



NACIONES UNIDAS

CEPAL

SEDE SUBREGIONAL EN MÉXICO

**UPGRADING VALUE CHAINS THROUGH PROFESSIONAL
AND SUPPORTING SERVICES: LESSONS FROM
THREE AGRO-INDUSTRY CHAINS IN
EL SALVADOR AND GUATEMALA**

Nahuel Oddone
Ramón Padilla

The authors wish to thank Martha Cordero and Mario A. Ricardo for their inputs to the analysis of fine woods and non-traditional vegetable value chains. The authors are grateful to Silvia Bertinazzi for her support in building the conceptual framework of this paper. They are also grateful to Jorge Mario Martínez-Piva, Martha Cordero, Joaquín Salido and Jennifer Alvarado for their valuable comments on an earlier version of this document.

This document has been prepared by Nahuel Oddone and Ramón Padilla of the International Trade and Industry Unit, Economic Commission for Latin America and the Caribbean (ECLAC), Subregional Headquarters in Mexico.

The views expressed in this document are the authors' sole responsibility and do not necessarily reflect those of the Organization.

CONTENTS

ABSTRACT	5
INTRODUCTION	7
I. VALUE CHAINS AND THE ROLE OF SERVICES.....	9
II. A BRIEF OVERVIEW OF EL SALVADOR AND GUATEMALA.....	12
III. METHODOLOGY.....	15
IV. CASE STUDIES: BOTTLENECKS FOR TECHNOLOGICAL UPGRADING.....	16
A. SHRIMP FARMING IN EL SALVADOR.....	16
B. NON-TRADITIONAL VEGETABLES IN GUATEMALA.....	17
C. FINE WOODS IN PETÉN, GUATEMALA.....	19
V. SERVICES TO INCREASE DOMESTIC VALUE ADDED	21
A. SHRIMP VALUE CHAIN IN EL SALVADOR	21
B. NON-TRADITIONAL VEGETABLES VALUE CHAIN IN GUATEMALA.....	24
C. FINE WOODS VALUE CHAIN IN PETÉN, GUATEMALA.....	27
VI. CONCLUSIONS.....	31
BIBLIOGRAPHY	33

Index of tables

TABLE 1 CENTRAL AMERICA: SELECTED INDICATORS.....	12
TABLE 2 CENTRAL AMERICA: GINI COEFFICIENT	13
TABLE 3 CENTRAL AMERICA: AGRICULTURE AND AGRO-INDUSTRY SECTORS AS A PERCENTAGE OF GDP, 2011	13
TABLE 4 PROFESSIONAL AND SUPPORTING SERVICES FOR UPGRADING THREE SELECTED VALUE CHAINS	30

Index of figures

FIGURE 1 PROFESSIONAL AND SUPPORTING SERVICES TO UPGRADING VALUE CHAINS	10
FIGURE 2 SHRIMP FARMING VALUE CHAIN.....	16
FIGURE 3 NON-TRADITIONAL VEGETABLE VALUE CHAIN.....	18
FIGURE 4 WOOD PRODUCTS VALUE CHAIN.....	19

ABSTRACT

There is an increasing acknowledgement of the key role of services for technological upgrading and increasing value added in manufacturing and primary goods value chains. Over the past two decades, Central American countries have experienced significant export growth. Yet exports have not been an engine of sustained economic growth and employment generation. Agro-industry exports, in particular, frequently incorporate only scant domestic value, with limited or no industrial transformation at all. This paper aims at studying the role of professional and supporting services in increasing domestic value added and fostering technological upgrading in agro-industry value chains. It presents empirical evidence on three agro-industry value chains: shrimps in El Salvador, and non-traditional vegetables and fine woods in Guatemala. Research and development services, technical assistance, support for certification processes, logistics and transport services and market research, among others, have a positive impact on productivity, efficiency, quality and revenues.

INTRODUCTION

Over the last two decades, Central American countries ¹ in general, have undertaken extensive economic reforms aimed at liberalizing trade, attracting foreign investment, and reducing the participation of the State in economic activities. Central America is the most open sub-region in Latin America: in 2012 foreign trade represented on average 85.7% of GDP. The economic results of this transformation have been positive in terms of export growth and significant transformation of export structure from one concentrated on primary goods to one oriented to manufactures. Yet exports have not been an engine of sustained economic growth and employment generation. As a result, large social challenges remain (Beteta and Moreno-Brid, 2014).

The weak link between exports and economic growth is strongly associated with low national value added. On the one hand, local small and medium-sized enterprises (SMEs) face multiple barriers—such as scale, quality, and technological capabilities—to supply goods to large transnational enterprises. Exports of manufacturing goods commonly include a high amount of imported components. On the other, agro-industry exports frequently incorporate scant domestic value, and primary goods are exported with limited or absolutely no industrial transformation.

This sub-region's challenge is to capture greater value added and more economic benefits from its participation in value chains. By increasing value added to current activities or moving towards higher value added tasks, actors can increase the economic benefits of participating in the value chain (Gereffi, Humphrey and Sturgeon, 2005).

Nowadays, increasing geographical production segmentation and rapid technological change demand more advanced capabilities and specialization to participate in value chains. Services are vital to increasing participation in international primary goods and manufacturing value chains. Primary goods and manufacturing value chains need services for the production processes as well as for the sale of their products (López and others, 2009; Rentzhog, 2010; OECD, 2013). Services such as certifications, technical assistance, and research and development are crucial for technological upgrading, higher value added, and access to international markets.

The paper focuses on one challenge mentioned above: the limited domestic value added content of agro-industry exports. This paper aims at studying the role of professional and supporting services in increasing domestic value added and fostering technological upgrading in agro-industry value chains. These services are here understood as relatively complex services, such as technical assistance, design and marketing oriented to strengthening primary goods and manufacturing value chains.

The analysis is based on a multiple case study methodology. Three Central American value chains with different production characteristics, degrees of internationalisation, and barriers to increase value added are examined: shrimps in El Salvador, and non-traditional vegetables and fine woods in Guatemala. The empirical evidence was collected as part of a technical assistance project in 2013, run by the United Nations Economic Commission for Latin America and the Caribbean (UN-ECLAC), and funded by the German International Cooperation Agency (GIZ). A comprehensive review of existing reports was accompanied by direct data collection in each country through face-to-face interviews with producers, local governments, industry associations, cooperatives, and other stakeholders of the value chain.

