusion of particular groups of producers in developing countries that may not (yet) be able to apply the strict requirements due to a lack of resources and capabilities (Lee *et al.*, 2012).

The different conceptualisations of the value chain – whether it is a set of activities, a set of actors or a strategic network – have implications both for the type of value chain analysis and for the design of interventions that follow from the analysis (Donovan *et al.*, 2015). With an activity-based definition, value chain analysis and value chain interventions focus on improving the efficiency of production and distribution processes. This ‘engineering’ approach may lead to optimisation strategies and

innovation policies that clearly show what needs to be done to obtain improvement, but that are often not clear on which actors have to implement what changes. Under the actor-defined value chain approach, a distinction can be made between resource-poor and resource-rich actors, and the link between them is the object of study. If development is about enabling the resource-poor to benefit from new market opportunities, then the goal of value chain development is to help smallholders link up with modern value chains by providing them with the knowledge and skills they need and by strengthening their bargaining power vis-a-vis the other chain actors. The strategic network perspective on value chains leads to the identification of the dominant companies in the network in order to encourage these actors to support their suppliers in improving quality.

### 1.4 Market access and the debate around the impact of quality standards

#### 1.4.1 Linking farmers to markets

A vibrant debate has emerged over the past decade on 'linking farmers to markets' to make use of the productive capacities of smallholder farmers and promote rural development. Most of this debate has focused on how emerging quality standards facilitate or hinder smallholder market access (Henson and Reardon, 2005; Jaffee *et al.*, 2011). While case studies have provided ample evidence for both scenarios, the prominence of this debate has largely detracted attention from the most fundamental challenge underlying all market access strategies of smallholder farmers: the issue of integrated quality improvement. Quality improvement can entail but exceeds compliance with standards, recognising that quality relates to a broad range of often interrelated issues, including market orientation (national or international), organisation and logistics of the chain, and technical aspects of production, processing and distribution. This type of integrated research on food quality problems has so far been limited to developed countries. The re-emergence of agriculture for development on the policy and research agendas (e.g. World Bank, 2007a) warrants a systematic analysis of integrated quality solutions that can strengthen smallholder market access and competitiveness in national and international food chains.

Market access<sup>2</sup> has been identified as one of the most important factors influencing the performance of smallholder farmers in developing countries. Access to more remunerative markets, such as those for products with higher value, is now considered as a major pathway to enhance and diversify the livelihoods of low-income rural households and thereby reduce poverty in the rural area. Many development NGOs

<sup>2</sup> With raising the issue of market access we do not want to suggest that smallholder farmers never sell farm products. Even in the poorest rural areas there are few farmers that are pure subsistence farmers (i.e. producing only for their own consumption). What we mean by a lack of market access is that many farmers do not have access to more remunerative output markets, or do not have access to well-functioning inputs markets. Lack of market access thus prevents smallholders to introduce the new farming technologies (such as new crop varieties) needed for quality improvement.

and donors have, over the last decade, made improved market access as one of their key targets in supporting farming households, and have selected value chain development as the core method for achieving such better market access.

However, market access is still a major problem for many smallholders, resulting from a combination of market characteristics and features of the smallholders. Constrained market access may result from physical barriers such as poor infrastructure, from weak technical capacity of the farm and farmer, from a lack of resources to make the necessary investments for meeting quality demands, or from the inability to bear the risk related to investment in quality improvement (World Bank, 2007b).

Low market access may be caused by problems in production or in transacting with buyers. Production problems often result in the inability of the farm to increase the quality of its products. This could be due to lack of knowledge, lack of scale, lack of resources, lack of access to inputs and technical assistance, lack of labour, and high risk related to local agro-ecological conditions. Also the need to produce sufficient food for farm household consumption may prevent farmers to shift to the crops and varieties that would strengthen their market position.

