

Review Paper

Understanding the rice value chain in Angola: Constraints, opportunities, and strategy to increase productivity

Chiambo, P. J.,^{1*} Coelho, J. P.,² Soares, F. B.,³ and Salumbo, A.⁴

¹Tropical Knowledge and Management Program, Nova School of Business and Economics at the New University of Lisbon, Portugal.

²Higher Institute of Agronomy, University of Lisbon.

³Nova School of Business and Economics at the New University of Lisbon, Portugal.

⁴Faculty of Agricultural Sciences at José Eduardo dos Santos University, Huambo- Angola.

*Corresponding Author E-mail: paschiambo81@gmail.com

Received 11 March 2020; Accepted 8 April, 2020

This work discusses the issues of value chain management and development in agribusiness. In particular, based on the study of Agriculture in Angola, it analyses and assesses the value chain formation process in the rice sector and the role of the involved stakeholders that increase the product value for consumers through organized cooperation. While it does not coincide with the traditional value chain concept, it describes the full range of activities required to bring a product or service from conception through the different stages of production, distribution to consumers and final disposal after use. For small farms to intensify production in high potential areas, efficient pre- and post-harvest services must contribute to economic growth and reduce poverty. This article is a brief bibliographical review of an introduction to agricultural value chains, written to help small farmers understand how agricultural value chains work. It

provides some examples of agricultural value chains, discusses why farmers must consider themselves part of an agricultural value chain, lists the potential benefits of agricultural value chains, and talks about different strategies for them. Farmers can move on to grow or improve their involvement with agricultural value chains. The difficulties faced by key rice value chain actors in accessing services have been reviewed, showing how incentives for the commercial delivery of services to smallholders differ between staple foods, traditional crops, and high-value product supply chains. The major challenge in providing services to smallholder farmers in Angola concerns the coordination of service development and delivery. Different forms of intermediary institutions to achieve this coordination are also examined.

Keywords: Value chain, rice crop, Angola, small-farmer

INTRODUCTION

Currently, there is a growing interest in the use of value chains in many different fields, in particular in the context of agriculture. The value chain is not an object that can be seen, but it is merely a useful way of understanding how the world of producing, buying and selling things works (Cuddeford, 2014). The analysis of the value chain is essential for understanding the markets, their relationships, the participation of different actors and the critical restrictions that limit the growth of livestock production and, consequently, the competitiveness of

small farmers. Currently, these farmers receive only a tiny fraction of the final value of their output, even though, in theory, the risks and rewards should be shared along the chain (Kajananthan and Achchchthan, 2012). Every person is part of a value chain in one way or another, as producers, consumers of goods and services, processors, retailers or finance providers. The chain stretches from growers to our kitchens (Cuddeford, 2014). According to Chokheli, (2016) at one end of the agricultural value chain are the producers and the farmers

who grow crops and raise animals. At the other end are the consumers who eat, drink, wear and use the final products. And in the middle, there are thousands of men and women and small and large businesses. Each person and each company performs one small step in the chain, and each adds value along the way by growing, buying, selling, processing, transporting, storing, checking, and packaging (Min Z n/d).

In the agricultural chain, banks, governments, and agricultural research play essential roles in supporting the chain by providing loans, establishing laws and policies, and developing ways for farmers to participate more successfully in value chains. Radio stations also have an essential supporting role in providing information about prices, value chain successes, innovations and opportunities for small farmers to be involved in value chains (Keshelashvili, 2018).

Given a large number of smallholders in African agriculture, their integration into global agricultural value chains is of crucial importance. The Food and Agriculture Organization estimates that smallholders supply up to 80% of food in sub-Saharan Africa; therefore, the interactions of smallholders with global value chains are of great interest. Smallholders face many obstacles in accessing global markets, most notably in terms of meeting strict standards of production, but also in ensuring continuous supply (Acosta, 2003). However, smallholder farmers increasingly participate successfully in global value chains through the initiatives of leading firms and entrepreneurs that have included them. Indeed, some supply chains depend heavily on smallholder farmers, according to the nature of the crop in question (like coffee or cocoa). Similarly, as larger farmers integrate with global value chains; formal employment opportunities are created in rural areas, which may have a positive impact on development in the surrounding region (AfricaRice, 2016).

For Angola, in particular, one of the significant constraints to the performance of the agriculture sector is the weak value chain linkages from production, processing, marketing as well as limited extension support. The inclusion of farmers in a value chain would be one of the best opportunities to take advantage of their production and an incentive in increasing production. According to Chiambo *et al.*, (2019) the Angolan small rice farmers still use traditional methods in production, without any innovations, resulting in low yields. It is a fact that the vast majorities of subsistence farmers grow some crops or raise some animals for sale. Even in the most remote areas, many subsistence farmers are connected to markets, and sell small amounts of their produce in local markets or to traders who visit their villages and farms. Cuddeford, (2014) emphasize that value chains are all about human interactions. Moreover, they are about linkages between people and businesses who transfer or exchange products, money, knowledge, and information.

According to FAO, (2016) value chain analysis is particularly useful for new producers including poor producers in poor countries who are trying to enter global markets in a manner that would provide for sustainable income growth. It is also useful as an analytical tool in understanding the policy environment that provides for the efficient allocation of resources within the domestic economy, notwithstanding its primary use as an analytic tool for understanding how firms and countries participate in the global economy. Value chain analysis can explain why the poor may face barriers to trade and how to overcome these barriers (Mitchell *et al.*, 2009).

But what is a value chain, and why is it essential for small farmers, namely for rice growers in Angola?

This paper is a literature review about agricultural value chains and aims at helping small farmers to understand how agricultural value chains work. Gives some examples of agricultural value chains, discusses why the integration of farmers in the value chain is essential and mentions different strategies that farmers can follow to improve or upgrade their involvement in agrarian value chains. Mitchell and Coles, (2009) point out that a systematic literature review is a summary of research that uses explicit methods to perform a thorough literature search and critical appraisal of individual studies to identify valid and applicable evidence. A key feature of systematic reviews is their objective and transparent approach for identifying and weighing both published and unpublished evidence (for the effectiveness of given interventions) while minimizing biases. Following standard systematic review protocols, the methodology consisted of an in-depth review of published and unpublished documents and collection of primary information in the field through focus group discussions.

Historical background and concepts of the value chain

In this section, a brief overview of the development of the value chain concept is performed. It clarifies to what kind of research questions value chain analysis has been applied and how the term value chain is being used. The value chain concept has been used since the beginning of the millennium, primarily by those working in agricultural development in developing countries. Although there is no universally accepted definition of the term, it usually refers to the whole range of goods and services necessary for an agricultural product to move from the farm to the final customer or consumer.