¹ Central America comprises Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama.

This paper is divided into six further sections. The first section discusses the concepts of value chains and technological upgrading, and examines the potential role of services in primary goods and manufacturing value chains, thereby setting the conceptual framework for this paper. The second section offers a brief economic overview of El Salvador and Guatemala. The third section discusses the methodology pursued in this paper to collect and analyse the empirical evidence. The fourth section presents empirical evidence of bottlenecks to increase domestic value added in three selected value chains. The fifth section examines international experiences in which services have helped overcome those bottlenecks and increase value added. The sixth section presents the conclusions.

I. VALUE CHAINS AND THE ROLE OF SERVICES

A value chain comprises the full range of activities required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use (Kaplinsky and Morris, 2000). Each stage, such as design, production, marketing and distribution, is known as a linkage. The activities that comprise a value chain can be contained within a single firm or divided among different firms. The number of linkages in each value chain varies across industries.

All producers, regardless their size and capabilities, participate at least in a local value chain. Even a small-scale rural farmer purchases inputs such as seeds, tools and fertilizers, thereby interacting with other linkages. Rural producers, cooperatives, and firms require a wide array of intermediate goods and components, as well as services to support their activities.

Increasing global competition, economic liberalization, and dissemination of information technologies have encouraged the development of inter-organisational networks, which are grouped around a product and link firms, buyers and suppliers within the context of the global economy (Gereffi and Korzeniewicz, 1994). International or global value chains cover both intra-firm and inter-firm transactions and forms of coordination. They link multinational enterprises with their own subsidiaries, and these with subcontractors, suppliers, service providers and partners (Ernst and Kim, 2001).

The value chain framework is useful for analysing how a firm or local industry participates in domestic and international networks and how it appropriates the revenues associated with varying activities in the value chain. Participation in different links of the value chain has significant implications for local development since the activities associated with each link have varied intensities in the use of production factors (capital, technological knowledge and labour), opportunities for building backward linkages and, therefore, windows to add domestic value (Padilla-Pérez and Hernández, 2010). Economic and technological upgrading in value chains can lead to social upgrading in terms of work conditions, wages and economic rights, among others (Milberg and Winkler, 2010; Barrientos and others, 2010).

Technological upgrading, a central concept for this paper, is understood as the outcome of more-advanced technological capabilities for developing new products or processes, or for engaging in more knowledge-intensive activities. Thus, upgrading is innovation aimed at increasing value added (Humphrey and Schmitz, 2002; Kaplinsky and Morris, 2000; Porter, 1990) or moving to higher value added activities (Gereffi and Korzeniewicz, 1994).

The literature recognises four types of upgrading that can be adopted at the firm level: i) product upgrading, which is the development and commercialisation of a product with improved performance characteristics that can be defined in terms of increased unit values; ii) process upgrading, which is the development and implementation of new or significantly improved production or delivery methods by introducing superior technology; iii) functional upgrading, which is engaging in new and superior activities in the value chain, for instance, when a firm moves from components manufacturing to product design; and iv) inter-sectoral upgrading, which consists of moving to new productive activities or sectors using previously acquired knowledge and skills; for instance, knowledge acquired in manufacturing electronic goods can be used to participate in other sectors such as aeronautics (Humphrey and Schmitz, 2002; Gereffi, Humphrey and Sturgeon, 2005).

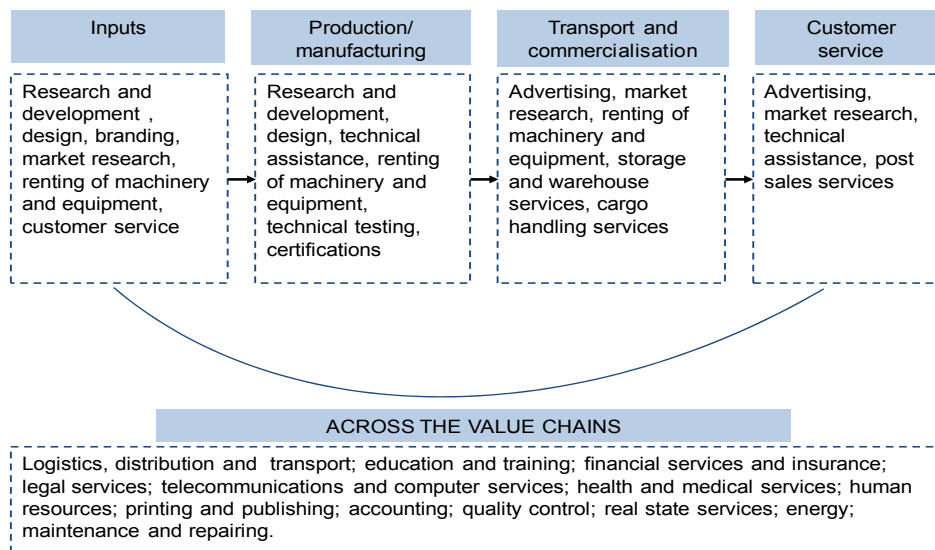
Primary goods and manufacturing value chains need services for their production processes as well as for the sale of their products. Services are increasingly important in a globalised world that demands more sophisticated products and business offers (Rentzhog, 2010). The data on trade in value added highlights the importance of services. Services make a significant contribution (typically one-third) to value added in manufacturing value chains (OECD, 2013).

Services are crucial for the efficient operation of regional and global manufacturing and primary goods value chains. On the one hand, logistics and information and communications technologies increase the efficiency of a value chain since they facilitate trade of goods and knowledge transfer within and between countries. On the other hand, goods value chains in general are making greater use of services to enhance their comparative advantages because they are crucial for increasing productivity, creating new products, improving production processes and building strong relations with customers (OECD, 2013). Similarly, supporting services are associated with product differentiation, market competitiveness and higher prices (Francois and Woerz, 2007; Nordas and Kim, 2013). This trend has been spurred by diverse factors such as new information and communication technologies, new business structures that foster outsourcing strategies, a growing tendency among firms to focus on their core businesses, trade openness and liberalization of trade in services, among other factors (López and others, 2009).