All transactions involve transactions costs, but these costs may vary substantially depending on the type of market and the type of buyer. Transaction costs are the cost of collecting information (e.g. on supply and demand and on prices), the cost of contracting (e.g. negotiating cost), and the cost of contract enforcement (e.g. ensuring that the buyer will pay and will pay on time). Transaction costs are particularly high for small producers who rely on traders and middlemen to come to the farm to collect the product. Lacking transport means and information about market conditions places these farmers in a disadvantaged bargaining position. Farmer transaction costs can rapidly increase when farmers switch from generic products for local markets to specialty products for export markets.

Switching from generic product quality, which is understood and appreciated by local buyers, to specific product quality demanded in distant markets entails the risk of becoming dependent on the few buyers that supply those distant markets. Such dependency is risky for smallholder farms, particularly because farmers need to invest at the start of the growing season and only receive payment for their products after the harvest (and then even after a delay). During this time lag, many uncertainties may arise. Risk-averse farmers will not easily accept these uncertainties and the risks involved (Chavas, 2004).

#### **1.4.2 Markets, quality requirements and upgrading**

Quality requirements differ considerably between markets (Poulton *et al.*, 2006). Local (wet) markets tend to have few quality requirements, mainly related to physical quality attributes, such as appearance. Local supermarkets are still modest in their quality requirements. Foreign supermarkets, particularly those in Northwest Europe

and the USA are the most demanding in terms of quality attributes. In between these three alternatives, other levels of quality requirements can be found.

Jaffee *et al.* (2011) distinguish six different markets which represent six different levels of quality requirements. These six markets range from wet markets and small retail stores in the local community of the producer in a developing country all the way to high-end supermarkets in developed countries. The authors pose that moving from one market to the other (from lower to higher quality requirements) entails a step in a process of upgrading (Figure 1.1). The different markets available to smallholder producers represent alternative marketing choices and supply response strategies. The key message of Jaffee *et al.* (2011) is that each upgrading step entails higher levels of quality requirements, which implies higher levels of compliance costs (including on-farm investments) and transaction risks. Going from left to right does not necessarily represent a better income for the farmer, as both revenues and costs go up. Only when farmers are able to produce at a higher quality level while reducing the costs and risks, the next step of upgrading will be attractive.

**1.4.3 Private quality grades and standards**

In the past, food quality and safety standards were mainly introduced and monitored by public authorities, who had two main reasons to develop and implement quality standards. First, by implementing and particularly by controlling compliance with specific quality requirements, the state can protect consumers from opportunistic producers and traders. This function is particularly relevant for those quality attributes

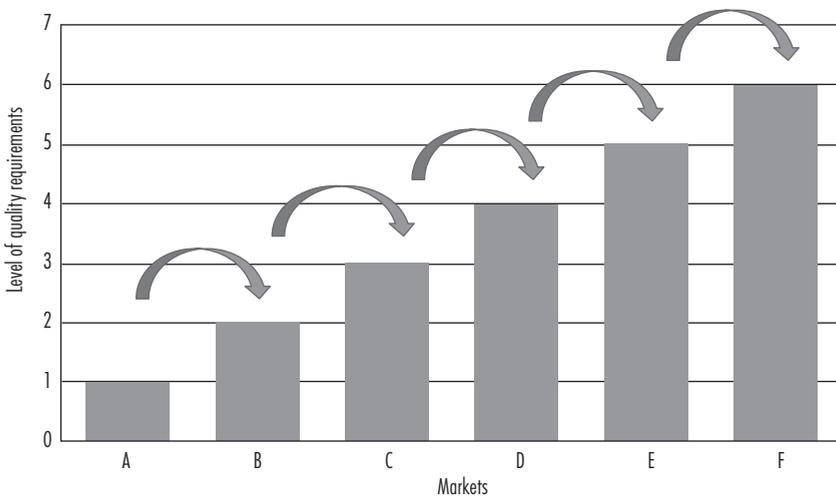


Figure 1. Upgrading options: moving from low quality to high quality markets (adapted from Jaffee et al., 2011).