During the last decades, the underlying concept of the value chain was subject to different influences and objectives. The origin of value chain analysis is discussed from two distinct perspectives. One is related to 'filière concept' and the other to Wallerstein concept (Bair, 2005;

FaBe *et al.*, 2009). From both, several frameworks have emerged and have been used to study individual firms, entire industries, industry clusters, as well as global networks. The well-known approaches are Porter's concept of the value chain, Gereffi's global commodity chain, and Humphrey's world economic triangle, the last two included in the idea of the global value chain (VGC) (Gereffi, 1994). The filière concept arises in the 1960s at the *Institut National de la Recherche Agronomique* (INRA). The *Centre Internationale en Recherche Agronomique pour le Développement* (CIRAD) as an analytical tool for empirical agricultural research used to gain a more structured understanding of economic processes within the production and distribution systems for agrarian commodities (FaBe *et al.*, 2009; Lançon *et al.*, 2017).

The filière was thus defined as a set of actors providing specific technical and economic functions in the process of producing and processing goods, from raw material to final product (Lançon *et al.*, 2017).

The Filière concept can be used to analyze the dynamics of integrating agriculture into agrifood and agro-industrial systems, measure the creation and distribution of wealth in these systems, and undertake activities to support the development of technical and organizational innovations (Gereffi, 1994; Kaplinsky and Morris, 2002; Yedan, 2019). Terence Hopkins and Immanuel Wallerstein coined the term Global Commodity Chains (GCC) to indicate a network of labour and production processes whose result is a finished commodity (Korzeniewicz, 1994; Bair, 2005). The GCC was used to describe the relationship between the actors and activities involved in creating goods and services in the global economy. It endeavours to explain the social and organizational structure of the global economy and its dynamics by examining the commodity chains of a specific product or service (Lee, 2017).

In the mid-1980s, Porter developed the concept of the value chain in the context of his work on competitive advantage (Porter, 1985). He developed his idea to analyze specific activities through which companies may create value by breaking down their activities into value-added. Porter distinguished two important value-adding activities of an organization: primary activities (inbound logistics, operations, outbound logistics, marketing, and sales) and support activities (strategic planning, human resource management, technology development, and procurement) (Porter, 1985). Currently and according to Porter (1985), Value Chain describes the full range of activities, which are required to bring a product or service from its conception, through the different phases of production, distribution to consumers, and final disposal after use.

Value chains do not exist in the sense of their having a tangible reality: "they are simply a framework for trying to understand how the world of business works" (Mitchell *et al.*, 2009).

The GTZ, in its "Value Links" Manuals, considers the value chain as the full range of parties involved, including all the stakeholders from producers, processors, dealers, distributors, wholesalers, retailers of a given product (Heinze, 2007; GTZ, 2007). These stakeholders are linked by a series of trade relations that ensure the movement of the product from the primary producers to the final consumers (GTZ, 2007). They are about links between people and businesses who transfer or exchange products, money, knowledge, and information. As the product moves from one player to another, it is assumed to gain value (Hellin and Meijer, 2006; GTZ, 2007). According to this point of view, the value chain takes the form of a series of links.

Value Chain Analysis (VCA) consists of the study of the structure and dynamics of the VC to draw up a strategy or an approach to the VC development, implements procedures to meet the constraints and/or to benefit from opportunities at multiple levels of the VC (Dekker, 2003; Zamora, 2016). Value chains work best when their actors cooperate to produce higher-quality products and generate more income for all participants along the chain. Value chains differ from supply chains, which refer to logistics: the transport, storage and procedural steps for getting a product from its production site to the consumer (Norton, 2014). All the approaches mentioned describe production and consumption in terms of a chain linking together different activities and agents. The purpose of this article is not to judge which method is most relevant but to examine these concepts, which over time have become a framework for analyzing the strategic choices made by companies, public authorities, and farmers' associations.

VCA4 Development methodology

Several techniques are available, usually starting with qualitative research like supply chain mapping or surveying the industry. There are also network models for in-depth analysis of supply chains (Beamon, 1998; Bode, 2007; Brusset and Teller, 2017). Since value chain analysis is a systematic approach, it is crucial to conduct a scoping study before initiating VCA for mapping and analyzing the whole chain, including stakeholders and aspects of the legal and regulatory environment. For VCA both qualitative and quantitative methodologies can be employed depending on the scope, scale, and purpose of research. The IFAD¹ (2016) developed a VC development methodology consisting of the following four stages:

¹ International Fund For Agricultural Development

- (i) Understanding the current state of the whole chain.
- (ii) Mapping the current state and understanding the bottlenecks, and opportunities across the chain.
- (iii) Developing a future state vision/Mapping the next chain.
- (iv) Developing an action plan for a future goal.

In every case, Michel *et al.* (2009) indicated that the goal of the methodology is to provide decision-makers with a set of information that relates to sustainable development strategies. This is done by producing evidence-based elements (supported by indicators measured quantitatively or based on expert assessments). On the other hand, the methodology to be used in the development of value chains should allow answering the framing questions presented below:

- (i) What is the contribution of the VC to economic growth?
- (ii) Is this economic growth inclusive?
- (iii) Is VC socially sustainable?
- (iv) Is the VC environmentally sustainable?

Within this scenario, the framing questions (FQ) and the core questions (CQ) can be presented as in (Table 1). Another methodology consists of using questionnaires/interviews to identify the key actors in the value chain in the area. The objective is to find out the key factors influencing the chain by typifying the strengths and weaknesses of each value chain actor and discover the opportunities and threats of each value chain actor. Additional suggestions can also be made for strengthening the sector along the line of socioeconomic benefits (Kajanathan and Achchchthan, 2012).

Foreign experience of VCA applied to rice crop

This section reports on rice value chain analysis projects that are implemented in several African countries such as Nigeria, Mali, and Tanzania and can serve as a model for many developing countries that have enormous potential for rice production such as Angola.

Nigeria rice value chain

Many analysts agree that a significant constraint in realizing self-sufficiency in rice production for export in Nigeria is the lack of functional irrigation. Currently, rain-fed upland and lowland rice account for about 77 per cent of the total production and are cropped between May and October in the South and between June to October in the North. Rain-fed rice production allows for only one planting per year and increases the farmer's risk as he is dependent on unpredictable rainfall patterns (Africa Division, 2008). Another constraint is the inability of farmers to process their produce. This procedure results

in low sales and leaves most of the winnings to those who buy, process and sell to others within the value chain. However, these problems were seen as an opportunity for innovation in the rice production chain (Donovan and Gelli, 2019). To reduce dependence on imported rice, and simultaneously develop the local rice industry, as well as to improve the process of adopting wide yielding varieties to increase rice productivity levels, Nigeria has taken several innovative development measures. Some include the African Rice Initiative (ARI), which aims to promote the dissemination of high yielding varieties and taking better advantage of irrigated areas (Hall *et al.*, 2001; Leeuwis, 2004; Hounkonnou *et al.*, 2012). The government controls rice imports and imposed a 10 per cent tax on rice imports to create a fund dedicated to the development of the local rice industry, including processing and marketing. The Nigerian government, recognizing the potential of irrigated agriculture, has invested in the use of improved technologies to further expand rice production (IFAD, 2016).