By the same token, services play an important role in fostering technological upgrading and increasing domestic value added in value chains of goods (Rentzhog, 2010; Lodefalk, 2012). Not all services contribute to technological upgrading. This paper focuses on professional and supporting (PS) services, which need qualified human resources and access to technological knowledge. Such services can be classified according to the linkage being supplied (see figure 1).

The supply of PS services to the first and second linkages can serve to strengthen the value chain in the form of improved and new inputs, lower prices and greater quantities. Research and development, design, branding and market research are just some of the services for the first linkage. The second linkage makes use of those services, as well as technical testing and certifications, among others.

FIGURE 1
PROFESSIONAL AND SUPPORTING SERVICES TO UPGRADING VALUE CHAINS



Source: Own elaboration.

The third linkage, transport and commercialisation, offers a wide array of opportunities for services such as cargo handling, storage and warehousing, and packaging. It also considers design and marketing, which are needed to enter the market. The fourth linkage, customer services, may be offered in diverse areas such as customer attention, market research and post sales services.

Some PS services extend across the entire value chain. Their breadth depends on the chain profile, but they comprise logistics, education and training, financial services and insurance, legal services, accounting, information technologies and communication services, computing and printing, among others. Not all PS services contribute equally to value chain upgrading. More technologically advanced services usually have a higher impact in terms of product and process upgrading. Finally, services are provided by private enterprises, including micro and small-sized enterprises, or by public and non-governmental organisations.

II. A BRIEF OVERVIEW OF EL SALVADOR AND GUATEMALA

El Salvador and Guatemala, as well as the other Central American countries, have economies that are both small and open. Guatemala has the largest population (14.8 million inhabitants) followed by Honduras (7.8 million) and El Salvador (6.2 million) (see table 1). Openness to international trade, measured by total international trade (exports and imports) divided by GDP, is high in Central America (over 100 in Nicaragua and Panama), but El Salvador and Guatemala show some of the lowest ratios in that sub-region. In terms of surface area, El Salvador is the smallest country in Central America. Nicaragua, which is the largest with 130,000 square kilometres, is only the 96th largest country in the world.

TABLE 1
CENTRAL AMERICA: SELECTED INDICATORS

	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	Panama
Population 2013 (million)	4.86	6.32	15.42	8.08	6.07	3.87
Surface area (km ²)	51 100	21 040	108 890	112 090	130 000	75 520
GDP per capita 2012 (current US dollars)	5 725	3 038	2 321	1 585	1 352	7 471
Percentage of the population living in poverty 2012 (or most recent available figure)	17.8	45.3	54.8	67.4	58.3	25.3
Percentage of exports and imports/GDP 2012	62.6	64.4	51.6	105.8	108.7	121.0

Source: ECLAC (2013b).

The Human Development Index of the United Nations Development Programme (UNDP) classifies El Salvador and Guatemala, as well as Honduras and Nicaragua as middle human-development countries, whereas Costa Rica and Panama are considered high human-development countries.² Economic growth in El Salvador was the lowest (1.9%, average annual growth rate) among Central American countries between 2000 and 2012, followed by Nicaragua (3.4%) and Guatemala (3.5%). In 2012, the manufacturing sector accounted for 18.7% of GDP in El Salvador, and 19.1% in Guatemala, whereas primary sector (agriculture, fishing, forestry, and livestock) represented 10.8% and 10.9% of GDP, respectively (ECLAC, 2013b).

As for social indicators, according to the most recent available figures, 55% and 47% of total population in Guatemala and El Salvador, respectively, live in poverty. Inequality is high and increased in Guatemala over the last decade, although it declined in El Salvador.

² The Human Development Index is a composite index measuring average achievement in three basic dimensions of human development: a long and healthy life, knowledge and a decent standard of living (UNDP, 2013). It classifies countries into four categories: very high, high, medium, and low human development.

TABLE 2
CENTRAL AMERICA: GINI COEFFICIENT

	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	Panama
Gini coefficient at the beginning of the XXI century	0.474 (2000)	0.531 (2000)	0.542 (2002)	0.577 (2001)	0.579 (2001)	0.555 (2001)
Most recently Gini Coefficient available	0.503 (2011)	0.454 (2010)	0.585 (2006)	0.567 (2010)	0.478 (2009)	0.531 (2011)

Source: by the authors.

In recent years, El Salvador and Guatemala have launched new strategies to strengthen production capabilities in diverse sectors. The former elaborated, in a joint exercise with the private sector, a national industrial policy aimed at fostering competitiveness, increasing domestic linkages, spurring innovation, and generating high-quality jobs. The latter, in turn, published a new national competitiveness agenda focused on increasing domestic value added, fostering innovation, and promoting public-private partnerships. ECLAC's technical assistance to enhance value chains took place under these new government strategies. It focused on three rural value chains with the aim of strengthening the capabilities of small producers and, by doing so, improving their economic and social conditions.

The agricultural and agribusiness sectors, in which this document focuses, have a significant contribution to the economic activity in the sub-region (see table 3). In 2013, those sectors accounted for 10.2% and 11.1% of GDP, respectively, in Guatemala. This country is the largest ethanol exporter in the sub-region, with 265 million litres per year as well as the largest global exporter of cardamom, the second largest global exporter of peas, the third of French beans, the sixth of sugar and the seventh of broccoli (AGEXPORT, 2013). In addition, production of fruit and vegetables, particularly mini-vegetables (Cordero, 2014), has been recently growing due to increasing nation and international demand. In turn, in El Salvador agriculture and agro-industry sectors account for 7.5% and 17% of GDP, respectively. Coffee, wheat, corn flour, sugar cane and tuna are among the most important primary products, whereas coffee, sugar and processed milk are among the largest agro-business goods (Angel, 2011). The agriculture and agro-industry sectors in El Salvador and Guatemala face considerable challenges such as institutional weaknesses, scarce implementation of best practices, poor use and dissemination of new technologies, lack access to credit. Moreover, it is increasingly critical to foster the implementation of climate-change adaptation programmes.