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that affect the health of consumers (notably those related to food safety). Second, quality standards reduce transaction costs by reducing asymmetric information, thereby making markets more efficient. When standards apply, the cost of market participants to find out about the quality of a specific product are reduced, which leads to a general welfare gain. Introducing standards and a system of compliance monitoring reduces transaction costs in two ways: customers spend less time and effort on finding out about the quality of a particular product, and, because they trust the quality grade, they are willing to pay the proper price for this grade. In other words, the adverse selection problem is prevented, and the producer receives a proper incentive to maintain the quality of the product.

While in the past food quality and safety standards were mainly a responsibility of the state, the last two decades have seen a proliferation of private standards (Hatanaka *et al.*, 2005; Henson and Humphrey, 2010). The introduction of private standards has important implications for the governance of food chains and the inclusion of smallholder farmers. The effects of private standards, however, are not straightforward, and a major debate has appeared in the development studies literature on the impact of private standards on developing countries in general and on smallholder market access in particular.

Why have private companies introduced quality grades and standards that complement or even replaced public standards? Henson and Reardon (2005) discuss three reasons for the introduction of private food quality standards. First, in the case of inadequate public regulation and enforcement, private companies may feel urged to set up their own system of standards, particularly to protect their reputation. As marketing costs make up an increasing part of their total costs, food companies are keen to assure the quality of their products towards consumers. Second, companies may consider public regulations not sufficiently strict, particularly when consumer demands change, and therefore introduce their own standards. Thirdly, companies use private standards in their differentiation strategy. For instance, the first food companies (producers and retailers) that offered fair trade products could position themselves as being more concerned with social responsibility than their competitors.

As the introduction and conformity assessment of standards entails a costly investment, most private standards are not introduced by individual companies but by groups of companies. For instance, the introduction in the late 1990s of EurepGAP (now GlobalGAP) can be explained by the need of major supermarket companies to impose the same quality standards on all their suppliers (Van der Grijp *et al.*, 2005). By making sure that all suppliers comply to the same quality standards, dependency of the buyer on one supplier is prevented and competition among suppliers strengthened. At the same time, the introduction of EurepGAP/GlobalGAP gave supermarkets the lead in pushing for more sustainable production methods, particularly for fresh produce. Developing this system of standards was also a pre-emptive strategy against those suppliers that were trying to set up their own set of standards. Finally, introducing a set of quality standards fits in the strategy of most supermarkets to strengthen the

competitive position of their private label (in-house brand) products. In response to retailers setting up their private quality standards, also agricultural producers and food processing companies have developed their own quality standards.

Another reason for companies to introduce private quality standards is the need for risk management (Henson and Humphrey, 2010). On the one hand, changes in European food law have placed a larger responsibility on the private sector. Companies in the food chain need to show that they have a food safety control system in place, not only for their own operations, but also for the supplies that they purchase. On the other hand, the globalisation of food chains has created new sources of risk as food is subject to more transportation and handling activities. While compliance with public food quality and safety standards is mainly measured within the jurisdiction of the public authorities, food companies operating in global food chains need to control their supply chains beyond the national borders. Private standards, in combination with third-party compliance monitoring, can ease this task of controlling global food chains.

Henson and Humphrey (2009) present a typology of private food quality and safety standards. They distinguish between individual company standards, such as Tesco's Nature's Choice and Carrefour's Filières Qualité, collective national standards, such as the Farm Assured British Beef and Lamb and the QC Emilia Romagna (Italy), and collective international standards, such as GlobalGAP and Marine Stewardship Council. While the initiative for setting up private collective standards was taken by a group of processing or retailing companies, they are often discussed in multi-stakeholder platforms where producers, traders, consumers and NGOs are now jointly deciding on the quality requirements.

### 1.5 From innovation to co-innovation

In this book, quality improvement will be conceptualised as a form of innovation. Improving the quality of products or production processes, changing the quality control system, or even revising the governance structure used for the transactions in the value chain are all elements of an innovation process that has the objective of delivering better food products to consumers.