Tanzania rice value chain

Nkuba *et al.* (2016) conducted a study on rice value chain analysis in Tanzania to provide rice actors with knowledge of the rice value chain and identify viable improvement strategies. The study identified key rice value chain actors at micro, meso and macro-levels (Figure 1). At the micro-level, the key actors were input suppliers (mainly of fertilizers, herbicides, seeds, and implements), producers (small, medium and large farmers), collectors, processors, distributors (transporters, traders and wholesalers), retailers and consumers. Most of the actors at the micro and meso levels were operating in isolation and scattered, with minimal linkage mechanisms between them and having limited business skills and a shortage of capital. At the macro-level, the rice value chain was supported by local government authorities, central government and providers of utilities such as electricity, roads, irrigation infrastructures, and storages facilities. In the vision of the authors, is still needed a robust investment in pre and post-harvest activities to attain a reliable, competitive rice value chain.

Mali rice value chain

In Mali, numerous reforms have been implemented in rice production in irrigated areas. Namely increasing the liberalization of rice production and marketing by reducing the role of the state and giving more power to the private sector to reduce the country's dependence on imports (Africa Division, 2008; Dordrecht *et al.*, 2017). The program was funded by the European Union through

Table 1. Framing and core questions.

Economic Analysis	Social Analysis	Environmental Analysis
FQ1. What is the contribution of the VC to economic growth?	FQ3. Is VC socially sustainable?	FQ4. Is the VC environmentally sustainable?
CQ1.1. Are the VC activities profitable for the entities involved?	CQ3.1. Are working conditions throughout the VC socially acceptable and sustainable?	CQ4.1. What is the potential impact of the VC on resource depletion?
CQ1.2. What is the contribution of the VC to the GDP?	CQ3.2. Are our land and water rights socially acceptable and sustainable?	CQ4.2. What is the potential impact of VC on ecosystem quality?
CQ1.3. What is the contribution of the VC to the agriculture sector GDP?	CQ3.3. Is gender equality throughout the VC acknowledged, accepted and enhanced?	CQ4.3. What is the potential impact of the VC on human health?
CQ1.4. What is the contribution of the VC to public finance?	CQ3.4. Are food and nutrition conditions acceptable and secure?	
CQ1.5. What is the contribution of the VC to the balance of trade?	CQ3.5. Is social capital enhanced and equitably distributed throughout the VC?	
CQ1.6. Is the VC viable in the international economy?	CQ3.6. To what extent are major social infrastructures and services acceptable? Do the VC operations contribute to their improvement?	
FQ2. Is this economic growth inclusive?		
CQ2.1. How is income distributed across actors of the VC?		
CQ2.2. What is the impact of the governance systems on income distribution?		
CQ2.3. How is employment distributed across the VC?		

Source: Adapted from (Michel *et al.*, 2009)

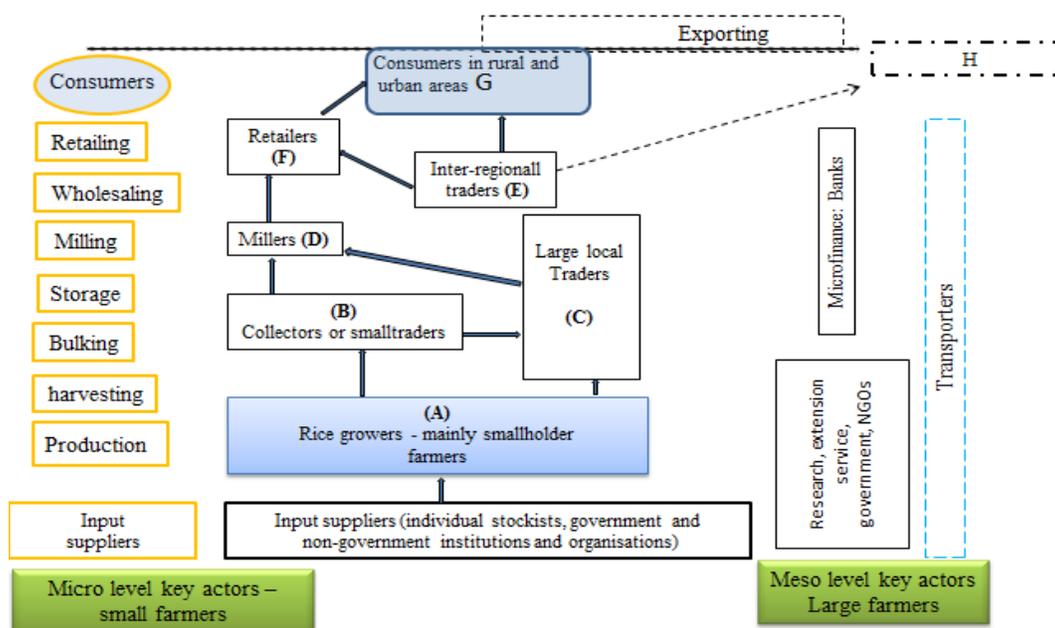


Figure 1. Rice subsector functions and participants in Tanzania. Source: Adapted from (Nkuba *et al.*, 2016).

bilateral cooperation and the methodological framework for the analysis was developed by the European Commission. It aimed at understanding to what extent the value chain allows for inclusive growth and whether it is both socially and environmentally sustainable (Michel and Coles, 2011). The rice value chain in Mali contributes significantly to social and economic growth and is fairly

inclusive. Twenty per cent of farms grow rice, with more than 5 million Malians, (about a third of the population) directly involved in rice production.² Figure 1 clearly shows the importance of the value chain to provide jobs.

² www.agrinatura-eu.eu

All actors in the value chain consider that the distribution of value added is (Michel *et al.*, 2009) 'reasonably' fair and balanced. The emerging paradigm of sustainable agricultural development and food security is based on the concept of innovation as a social process that takes place in a social system, involving not only research organizations but also other non-research related bodies and tasks (Klerkx *et al.*, 2010; Kilelu *et al.*, 2013). By definition and according to Hall *et al.*, (2001); Clark *et al.* (2003) an innovative system is one that involves all major social actors, affecting the production, distribution of technical and institutional knowledge over time. The innovative system also includes interactive learning that occurs when an organization engages in the production, distribution, adaptation, and use of new experience; as well as institutions (norms, rules) that govern this interaction (Walts *et al.*, 2006). By coherence, the links that constitute a rice innovation system explain the fact that rice production is a process that occurs throughout the entire commodity chain with the involvement of different actors in each stage of production (Walts *et al.*, 2006; Erenstein *et al.*, 2004).