TABLE 3
CENTRAL AMERICA: AGRICULTURE AND AGRO-INDUSTRY SECTORS
AS A PERCENTAGE OF GDP, 2011

	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	Panama
Agriculture/GDP	7.5	7.5	10.2	11.5	12.4	16.7
Agro-industry/GDP ^a	19.4	17.0	11.1	8.5	7.1	2.6

Source: by the authors, based on official figures.

^a It corresponds to food, beverages and tobacco.

In Guatemala, more than 60% of the farmlands are concentrated on large agribusiness owners. Land reforms to tackle this concentration have not been discussed, with important consequences of good

security: 87% of inhabitants in Petén suffer from some degree of food insecurity and 34% of school-age children have some form of developmental delay due to problems of chronic malnutrition (SESSAN, INE, FAO, 2011). On the contrary, in El Salvador, according to the 2007 Census, there is a large number of small producers (68%), who grow less than one hectare of land each, and many of them are tenants (Baumesiter, 2013). Furthermore, El Salvador, in contrast to most of its Central American neighbours, faces significant constraints to expand the agriculture frontier; they can be only resolved by increasing productivity. In addition, as a result of land reforms a group of large cooperatives, based on collective land ownership in products such as coffee and sugar cane has been created. Constitutional law has set a maximum size of 245 hectares for single pieces of land under any legal form, thus reducing land concentration (Baumesiter, 2013).

III. METHODOLOGY

The empirical evidence presented in this paper was obtained from a technical assistance project executed by ECLAC, coordinated by the authors, aimed at strengthening value chains in El Salvador and Guatemala. The whole process was executed in 2013 and comprised three core stages.³

First, an in-depth analysis of each chain was conducted to identify bottlenecks and barriers for technological upgrading. As a first step, a comprehensive review of existing studies and publicly available information was carried out. Later on, around 30 interviews with main stakeholders were conducted for each value chain, and preliminary results were discussed in focus groups to validate and enrich the analysis. The interviews were with producers, public officers in charge of supporting and regulating the activities of the chain, local experts (scholars and consultants), and suppliers, among others.

The diagnostic of each value chain covered six main areas: a) a map of all actors of the value chain; b) costs, margins and competitiveness; c) markets and standards; d) governance and linkages; e) resources, productivity and environmental sustainability, and f) analysis of potential economic and social benefits resulting from a stronger value chain.

Second, best international practices were identified and examined. Studying best practices helps in mapping the differences between the chain under study and international examples of more competitive chains. The search for best or good international practices (it can be difficult to map all international practices and decide which is best), was aimed at addressing bottlenecks identified in the first stage. Reviews of existing literature, interviews with value chain experts and Internet research were the main activities conducted to identify good international practices. To examine such good practices, further research was done through interviews and literature review.

Third, strategies to address the bottlenecks were drafted. This methodology allows for the identification of micro-level actions to strengthen each link of the chain and the chain as a whole. The strategic guidelines identify who is responsible, timeframes for operations, and gross resources needed.

The methodology developed and applied by ECLAC in El Salvador and Guatemala is characterised by participatory processes. The analysis of bottlenecks and the strategies are presented and discussed in focus groups integrated by the main actors of each value chain.

This paper makes use of empirical evidence collected for three agro-industry value chains: shrimp farming in El Salvador, and both fine woods and non-traditional vegetables in Guatemala. Section 4 focuses on the main characteristics of each chain and its bottlenecks, while section 5 discusses how those bottlenecks can be overcome through the supply of services (good international practices).

³ For further details on ECLAC's methodology, see Oddone, Padilla-Pérez and Antunes (2014).

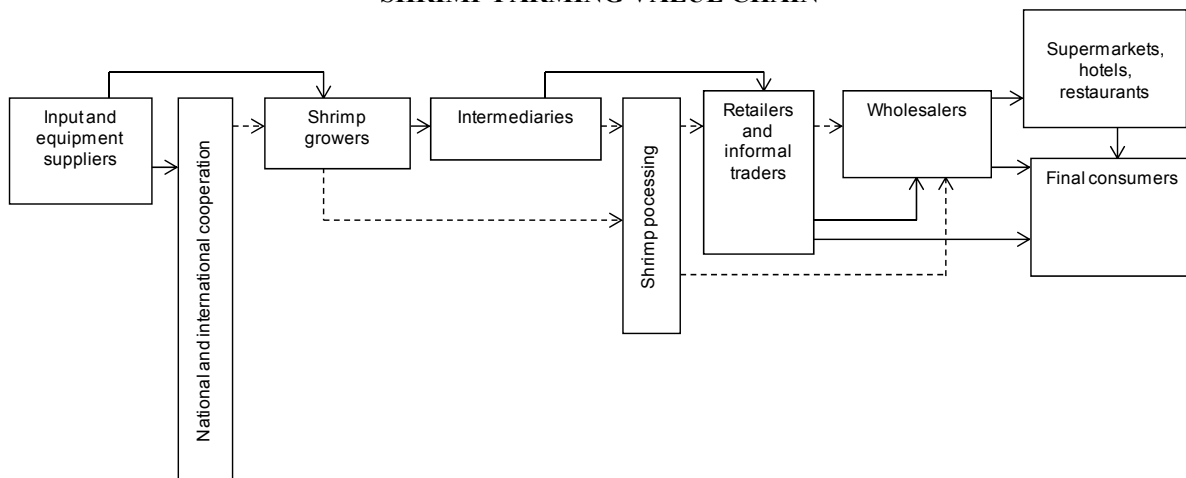
IV. CASE STUDIES: BOTTLENECKS FOR TECHNOLOGICAL UPGRADING

A. SHRIMP FARMING IN EL SALVADOR ⁴

Shrimp farming in El Salvador is practiced on a small scale due to the limited socio-economic and technological capabilities of producers. Former fighters and soldiers from the civil war of the 1980s, along with a small group of independent farmers, comprise this group of producers. They are organised in 44 cooperatives with a total of 1,500 members. The cooperatives follow three different production models: extensive (23% of total farms), improved-extensive (32%), and semi-intensive (45%). The semi-intensive model is technologically more advanced and results in higher profits.