Innovation is understood as 'an on-going process of learning, searching and exploring, which result in new products, new techniques, new forms of organisation and new markets' (Lundvall, 2010: 8-9). Innovation does not have to refer to a worldwide novelty, but rather to something perceived as new in a particular locality or by particular actors. Especially in a developing country context, the adoption and adaptation of existing knowledge or technologies are most relevant (Aubert, 2005; Pietrobelli and Rabellotti, 2011).

Over the past few decades, thinking on innovation has altered significantly, shifting from the dominance of linear perspectives on technological change towards the wide

acceptance of the innovation systems (IS) perspective. An innovation system is defined as 'a network of organisations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organisation into economic use, together with the institutions and policies that affect their behaviour and performance' (World Bank, 2007b: 18). The IS approach recognises that actors do not innovate in isolation, but depend on extensive interaction with their environment (Fagerberg, 2005).

This book starts from the premise that innovation cannot be understood from a technical perspective alone, as innovations form part of a 'successful combination of hardware, software and orgware' (Smits, 2002: 865). Hardware relates to appropriate technologies, software to knowledge and mind-sets, and orgware to organisational and institutional conditions that influence the development and diffusion of innovations. Such an integral view on innovation recognises the complementarities between technical, organisational and institutional dimensions, and places attention to the interaction among the various stakeholders involved. In the case of food value chains, innovation involves all actors that together form the chain.

The integral perspective leads to the concept of co-innovation, defined as complementary innovations combining different dimensions (technological, organisational and institutional changes) for integrated quality improvement at different levels of the value chain and involving different actors. More specifically, co-innovation has been defined as the combination of collaborative, complementary and coordinated innovation (Bitzer and Bijman, 2015). Collaborative refers to the multi-actor character of the innovation process, where each actor brings in specific knowledge and resources. Complementary indicates the smart combination of technological, organisational and institutional innovation. Coordinated draws attention to the importance of chain-wide adjustments and changes to make innovation in one stage of the chain a success. Most chapters of this book use the co-innovation perspective in exploring and evaluating the different options for quality improvement in African food chains.

Understanding the options for quality improvements as an co-innovation process requires an interdisciplinary perspective in research. 'Interdisciplinarity is defined as collaborative work between scientists, each from different disciplines, each with its own concepts, methods and epistemology, working together on the same research question, mutually influencing each other and needing some shared concepts and methodologies' (INREF, 2010). Interdisciplinary research is more challenging than monodisciplinary studies, as it require learning the 'language' and methods of other disciplines. However, in the end, it may lead to a better understanding of real life problems and generate better solutions, because explanations and solutions from different disciplines are being assessed in an integrated framework.

As quality improvement involves both changes in technology (such as new crop varieties, new sorting machines or new storage facilities) and change in organisation and institutions (such as new contract forms or new quality standards), only an

interdisciplinary perspective can generate the full explanation of the opportunities chain actors may have. Finding the optimal mix of changes given the local context, and implementing the various changes simultaneously requires an analytical framework that integrates different disciplines, ranging from crop sciences, to food technology, to economics, and to other behavioural sciences. Most of the chapters in this book have taken an interdisciplinary perspective, combining insights from social sciences and technical sciences to obtain better explanation and to generate recommendations for improvement.

### 1.6 Outline of the book

The book deals with quality improvements and innovation in various African food chains. In the original research programme 'Co-innovation for Quality in African Food Chains', three countries and three products were chosen: the pineapple value chain in Benin, the potato value chain in Ethiopia, and the tree fruit value chain in South Africa. In the latter case, the programme studied both citrus and deciduous fruit. Each of these value chains is covered in two chapters. In addition, three chapters on food chains in other African countries have been added, because these cases also give good examples of interdisciplinary co-innovation processes towards quality improvement.

Preceding the eight chapters with cases studies, Chapter 2 discusses the different organisational and institutional arrangements that can be found in value chains. Such arrangements are a reflection of the extent of collaboration among the chain partners, but also of the power relations in the chain. The chapter focuses on three often found organisational and institutional arrangements: contract farming arrangements; producer organisations and public private partnerships. While each of these arrangements affects the options for quality improvement individually, they can also be found in combinations.