However, the innovative force of the whole process is a function of interaction, bonds, alliance and flow of knowledge. According to Zamora, (2016) rightly pointed out that technical change and innovations have become much more interactive processes that can be guided by many different types of actors. Rice's innovation system encompasses all actors, their interactions, and the political environment (IFAD, 2018). It tends to go beyond knowledge creation to address factors that affect the demand and use of knowledge in useful ways. Innovative performance depends not only on how the individual/actors act in isolation but also on how they interact with each other as part of a collective system of knowledge creation and use, e.g. the enabling environment that encourages continuous learning (World Bank, 2006).

Angola rice value chain

In PND³ (2018-2022), PDMPA⁴ (2018-2022) and PRODESI⁵ (2018) rice is considered by the government as a strategic food crop for strengthening food and nutritional security and import substitution (MINAGRIF, 2018). The provinces with a relatively high potential for rice cultivation are Lunda Sul, Cuando Cubango, Moxíco, Uíge, Malange, Bié and Huambo as shown in (Figure 2) (GSA, 2018; Chiambo *et al.*, 2019).

³ National Development Plan

⁴ Medium-Term Development Programme for the Agricultural Sector

⁵ Program to Support National Production, Diversification and Import Substitution

Rice production areas visited in Angola

Five rice production areas were visited during the assignment, namely Huambo, Bié, Moxico, Cuando Cubango, and Malange. Two of these represented areas where JICA is actively trying to introduce and promote rice cultivation. Along this route, we had a conversation with the head of the agriculture departments and potential rice producers. Data on constraints present in the rice value chain, in general, was obtained and at the same time opportunities to improve the value chain in all aspects were explored. The following is a general description of the rice sector in the visited localities.

Huambo

In Huambo, about 97% of local farmers work in small plots. The rice crop is residual and circumscribed to some villages where it is made in small blocks irrigated through ditches. The province has favourable climatic characteristics. Although the region does not have any massive irrigation scheme, it has a high potential in water resources. The farmers are very motivated, although they have little knowledge about the crop. However, care must be taken to address the issues of low fertility of soils and cold periods that may damage the plants.

Moxico

The Moxico region was one of the largest producers of rice within the colonial era (1961-1971) with an average production of 27,000 tons/year and a yield of 1.5 tons/ha. The production was both in small and large scale farms. Production over 5 recent years (2010-2015) is reported in (Table 2). There are 242 farmers' associations and 10 cooperatives in the province, some of which produce rice. Recently there are also plans to invite 4 private companies to grow rice in plots of 500 ha/each. The two companies have already tested the variety IRGA 424, bred in Brazil, which performed well. The region has excellent potential for rice cultivation (sufficient rain-fall and fertile soils), and its expansion is mainly limited by the lack of processing units. However, the province continues to discuss the invitation to companies to produce rice on a large scale, and the small farmers maintain interest in expanding the area of cultivation.

Quando Cubango

In Cuando Cubango, most areas are rain-fed, depending on the rainfall of 700-800⁶ mm on the western side of the

⁶ <https://pt.climate-data.org/africa/angola/cuando-cubango-1447/>

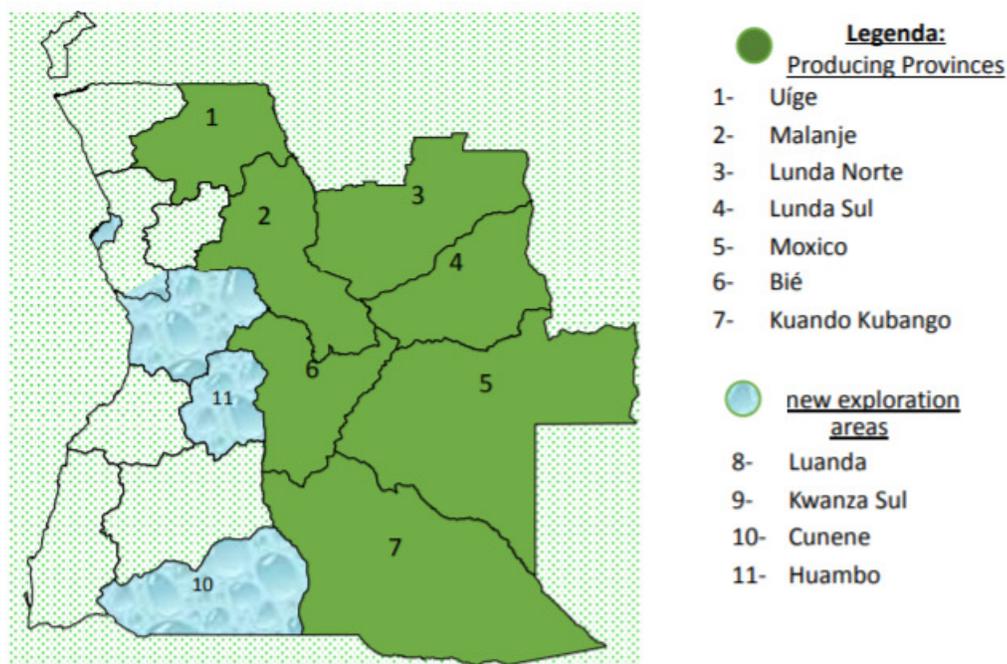


Figure 2. Map of potential producing provinces of rice. Source: GSA, (2018).

Table 2. Production of rice over 5 recent years in Moxico province.

Year	Area (ha)	Production (tons)
2010/2011	9000	7200
2011/2012	6530	5224
2012/2013	3008	2406
2013/2014	7462	5970
2014/2015	8432	6745

Source: MINAGRIF (2018).

region. The total cultivated area is about 1,600 ha, but a company with Chinese investment in Longa explores 1,300 ha of rice. The province does not have large-scale irrigation systems. Agricultural areas are located in the western part of the region because the southeastern part is dry and the soils have low fertility. The company of Longa is one of the largest producers of rice. Small-scale rice production is currently limited, but there is great potential in an area of approximately 2,000 ha in Cuchi on the low-lying floodplain near the Canona River. The IAD/EDAs teams are highly motivated to convince small farmers to introduce rice cultivation in this area if seeds and fertilizers are provided.