Figure 2 shows the main linkages in the shrimp farming value chain. Shrimp growers are the core of the value chain; forward and backward relationships are identified departing from this linkage. Suppliers of equipment and inputs comprise the main backward linkage, whereas the main forward linkage consists of the intermediaries, which, in turn, supply a large number of traders, wholesalers, retailers and consumers.

**FIGURE 2
SHRIMP FARMING VALUE CHAIN**



Source: Oddone and Beltrán, 2013 and 2014.

Shrimp growers produce on communitarian farms and sell their production to intermediaries, who in turn transport cultivated shrimps to wholesalers operating in “La Tiendona”, the national distribution and storage centre. In some cases, the intermediaries also play the role of retailers and trade informally. A paucity of processing activities in this chain means that shrimps are sold without undergoing any significant post-cultivation transformation or manufacturing process. Value added or industrial transformation in this chain refers to any process other than beheading. Ways to add value include methods for producing shrimp heads-on, individually quick frozen (IQF); peeled with tail; peeled and deveined (P&D); cooked and peeled; butterfly (P&D with tail and a small cut to slightly flatten the shrimp); round cut (peeled and deveined with tail), and western cut (deep flattening butterfly). The final consumer, as well as supermarkets, hotels and restaurants, buys the product directly in La Tiendona.

⁴ A detailed analysis of this value chain can be found in Oddone and Beltrán (2013 and 2014).

Shrimp farming in El Salvador is characterised by small-scale production as well as poor technological capabilities. For instance, the quantity of shrimp planted per square metre remains low and only 45% of farms possess pumping systems. By comparison, between 10 and 13 shrimps are planted per square meter nowadays in El Salvador, while shrimp growers in Honduras or Mexico plant up to twice as many in the same square metre. Salvadoran shrimp farmers also lack bio-security programmes—they continue to fill tidal ponds and use seeds obtained from the natural environment—leaving the Salvadorian shrimp farms vulnerable to extreme weather conditions and diseases, such as Whitespot Syndrome Baculovirus Complex (WSSV) or Early Mortality Syndrome (EMS).

The quality and safety of shrimp gradually deteriorates during transportation from ponds to La Tiendona. This is one of the most significant bottlenecks given that quality standards, safety certifications, and other major sanitary and phytosanitary (SPS) measures are especially relevant to business relationships in food chains. Intermediaries commonly use buckets with ice to transport and store shrimps until they are sold in La Tiendona or to retailers and informal traders. As this practice fails to offer a uniform or adequate refrigeration process, it opens the door to microbial reproduction, diminishing the quality of the shrimps and potentially making them unsafe for human consumption.

Farmers have no access to formal sources of credit. Intermediaries rarely offer financial assistance to farmers, in contrast to other agro-industry chains in Central America. This factor hinders the opportunity for achieving economies of scale, increasing productivity and improving quality.

Summarising, the shrimp value chain in El Salvador faces critical barriers which need to be faced in order to increase domestic value added and strengthen technological capabilities, such as the small size of cooperatives, inefficient production and managerial systems, poor quality management by intermediaries, deficient processing linkage, an absence of bio-security programs and a lack of support from financial institutions.

B. NON-TRADITIONAL VEGETABLES IN GUATEMALA ⁵

Rural population in Guatemala represented 54% of total population in 2012. Agriculture is one of the main economic activities: in 2011, 47.8% of the population was employed in agricultural activities. For many decades traditional vegetables, such as wheat, corn and beans, dominated the production of agricultural goods. In the 1960s, a small number of farmers began to produce non-traditional vegetables such as peas, broccoli, French beans and various mini vegetables. In 1980, the surface intended for non-traditional vegetables represented 6.3% of total agriculture area, but for 2011 it had increased to almost 17%.

The number of non-traditional vegetable farms amounts to 18,171, representing 1.5% of total farms (Censo Agropecuario de Guatemala, 2002-2003). ⁶ In terms of harvested area, the six non-traditional vegetables grouped in this value chain (peas, broccoli, French beans, zucchini, small corn and small carrots), represent 0.55% of the total harvested area. These non-traditional vegetables are cultivated mainly in Guatemala's high central plateau. ⁷

⁵ A detailed analysis of this value chain can be found in Cordero (2014).

⁶ It corresponds to farms growing all non-traditional vegetables but baby corn, since there is no publicly available information for this crop.

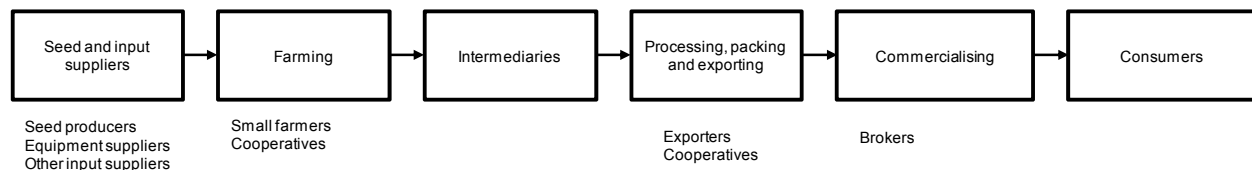
⁷ Comprises Huehuetenango, Quetzaltenango, Quiché, San Marcos, Totonicapán, Sololá, Chimaltenango, Jalapa and Las Verapaces.

According to the Guatemalan Ministry of Economy (MINECO), in 2010 there were more than 35,000 producers dedicated to the cultivation of small vegetables. Direct employments related to non-traditional vegetables summed up 18,809, 54% for broccoli, 35% for peas and 11% for French beans.

This value chain is highly oriented to international markets. Exports of peas are the most important among the six vegetables studied in this chain. Guatemala is the largest supplier of peas to the United States, capturing 46.1% of that market. In 2012, according to COMTRADE/United Nations, Guatemala exported 49 million of US dollars worth of peas, 44 million of broccoli⁸ and 9 million of French beans. These three vegetables represent 1% of Guatemalan total exports.