Chapter 3 explores the key quality issues of the Beninese pineapple sector. As pineapple is being commercialised in three different value chains – for local markets, for neighbouring countries and for Europe – also quality requirements differ. An analysis is made of the constraints and opportunities for improving pineapple quality at production, processing, trading and post-harvest levels. The chapter concludes with recommendations on how various actors in the institutional environment of Benin, such as governmental agencies and NGOs, can contribute to quality improvements of the pineapple sector.

Access to up-to-date information on market prices and quality requirements remains a key issue for smallholder farmers' access to high income markets. The aim of Chapter 4 is to explore the problem of information asymmetry between farmers and buyers in the pineapple supply chain in Benin, and to assess strategies using mobile phones to overcome this problem.

Chapter 5 focusses on the seed potato chain in Ethiopia, distinguishing among three different seed potato systems: the informal system, the alternative system and the formal system. The chapter analyses the performance of seed potato value chains with respect to their ability to supply quality seed tubers to seed potato systems, by using the chain performance drivers enabling environment, technology, market structure, chain coordination, farm management, and inputs.

Chapter 6 deals with ware potato chain. It analyses the extent of quality alignment along the chain, focussing on the varieties that ware potato growers choose. There seems to be a large misalignment between the new potato varieties that have become available from breeding institutes and that have better agronomic quality and the varieties that wholesalers and retailers downstream in the value chain ask for. Thus, ware potato farmers continue to grow traditional varieties that have suboptimal agronomic quality but have high quality for the final consumer.

The recent turn towards the use of private quality standards in global agrifood chains has triggered an intense debate among scholars about the implications for smallholder producers in developing countries wishing to access such chains. Chapter 7 deals with the citrus chain in South Africa, particularly with the question whether smallholders have a chance to participate in export-lead high quality value chains. As the South African government has introduced a number of new institutional arrangements (IAs) between smallholder farmers and established agribusinesses, the chapter discusses these arrangements and the contribution they make to quality improvement and smallholder inclusion.

While Chapter 7 deals with the collaborative arrangements in the value chain needed for smallholder market access, Chapter 8 explores the farm resources that smallholder producers require to participate in high value markets. Using case studies from the Western Cape Province of South Africa, the authors identify resources that smallholder producers in developing countries require to increase competitiveness and sustain participation in high value markets.

Chapter 9 deals with the important role the institutional innovation plays in making quality improvement possible and feasible. The focus is on rural collective action that enables small farmers to participate in newly created export chains. The chapter compares two cases: new apicultural technologies in the North West of Uganda and high value horticulture exports crops in the North of Peru. This chapter seeks to unravel which factors and actors play what roles and how these explain differences in the process of institutional development and in that way to arrive at a better understanding of local institutional change.

Also Chapter 10 deals with how the institutional environment affects the options for quality improvement and market access for smallholder producers in African countries. This chapter looks at the export of shrimp from Benin. Stable market access for shrimps is hindered by the microbiological and chemical characteristics that affect

product quality and safety. In the international market, these quality aspects have legal implications, potentially leading to import bans if safety standards are not met. This chapter examines the quality and legal issues of the Beninese shrimp chain and discusses the responsiveness of the chain to these issues.

High variation in quality is one of the limiting factors for market access, particularly for export markets. Chapter 11 presents a case study of quality measurement of a non-timber forest product, arabic gum. The chapter explores the possibility to understand the current practices of producers in terms of quality supply and to link at least some of the users' quality criteria to production and marketing practices of producers. The study finds that good quality as defined in the field is not always good when measured in laboratory; yet improving quality in the field increases the likelihood of obtaining chemically good gum. Furthermore, determinants of supply by collectors and traders are investigated for two quality attributes namely size and cleanliness of gum nodules. Quality maintenance and improvement is influenced by harvest and post-harvest practices, behaviour and experience of traders, and price expectations.

The final chapter, Chapter 12, presents a discussion of the main findings of the various chapters. It follows the main concepts as introduced in Chapter 1, that is, food chains, interdisciplinary research, and co-innovation.

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