Malanje

Malange has excellent characteristics for rice production, especially in the Northeast part, where there are vast

tracts of lowland that can be flooded during the rainy season and where ferralic and psamo-ferralic soils are predominant. The altitude is between 1000-1250 m, with precipitation between 1800-1900 mm and average annual temperatures of 21-22°C. The provincial government has allocated a reserve of about 30,000ha for rice cultivation and seeks to attract entrepreneurial farmers. At present rice production is practised only by family farmers, who use local seeds and those distributed by IAD⁷ (mainly Chimbissa, Siam, California and Senta varieties). Irrigation systems are depleted, cultivation is done in lowland (chanas) by taking advantage of the floods in the rainy season. The sowing is done by the broadcasting method, and the seeds have a considerable degree of mixture. Farmers make fallows and neither apply fertilizers nor phytosanitary treatments, and

⁷ Agrarian Development Institute

nevertheless, they can obtain yields of around 2 tons/ha. The main obstacle to the expansion of this crop beyond the phytotechnical issues is processing. Access roads are still under rehabilitation, challenging to use, and there are no milling facilities nearby. The manual husking (with the pestle) is painful and time-consuming, and thus the milled rice serves almost exclusively for local consumption. In contrast, the rice consumed in the capital of the province and other areas is imported.

A Chinese company in a non-traditional rice growing area (Sunginge Field) tested 12 varieties and obtained 6tons/ha in a total area of 180 ha. However, the lack of milling in the region forced them to transport the production to Luanda where it is processed. The rice they produce is also consumed by the workers of the company.

There is a private company which is setting up a processing centre on the outskirts of the city of Malanje, and intends to buy rice from individual producers (mainly small-scale producers) process and market and also want to recover irrigation systems and repair access roads. Together with the use of suitable technological packages and the installation of Processing Centers near the production sites, the province has enormous potential as a rice-producing region. As a first step, the focus should be on small family producers who are highly motivated. This will take advantage of their productive potential and increase their incomes, which will undoubtedly result in an improvement of their living conditions.

Intending to turn subsistence agriculture into a commercial one in sustainable and market-oriented agriculture, the Government of Angola decided to give high priority to the production of cereals, focusing mainly on rice production. This strategy aims to achieve food security and meet the needs of the national agro-industries as part of the process of economic diversification, namely by using the country's marshlands where, with adequate investment in irrigation infrastructure, the crop is capable of yielding up to 7 tons/ha (MINAGRIF, 2018).

Angola strategic plan for 2018-2022 is to increase area and productivity. Its main objectives are: to increase rice production to 45,000 tons; to reach an average yield of 2.5 tons/ha; to supply 4,500 tons of fertilizer for rice cultivation; to select two varieties per eco-system; to make available to farmers 1.7 tons of improved seeds by 2022 (MINAGRIF, 2018). Table 3 shows the projection of rice consumption needs for a five-year horizon (2018-2022), assuming a population growth rate of 2.7% (INE⁸, 2014) and a per capita consumption of 40 kg/ person/year (NRDS, 2018).

Although there is a need for increasing production, it is known that in an increasingly globalized and competitive economic environment, agriculture should not only be

limited to increasing productivity *per se*. Continuous, sustained and coordinated monitoring of each stage of the value chain is required to improve product quality and reach a satisfactory income level for producers (Erenstein *et al.*, 2004). The role of the farmer is the most important, as, in most cases, he is not able to sell his products at rewarding prices, because the quality of the grain does not meet the requirements of the market compared to imported rice, which is the preference of most consumers. A study on the entire rice value chain is necessary to ensure profitability and sustainability for the farmers and all the other actors in the chain (Stockbridge *et al.*, 2003).

As presented by Kajanathan and Achchuthan, (2012) Value Chain analysis is essential to an understanding of markets, their relationships, the participation of different actors, and the critical constraints that limit the growth of livestock production and consequently the competitiveness of smallholder farmers.

These farmers currently receive only a small fraction of the ultimate value of their output, even if, in theory, risk and rewards should be shared down the chain.

Constraints and opportunities in the rice value chain in Angola

The value chain for rice is divided into three primary components: production, processing, and marketing, with various links between them, mostly associated with transport. In the visited areas, the rice value chain is very fragmented, and there is no follow-up in its horizontal and vertical coordination.

As referred to by Gulati *et al.*, (2007) and Mitchell and Coles, (2011), vertical coordination refers to the synchronization of successive stages of production and marketing concerning the quantity and quality. While horizontal coordination is the process of creating closer relationships, formal or informal, among actors within a functional node of a value chain. Several studies like (Stockbridge *et al.*, 2003) argue that the farmer organization can combine horizontal coordination with vertical coordination in the supply chain by adopting farmer cooperation and that contract farming can work better. The main restrictions faced by the key actors in the rice value chains visited in this study are described below.

Constraints in input supply

There is no natural link between input suppliers and farmers, resulting in inadequate capital circulation. Most roads and rail infrastructure on the central plateau were built during the colonial period, and only limited improvements were made. As a result, most support in the region is reduced in coverage and unreliable.

⁸ National Statistics Institute

Table 3. Projection of rice production, population, needs, and imports.

Year	Production (ton.)	Population (hab.)	A necessity for consumption (ton.)	Import needs (ton.)
2018	29,733	27 135 263	485, 120	455, 387
2019	32,707	28 027 742	498, 218	465, 511
2020	35,977	28 949 574	511, 670	475, 693
2021	39,575	29 902 015	525, 485	485, 910
2022	43,533	30 885 721	539, 673	494, 140

Source: Adapted from NDP¹, 2017

The constraint in production

The cultivated areas are small, and production is mainly for family consumption, the remaining rice being sold in the husk or kept to serve as the payment for workers in the next agricultural season. The prices practiced are quite low, and in many cases, there is no bond with the buyers. Frequently, they are not motivated to produce rice due to the lack of adequate processing machines to obtain quality grain. Although IAD is present in the region and has been reported as one of the key actors in the rice value chain, its team focuses on fertilizer and seed distribution, leaving the rest of the operations unattended. There is the MOSAP⁹ II project, but it focuses mostly on the post-harvest delivery and marketing aspects, leaving out production. Other restrictions at the farmer level include limited access and high financial costs, small farm size, low levels of farmer organization, low incomes, and high cost of agricultural inputs, minimal input use and minimal access to extension services on the farm. Factors affecting yields include the use of rudimentary tools and equipment (e.g. hand hoe); lack of agronomic knowledge by farmers; and incidence of pests, weeds, worms, and diseases. Some areas are affected by soil exhaustion, due to previously over-cultivation of land.

The constraints in processing

Existing mills are of the traditional type, which only processes rice for the consumption of the farmer and his family. The processed rice is of poor quality, and the storage facilities do not provide adequate storage conditions. In most cases, the processors are the farmers themselves.

Constraints in consumption

Consumer's preferences are not known by the farmers.

Opportunities for the rice value chain in Angola

The constraints, as mentioned earlier, may also be seen

as prospective opportunities for chain improvement. From this perspective, we highlight:

Input supplying

Improvement in infrastructures and roads will increase the number of people interested in rice production and will concurrently facilitate access to credit.

Production

Increased importance of rice as a staple food in rural and urban areas; improvement of technology, research and extension services, roads and other media.