The value chain of non-traditional vegetables can be divided into four main links: 1) seed and input suppliers; 2) farming, 3) processing, packing and exporting, and 4) commercialisation (see figure 3). The first link is dominated by multinational enterprises that produce seeds, equipment and other inputs (pesticides, fertilisers, etc.). They supply the domestic market through importing firms. The second link comprises small farmers, landowners and tenants. The third link corresponds to enterprises that provide services for selecting, processing and packing non-traditional vegetables. These enterprises also manage transportation and logistics, and obtain export permissions. The last link is the broker, who completes the export permission process as well as the customs procedures in the final market. This broker commonly sells non-traditional vegetables to supermarkets, hotels and restaurants in the import country. The products of this chain are transported by air, sea and land, making use of refrigerated containers and freezers.

FIGURE 3
NON-TRADITIONAL VEGETABLE VALUE CHAIN



Source: Cordero (2014).

This value chain faces several bottlenecks that hinder its competitiveness, understood as the capability to produce high quality products with cost-efficient processes. First, most seed suppliers are international firms with little competition from national firms, a situation that results in high seed costs for farmers. Second, high sea and air transport costs, and excessive customs control negatively impact imports of agricultural inputs and exports of non-traditional vegetables. Third, market intelligence (information on customer demand and preferences, competitors' products, market prices, etc.) is insufficient for developing new products and accessing new markets.

Fourth, there are no domestic laboratories to analyse vegetables before they are exported. There are no R&D laboratories to improve products and processes related to different links of the value chain. Similarly, there are no national laboratories or certification companies able to analyse non-traditional vegetables for compliance with international standards and customer specifications. Lastly, the use of good international agricultural practices is not generalized among all producers, so any lack of compliance negatively impacts the whole value chain, including those producers following international practices, since international customers penalise all products coming from Guatemala.

⁸ The tariff code also includes cauliflower.

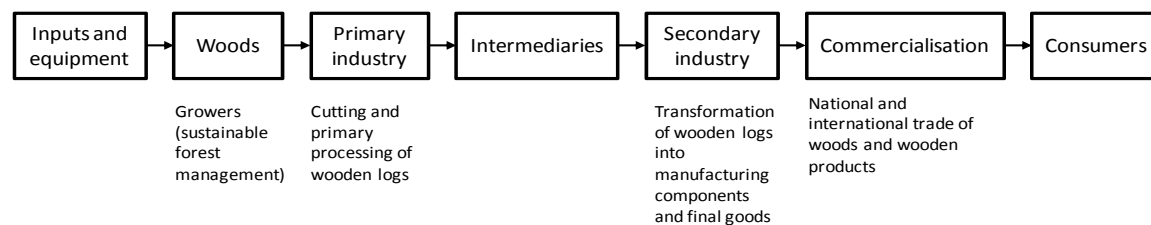
Other bottlenecks identified in the diagnostics are outdated and inadequate cooling systems, weak managerial and technical capabilities of producers and significant dependence on imported inputs.

C. FINE WOODS IN PETÉN, GUATEMALA ⁹

Guatemala has the second largest forest area in Central America. It possesses 3.6 million hectares of evergreen, broadleaf and mixed forest, which represent 34% of Guatemala's total land surface. Yet, along with Honduras and Nicaragua, Guatemala has the highest deforestation rate in Central America. ¹⁰ Forest production observed an annual average growth rate of 2% in the previous decade, exceeding 35 million cubic metres; it represents approximately 1.5% of GDP. According to Dalberg (2011), wood's production costs in Guatemala are 40% higher than those of Costa Rica, and 95% above those of Brazil and Chile. The main factors are high transport costs, weak technological capabilities and inefficient use of wood in the primary industry.

Petén has an area of 35,854 km², approximately 60% of which corresponds to the Mayan Biosphere Reserve, whose main focus is natural forest conservation. 14 forest concessions operate in this area and extend over 530,000 hectares. Only 11 concessions are currently operating, of which nine are cooperatives and two private enterprises. These concessions operate under strict sustainable standards: each year they are allowed to cut a maximum number of trees to guarantee long-term sustainability. In Petén, there are about 50 different types of timbers. Some of them, such as mahogany and Spanish cedar, are fine woods protected by the Convention on International Trade in Endangered Species of Wild Fauna and Flora.

FIGURE 4
WOOD PRODUCTS VALUE CHAIN



Source: Ricardo (2014).

Figure 4 shows the main links of the fine woods value chain in Petén. The first link correspond to input and equipment suppliers, whereas the second comprises all activities related to the use, recovery, protection and conservation of natural forests. It involves the design of forest management plans, which demand diagnostics of tree populations, potential volume of wood to be obtained and the particular conditions of each ecosystem to work with, paying special attention to sustainability.

The processing link includes the activities of wooden log transformation. It is important to separate the primary industry of the secondary one. The last link is commercialisation and involves all the activities related to national and international trade of fine woods and wooden products, including intermediaries and brokers. Producers themselves commercialize a high percentage of the primary industries' production. Yet intermediaries or middlemen also buy large amounts of wood, with no transformation, and frequently offer transport services to cooperatives.

⁹ A detailed analysis of this value chain can be found in Ricardo (2014).

¹⁰ Guatemala's forest area decreased by 1.5% between 2000 and 2010, and by 1.2% between 1990 and 2000.

The links between primary and secondary wood industries are weak. Around 80% of total production of forest concessions is commercialized with no transformation or industrial value added. FORESCOM (the Community Forest Service Company, for its Spanish acronym), which is the pillar of the secondary industry in the forest concessions, has an underutilized technological structure due to the low availability of working capital and weak links with the communitarian primary industry.

The value chain shows generally low competitiveness because of inadequate exploitation of forest resources (for instance, insufficient and outdated equipment and inefficient processes), high transport costs and dated technologies. For instance, current costs of transport services could be reduced by 50% using more efficient equipment and techniques. Spanish cedar and mahogany are the main commercialized woods, but there are other species (such as Guatemalan cherry, Santa María and Tropical walnut) as well as other forest products (such as pepper, nuts and palms) insufficiently exploited.

Human resources of forest concessions are, in general, under qualified, having a direct negative impact on productivity. In addition, these concessions have limited access to formal sources of credit. Lastly, they exhibit reduced access to market intelligence, hindering production and commercialization strategies.