Processing

Government willingness to support farmers with processing machines will contribute to a motivational increase in rice cultivation by farmers.

Consumption

Change in eating habits that may increase the population income.

DISCUSSION

Actions to improve the rice value chain

According to (MINAGRIF, 2018), the profitability of rice production is essential to establish the right channel from the field to the consumers. The production outlets should be able to minimize post-harvest losses, stabilize the price of rice, and provide the conditions to create a favourable environment for processing and marketing. The following are suggested actions needed to improve the rice value chain.

Post-harvest technology

Research and extension programs for post-harvest

⁹ Family Agriculture Development and Marketing Project

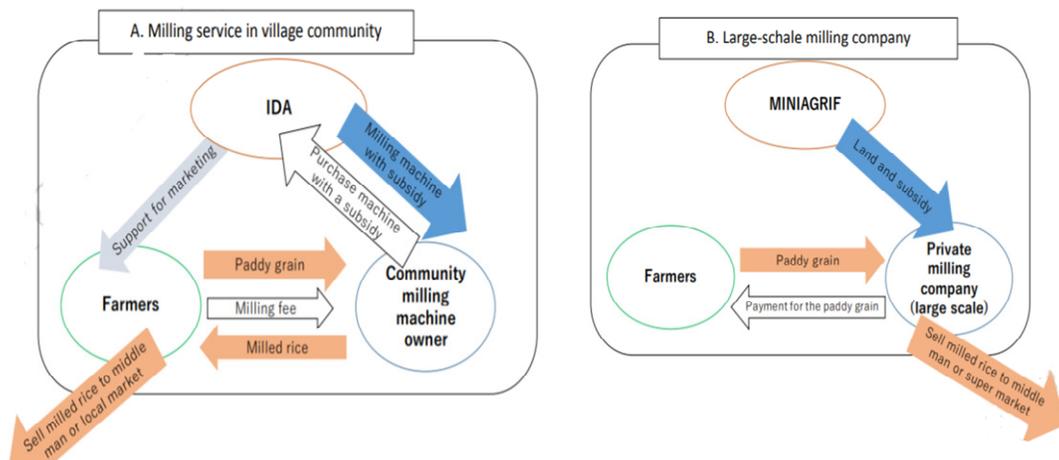


Figure 3A and B. Flow of grain and money in post-harvest processing. Source, NRDS, (2018).

technology, such as threshing, drying, storage, husking, milling, and packaging, should be carried out practically and appropriately taking into account the production costs for small farmers. Manual post-harvest processing of rice is laborious and time-consuming. It is one of the main limiting factors to the expansion of rice cultivation, especially in rural communities. The Government, through MINAGRIF/IAD, should provide facilities for private companies to acquire and install industrial processing centres, and to provide subsidized credit service to small-scale farmers in a policy similar to that adopted for the distribution of maize mills. The private owners (Figure 3 A and B) of the processing units should establish production contracts and guarantee the technical assistance to producers during the crop season. This means providing the appropriate technological packages for the production and harvesting of rice and buying it from the producer (individual or associated). The company purchasing the rice will then be responsible for processing and sales in both the internal and external markets. If the farmers do not have money to pay for the milling, they should be allowed to pay with rice grain in the same way as it happens with maize in some regions. Similar actions were implemented in countries such as Niger, Mali, and Nigeria, with numerous positive impacts (Africa Division, 2008) in terms of:

- (i) Increased production and yields.
- (ii) Increased producer prices and linkage of producer prices to global market prices.
- (iii) Increased consumer prices.
- (iv) Greater competition within the sector due to an increased number of actors.
- (v) Greater private investment.
- (vi) Increased number of actors in the value chain, including numerous traders and collectors, and the

emergence of small village mills which currently account for the vast majority of rice milling in the country.

The other component in the value chain project design is the value chain map, represented by step four in (Figure 4). A value chain map graphically illustrates all the parts, and relationships between them, it is a visual tool that helps us understand how a particular industry works. Value chain maps demonstrate how a product in an enterprise moves from raw material through production, processing, and other steps until it eventually reaches the consumer. The map highlights the range of activities that occur within the value chain. It also outlines the transformation steps or functions, actors, relationships, and support services. The level of detail in a value chain map can vary, ranging from noting the essentials to highly comprehensive components (Poulton *et al.*, 2009).

Value chain management

Strategy to develop the rice value chain in Angola

Rice cultivation in Angola is in a re-launch phase. Rice varieties and technologies used to go back to colonial times and have low productivity and reduced expansion in the country. In practice, the re-launch of rice cultivation will be a pioneering activity in which the Government should play a central role as a catalyst. It includes the burden of dynamising and structuring the whole value chain for this crop, particularly in guaranteeing the quantity and quality of seeds, research, dissemination, technological packages, rehabilitation of roads and irrigation infrastructures, processing and stimulation of commercialization/distribution circuits, as well as strengthening and supporting private initiatives in this sector. The low supply of domestically produced rice,



Figure 4. Value chain map. Source: www.value-chains.org.



Figure 5. Rice production in Kamacupa, Arrozal farm.

which is currently complemented by imports, makes the cultivation of this cereal a priority for the country's food security policy, especially in terms of nutritional and import substitution issues. The country's agricultural and irrigation potential coupled with strong domestic and regional demand turns rice cultivation into an attractive and promising business capable of generating income and employment. In the current context according to rice

needs and potential, the key strategies for the development of the crop in Angola should focus on: (1) seeds; (2) fertilizers; (3) irrigation; (4) pests and disease control; (5) expansion of rice cultivation area; (6) development of the value chain; (7) research and extension capacity.

Additionally, it is essential to improve farmer access to inputs, particularly fertilizer, because in general, much of



Figure 6A. Rice packed in a 15 kg bag. **Figure 6B.** Rice stored on wooden, pallets.



Figure 7. Kamacupa rice marketing circuit.

the fertilizer supply chain is poorly organized, leading to high prices and sub-optimal availability both in terms of quality and volume. Fertilizer procurement practices are particularly poor, leading to unavailability at critical times and high prices. Producer organizations need to be coached to enable them to become smart purchasers of inputs, and agro-input dealer networks need to be enlarged. Agro dealers need to be trained to supply information to farmers in a professional manner.

A critical credit line should be dedicated to the purchase of motor pumps to ensure that farmers can successfully adopt small-scale irrigated systems, to avoid

the increasingly uncertain rainfall. Improving rice quality and informing the Angolan consumers about the benefits and strengths of the condition of domestic rice is also crucial because in most cases, many Angolans are becoming rice consumers. Still, they are not yet conscious of the value of domestic rice. This information campaign has to go hand-in-hand with efforts to ensure that local rice is of good quality and therefore competitive vis-à-vis the imported one.

One strategy that seems to be to support and continue is to promote greater interconnection between companies and family producers. A case we studied in Kamacupa

gives us an idea of the type of relationships and impacts that can result as reported in the following section.

The rice value chain manage at the business level

Business sector

Unlike the traditional sector, which implements less sophisticated techniques because of the lack of investments in terms of production factors in quantity and quality appropriate for rice cultivation, the business sector grows considerably. The Kamacupa rice farm in Bié Province, in 2018 developed its industrial project in an area of 1,800 hectares with a production of 12,000 tons of paddy rice which response to the requests of consumers from different regions of the country (Figure 5). The business sector has a complete production chain where all actors interested in the production process are engaged. The company has drying equipment with a capacity of 90 tonnes, 4,000 tons for storage and a debarking unit with a production of five tonnes per hour (5 tons/ha) which represent a global investment around the US \$10 million also can bag, pack and put rice on the commercial circuit. All rice produced is processed and marketed. Rice is packed in bags of 15, 30, 50 and 75 kg, respectively, and stored on wooden pallets (Figure 6 B) to avoid contamination caused by the influence of moisture. Rice produced by the local business sector accounts for 25% of the cracks (Figure 6 A) after processing it mean that is slightly damaged during the transformation process. Rice cracker is the grain fragment whose length is less than three quarters of the average length of the typical grains of the variety (Narcisio, 2015). According to Garcia (2017), the percentage of cracks (broken and defective grains during husking) are factors that determine the quality of the product on the market.

Distribution chain

The Benguela railway (CFB) that passes through the Municipality has served as a vehicle for transporting rice to the East and South of the country, where large commercial areas promote the product outside the border of Angola such as the Democratic Republic Congo (DRC), Zambia and Namibia by national wholesalers (Figure 7). Kamacupa rice has been the preference of Angolans and expatriates, especially those of advanced age for the taste and smells it offers.

Social impact of the project

As a result of the armed conflict that devastated the region, young workers on the farm have low levels of education. This situation led to farm management to teach professional courses in the handling of tractors, hulling machines and other equipment. It also provided seed support to associated farmers in the region.

The impact of the business sector on the traditional sector

The investment made by the business sector in the production of rice has served as a stimulus for all rice producers around the farm since with the assembly of the rice hulling unit it has enabled traditional farmers to sell their product in the business sector under more competitive conditions. According to the Farm Administrator, they built the factory intending to expand the farm's production area to over 1,800 hectares, counting with the spaces of traditional farmers spread over several locations of Kamacupa that have the support of the enterprise for the processing of their rice harvested. The machine can process six tons of rice per hour. It is an investment of 1,500 dollars (310 thousand kwanzas).

CONCLUSION

The present review allowed us to conclude that:

- (i) Although there is no concrete definition of the value chain, the common consensus among the various authors is that it comprises the full range of activities necessary to bring a product or service from its conception, through the different stages of production, distribution to consumers and final disposal after use.
- (ii) Family farming in Angola is mainly focused on self-consumption. It is not because there is no desire to make it more extensive and achieve commercialization; local production is not competitive in the market. Among the several reasons that explain this fact, one of them is the lack of technical support and the assurance of farmers by the institutions responsible for facilitating productive factors and integrating the farmer into an adequate bank financing scheme that would allow him to gain motivation in producing more adding value to his product. The rice value chain in Angola is quite fragmented because the producer is unable to continue with post-harvest activities due to the lack of equipment that allows the product to be adequately processed so that it has a quality grain that can satisfy consumer expectations.
- (iii) Research has shown us that the related problem is solved by integrating the rice producer into a functional value chain into one where there is a good partnership relationship between the business sector and the traditional sector.
- (iv) The availability of processing equipment and facilities for transporting the product from the field to urban centres would serve as a motivational channel for the farmer to produce in quantity and quality. Therefore, post-harvest investment in the rice sector in Angola would serve as a basis to deliver at the level corresponding to the natural resources that the country has for this crop.
- (v) The market would be an incentive not only to increase

production but also to improve its quality, since domestic production will have to be competitive, with imported rice. The experience of other developing countries' projects could be inspiring for a profitable rice production expansion area in the country.

(vi) The use of means of communication and dissemination at various levels (national, provincial, municipal, etc.) is of great importance. The use of such means would increase the effectiveness of catapulting rice cultivation to the highest levels in the country's cereal production and attract investors, donors and the interest in international institutions.

Authors' declaration

We declared that this study is an original research by our research team and we agree to publish it in the journal.