V. SERVICES TO INCREASE DOMESTIC VALUE ADDED

This section discusses the role that PS services can play to support studied value chain in their technological upgrading processes. As stated above, the empirical evidence was collected through an international benchmarking exercise, undertaken for the already mentioned ECLAC's technical assistance project to strengthen value chains in El Salvador and Guatemala. The search for best practices comprised various international experiences to address the identified bottlenecks. Only some of them are described here to illustrate their impact.

A. SHRIMP VALUE CHAIN IN EL SALVADOR

To address the main bottlenecks of this value chain, four types of services were identified. The first type of service is aimed at improving inputs quality. The most important inputs are seeds (post-larval shrimp), food concentrates, microalgae, brine shrimp, chemical products and fertilizers, as well as lime, sand filters, wood, fuel and lubricants for pumps and vehicles. Technical services to preserve conditions and properties of inputs are needed, as well as to conduct quality analysis in order to assess their economic and environmental performance.

In El Salvador, not all producers have the infrastructure needed to mature seeds; nauplii¹¹ are imported from Guatemala or Honduras by local laboratories that produce post-larvae. The production of post-larvae requires a high investment in infrastructure, equipment and technologies. Animal genetic research aimed at developing new lines of shrimp and enhanced food concentrates (improving proteins), contributes to value chain upgrading. In Sinaloa, Mexico, Maricultura del Pacífico, a private enterprise, produces white shrimp larvae and, in collaboration with other research institutions, has developed a genetic selection program for weight gain and increased survival rates. These services are offered to local producers and have a significant impact on productivity as shrimp that previously weighed 18 grams on average gained three grams per shrimp, a 16.5% increase in two generations (Castillo Juárez, 2005).

The services provided by Colombia's Aquaculture Research Centre (CENIACUA), allowed shrimp value chain to obtain positive results in larvae growing and maturation laboratories, as well as better farm yields. In the first case, larval survival has increased from 30% in 1997 to 50% in 2001. In the second case, maturation laboratories, productivity was reflected in better percentages of female shrimp fertility. While in 1997, each female shrimp spawned 70,000 nauplii on average, by 2001 productivity had risen to 95,000 nauplii. On farms located in the Caribbean zone, larval survival grew from 42% in 1996 to 72% in 2003 (Ministerio de Agricultura y Desarrollo Rural–Observatorio de Agrociencias, 2005).

New food plant concentrates are needed since they represent a key input in the shrimp growing process. They can be developed by laboratories for grinding, mixing and pelleting, according to the formulation demanded by the producer. The Department of Agronomy of the "Escuela Agrícola Panamericana Zamorano", in Honduras, provides services to develop different formulas and nourish diets.

¹¹ *Nauplius* is the first larval shrimp obtained from the egg, which is produced by mating in a laboratory. Nauplii transform into *zoetas*, and *zoetas* into *mysis* to become post-larvae. The most common commercial size in El Salvador is PL 10 (ten days post-larvae), which are fattened in ponds for about 90 days to finally get shrimp with an average weight of 10-12 grams.

Teachers and students of this University develop new concentrates according to the specific needs of proteins and carbohydrates required by farmers.¹²

Services in R&D would support the shrimp value chain in El Salvador through new genetic lines aimed at improving production systems that are customized to local climate and territorial characteristics. This product and process upgrading would benefit producers, consumers and the environment. For example, in 2004 Charoen Pokphand Foods Public Company Limited, a private enterprise, entered into an R&D joint venture with an American company with shrimp breeding expertise to develop shrimp fry suitable to farming conditions in Thailand.¹³

Management services in agricultural engineering that technically assist producers are important to develop and implement effective and sustainable bio-security programs on farms and seed production laboratories, incorporating best practices in aquaculture. Bio-security services help ensure long-term sustainability, through process and product upgrading. Research institutions in Mexico such as CESASIN and CIBNOR provide these kinds of services. Technical assistance to farmers has included good management of food concentrates, which leads to higher profitability and environmental sustainability.¹⁴

The second type of services needed to upgrade the shrimp value chain in El Salvador is related to certifications. Certification processes are increasingly important for demonstrating compliance with international norms and standards across the value chain. In a virtuous circle, certifications support producers to improve productivity and promote competitiveness. Periodic variations in consumption trends, as well as the acquired importance of international standards or certifications to buyers and consumers, have led producers worldwide to change their production and transformation processes to satisfy sanitary and phytosanitary (SPS) measures.

Certifications also ensure the long-term sustainability of shrimp farms and reduce their vulnerability to diseases, invasive species and the impact of natural phenomena. Technical assistance to ensure implementation of good aquaculture practices (GAP) and bio-security programs by Salvadorian producers are needed. However, certification fees are costly and frequently force small producers out of the market.

The existence of GAP or best aquaculture practices (BAP) at all stages of farm practices, including harvesting and post-harvest handlings prior to transport, are crucial to produce shrimps that are high quality and safe for consumption. Professional services to implement GAP and BAP have a significant impact on process and product upgrading. BAP and GAP comprise animal welfare as well as environmental integrity and social responsibility, but do not cover practices for hatching and nursing. GAPs have been applied in Thailand and have been crucial to tackling outbreaks of aquatic animal disease, such as the Yellow Head Virus and the Taura Syndrome Virus.¹⁵ In 2011, Thai shrimp exports amounted to 260 million of US dollars, rising 7.9% from 2010 (Wati and others, 2013) and retrieving market after the past disease's crisis.

The high cost of certification and its updating have forced many small family shrimp farmers out of the market, leaving more space for the big players. For this reason, it is also important for El Salvador to establish supporting mechanisms to certify national production.

¹² See Escuela Agrícola Panamericana Zamorano (2013).

¹³ See Charoen Pokphand Foods Public Company Limited (2005).

¹⁴ See CIBNOR (2011).

¹⁵ See Thai Ministry of Agriculture and Cooperatives (2009).