REFERENCES

- Acosta A (2003). Institutional learning and change: An introduction: A discussion paper. ISNAR. The Netherlands.
- Africa Division (2008). Study of the Domestic Rice Value Chains in the Niger Basin of Mali, Niger, and Nigeria, West Africa. IFDC (An International Center for Soil Fertility and Agricultural Development).
- AfricaRice (2016). Annual Report 2015: Investing in rice research and innovation for Africa. Abidjan, Côte d'Ivoire: p. 32.
- Bair J (2005). Global Commodity Chains. Genealogy and Review. Paris.
- Bode C (2007). An empirical investigation into supply chain vulnerability, 12 (2006),301–312. <https://DOI.org/10.1016/j.pursup.2007.01.004>
- Brusset X, Teller C (2017). Supply chain capabilities, risks, and resilience. Intern. Journal of Production Economics, 184(September 2016):59–68. <https://DOI.org/10.1016/j.ijpe.2016.09.008>
- Clark N, Hall A, Sulaimain R, Naik G (2003). Research as a capacity building: The case of an NGO facilitated a post-harvest innovation system for the Himalayan hills. World Development, 31(11), 1845–1863.
- Chiambo PJ, Coelho JP, Soares FB, Salumbo A, Lima A (2019). Angola: Rice Crop Grow and Food Security Reinforcement. J Rice Res 7: 205. DOI:10.4172/2375-4338.1000205.
- Chokheli E (2016). The impact of the competitive strategy on the success of wine companies (The Case of Georgia), Proceedings of 24th international academic conference, International Institute of Social and Economic Sciences, Barcelona.
- Cuddeford V (2014). An introduction to agricultural value chains. In: <https://idl-bnc-idrc.dspacedirect.org › IDL-52685>. Accessed in December 2019.
- Dekker H (2003). Value Chain Analysis in inter-firm relationships: a field study, Management Accounting Research Vol 14(1):1-23.
- Donovan J, Gelli A (2019). Designing interventions in local value chains for improved health and nutrition: Insights from Malawi. Journal homepage: www.elsevier.com/locate/wdp.
- Dordrecht M, Michel B, Boureima F, Goita M (2017). Value Chain Analysis for Development in Mali. In: www.agrinatura-eu.eu. Accessed in November 2019.
- Erenstein O, Frederic L, Olu O and Mohamed K (2004). Operationalizing the strategic. Framework for the rice sector revitalization in Nigeria, WARDA. 2004.
- FAO (2016). Market and Value Chain Analysis of selected sector. Economic Forum. In: www.fao.org. Accessed in February 2020.
- Faße A, Grote U, Winter E (2009). Value Chain analysis Methodologies in the context of environment and trade research, Diskussionsbeitrag, No. 429,
- Garcia M (2017). Influência de diferentes variedades de arroz carolino no seu comportamento em cozedura. Coimbra. Portugal.
- Gereffi G (1994). The organization of buyer-driven global commodity chains: how the U.S. Retailers shape overseas production networks. In G. Gereffi and M. German Technical Cooperation (GTZ) (2007). ValueLinks manual: The methodology of value chain promotion. (1st ed.). Eschborn: GTZ.
- GSA (2018). Food Security Office. Producing provinces of rice. Angola.
- Gulati A, Minot N, Delgado C, Bora S (2007). Growth in high-value agriculture in Asia and the emergence of vertical links with farmers. CABI Publishing, pp. 91–108.
- Hall A, Beckett G, Sivamohan MVK, Clark N, Taylor S (2001). Why research partnerships matter: Innovation theory, institutional arrangements and implications for developing new technologies for the poor. Journal of World Development, 29(5):783-797.
- Hellin J, Meijer M (2006). Guidelines for Value Chain Analysis. Food and Agriculture Organization of the United Nations (FAO), Rome, Italy.
- Heinze A (2007). ValueLinks Manual. GTZ / Springer.
- Hounkonnou D, Kossou D, Thomas W, Leeuwis C, Nederlof ES, Niels R, Owuraku SD, Mamoudou T, Arnold H (2012). An innovation systems approach to institutional change: Smallholder development in West Africa. In: Journal homepage: www.elsevier.com/locate/agsy. Doi:10.1016/j.agsy.2012.01.007.
- International Fund For Agricultural Development (IFAD) (2016). How to do commodity value chain development projects. Sustainable inclusion of smallholders in agricultural value chains. Guinea - The National Programme to Support Agricultural Value Chain Actors.
- Kaplinsky R, Morris M, (2002). Handbook for Value Chain research. IDRC. <http://www.ids.ac.uk/ids/global/pdfs/VchNov01.pdf> (accessed: November 2007).
- Kajananthan R, Achchthan S (2012). A Study on Value Chain Analysis in Paddy Sector: Particular Reference to Kilinochchi District, Srilanka. Global Journal of Management and Business Research Volume 12, Issue 18, Version 1.0.
- Keshelashvili G (2018). Value Chain Management in Agribusiness. International Journal of Business and Management, Vol. VI(2), pp. 59-77., 10.20472/BM.2018.6.2.004.
- Kilelu C, Klerks L, Leeuwis C (2013). Unravelling the role of innovation platforms in supporting co-evolution of innovation: Contributions and tensions in a smallholder dairy development program. In Agricultural Systems pp. 65–77.
- Klerks L, Aarts N, Leeuwis C (2010). Adaptive management in agricultural innovation systems: the interactions between innovation networks and their environment Agr. Syst, 103, pp. 390-400.
- Korzeniewicz K (1994). Commodity Chains and Global Capitalism. Westport: Praeger, pp. 95-122.
- Langon F, Temple L, Biénabe E (2017). The concept of *Filière* or Value Chain: An Analytical Framework for Development Policies and Strategies. In: Biénabe E, Rival A, Loeillet D. Sustainable Development and Tropical Agri-chains. Springer.
- Lee J (2017). Global commodity Chains and Global Value Chains. DOI: 10.1093/acrefore/9780190846626.013.201.
- Leeuwis C (2004). Communication for Rural Innovation. Rethinking Agriculture Extension. Third Edition. Blackwell Science Asia Pty Ltd, 550 Swanston Street, Carlton, Victoria 3053, Australia.
- Michel B, Boureima F, Goita M (2017). Value Chain Analysis for Development. Mali. Agrinatura. www.agrinatura-eu.eu. Accessed in November 2019.
- Min Z (n/d). Vertical and Horizontal Linkages with Small-scale Farmers in Developing Countries: Evidence from China.
- Ministério da Agricultura e Florestas (MINAGRIF) (2018). O PDMPISA (Programa de Desenvolvimento de Médio Prazo do Sector Agrário). Luanda.
- Mitchell J, Keane J, Coles C (2009). Trading up: How a value chain approach can benefit the rural poor. COPLA Global: Overseas Development Institute, 111 Westminster Bridge Road London SE1 7JD UK.
- Mitchell J, Coles C (2011). Markets and Rural Poverty: Upgrading in the Value Chain. Earthscan. IDRC. ISBN: 9780415694124. pp. 280.

- Nkuba J, Ndunguru A, Madulu R, Lwezaura D, Kajiru G, Babu A (2016). Rice Value Chain Analysis in Tanzania: identification of constraints, opportunities, and upgrading strategies. *African Crop Science Journal*, Vol. 24, Issue Supplement s1, pp. 73 – 87. DOI: <http://dx.doi.org/10.4314/acsj.v24i1.8S>.
- Narcisio DR (2015). Valorização de subprodutos da indústria arroseira para desenvolvimento de uma Mix isenta de glúten para bases de pizza. Dissertação para obtenção do Grau de Mestre em Engenharia alimentar. Universidade Lisboa. Lisboa.
- NRDS (2018). National Rice Development Strategy. Angola.
- Norton R (2014). Agriculture value chains. A game-changer for smallholders. Tanzania.
- Porter ME (1985). Competitive advantage. Creating and Sustaining Superior Performance. The free press. A Division of Macmillan, Inc. New York Oxford, Singapore, Sydney.
- Poulton C, Dorward A, Kydd J (2009). The Future of Small Farms: New Directions for Services, Institutions, and Intermediation. www.elsevier.com/locate/worlddev. DOI:10.1016/j.worlddev.2009.06.009. *World Development*, Vol. 38, No. 10, pp. 1413–1428, 2010.
- Walts J, Mackay R, Horton D, Hall A, Douthwaite D, Chambers R (2006). World Bank (2006). Enhancing Agricultural Innovation: How to Go Beyond the Strengthening of Research Systems. Washington, DC.
- Yedan A (2019). Measuring value chains. Introduction of a quantitative instrument based on input-output tables. Coco Ocean Resort, Bijilo. The Gambia.
- Stockbridge M, Dorward A, Kydd J (2003). Farmer Organizations for Market access: an International Review. Wye College, University of London. UK.
- Zamora EA (2016). Value Chain Analysis: A Brief Review. *Asian Journal of Innovation and Policy*. DOI: <http://dx.doi.org/10.7545/ajip.2016.5.2.116>.