There are firms that provide technical support services to producers for obtaining GAP or BAP certifications. Some recognized certification schemes for shrimp are BAP by the Global Aquaculture Alliance, Naturland from Germany and the well-known GLOBALGAP. The Global Aquaculture Alliance is an international consortium that has developed BAP, combining annual site inspections and discharge sampling. In turn, GLOBALGAP sets voluntary standards for the certification of aquaculture products; its goal was to establish one standard for Good Aquaculture Practice (GAP) with different product applications. The checklist for compliance with GLOBALGAP standards allows checkpoints to be rated as minimum musts, maximum musts and recommendations. For instance, as a “minor must,” shrimp operations are expected to have action plans and safety measures in place to prevent and monitor salt accumulation and minimize the direct impact on soil, ground water and natural water flows (Food and Water Watch, 2008). Quality Certification Services is a private certification company that offers organic labelling to shrimp farms, processors, handling operations and aquaculture facilities. In Mexico, CIAD is accredited as a certification body to assess shrimp product specifications shrimp and award the Mexico Supreme Quality label. CIAD assesses the degree to which quality management and safety provider systems on shrimp farms or in processing plants comply with requirements for shrimp production and transformation processes.

Certification processes are extremely important to exports. In Viet Nam, shrimp exporters have adopted buyers’ certification systems. Although certification processes have affected only processor-exporters, they have had a positive impact on technological upgrading throughout the value chain (Van Nhuong and others, 2011). Chile also provides an interesting example. This Andean country has developed good international practices regarding certification process services. The Poultry-Pork Producers Trade Association took the lead and partnered with the Ministry of Agriculture to expedite certification processes. This association allowed the introduction of new software and an online database (Hopper and others, 2012). This experience has been applied to other Chilean value chains, thus resulting in adjustments to their procedures.

Third, good shrimp transportation practices are needed to guarantee quality and safety. At present, shrimp collections in El Salvador are conducted with minimal care given to the cold chain. Intermediaries are generally unaware of good handling practices and have their own quality standards, which differ greatly from international ones. Services could improve handling and transportation conditions from harvest to sale.

To improve handling and transportation current practices through the adoption of international safety and quality standards, intermediaries must use flake ice and thermo king trucks or at least properly pre-cooled isothermal boxes that have been loaded with ice blocks that were finely chipped using properly sanitized equipment. As experience in Bangladesh shows, good handling and transportation services contribute to value chain upgrading. Hazard Analysis and Critical Control Points (HACCP) provided by a private consulting company were introduced during the handling, transporting and manufacturing processes to identify weaknesses and sources of losses in farms and depots, during handling and transportation (Paul and others, 2010).

Fourth, technology services such as software design and customized electronic devices for enhancing price transparency may help achieve fairer prices for producers and traders. On the one hand, better market information may lead to improved negotiation techniques and schemes between growers and intermediaries. On the other, market information and financial access (bundled services) may strengthen growers’ capabilities to commercialize directly their products with retailers and other traders, increasing revenues (capturing a higher proportion of value added), and achieving better compliance with

GAPs and certifications. Consequently, shrimp growers (the core of the value chain) may experience process and functional upgrading.

These information technology (IT) services may also support shrimp farmers through updated information on weather conditions, market data with specific emphasis on price formation, and GAP on cultivation and management of shrimp.

A good example of the impact of IT services is found in Kerala, a state in India with a large fishing industry. Between 1997 and 2001, mobile phone service was introduced throughout this state. By 2001, over 60% of fishing boats and most wholesalers and retailers were using mobile phones to coordinate sales and collect market information. As a result, price dispersion and intermediary margins were dramatically reduced. Fishermen's profits increased on average by 8% in that period, while consumer prices declined by 4% (Jensen, 2007).

B. NON-TRADITIONAL VEGETABLES VALUE CHAIN IN GUATEMALA

Services for upgrading in this value chain are grouped in three areas: good agricultural practices and certifications, research and development, and market information.

Although this value chain is highly oriented toward supplying international markets, particularly the US market, not all producers apply good international agricultural practices (GAP), a weakness that adversely affects the performance of the whole value chain. In addition, there are no domestic laboratories that provide services certified by the US Food and Drug Administration.¹⁶ Agricultural engineering services are needed to achieve certification procedures, including the use of pesticides and chemicals. Standards also have technological and innovative features embedded in them and hence the compliance process demands services for transferring advanced production capabilities to developing economies (Otieno and Knorrington, 2012).

Several experiences, such as asparagus in Peru and vegetables in South Africa and Kenya, show the positive impact of international certifications on export competitiveness. According to ECLAC's research, there are some common points between the Peruvian asparagus chain and the Guatemalan beans chain. To increase the quality and food safety of asparagus, the Peruvian Commission for Export Promotion (PROMPEX, for its Spanish acronym) promoted the introduction of a code of practice on food hygiene in the production of asparagus. A private company helped the stakeholders involved in the chain to develop the proper code of practices and hygiene. As a result, production and processing methods were upgraded, resulting in better product quality and safety (UNIDO, 2006). Peru is the largest exporter of asparagus in the world. Asparagus represents 21% of Peru's more than 1 billion US dollars in exports even as 74% of asparagus production units are small farmers with less than 10 hectares. Significant elements that contributed to the strengthening of competitiveness include the commitment made to asparagus quality and safety, the technical standardization process that has been developed, and the establishment of the Peruvian Asparagus and Vegetables Institute.

The Peruvian Asparagus and Vegetables Institute embarked on a demanding process to teach producers and other value chain stakeholders the importance of maintaining the asparagus cold chain

¹⁶ The FDA Food Safety Modernization Act (FSMA) was signed into law on January 4, 2011, to better protect human and animal health by helping to ensure the safety and security of the food and feed supply. The FDA has proposed rules that are foundational for a preventive approach encompassed by FSMA. See US Food and Drug Administration (2011).

given that this crop is highly perishable (the optimal temperature is 0-2 °C), and has a short storage life (14 to 21 days). Domestic producers comply with several quality standard certifications such as GAP, HACCP, Safe Quality Food (SQF) 2000, British Retail Consortium (BRC) and Business Alliance for Secure Commerce (BASC), as well as other organic certificates. Furthermore, a Technical Committee of Asparagus Standardization was created to set out national guidelines harmonized with the Codex *Alimentarius* (Díaz, 2010).

The Market Access Working Group (MAWG) for Fresh Fruit & Vegetables in South Africa is a public-private partnership aiming to enhance the delivery of services by the Department of Agriculture, Forestry and Fisheries (DAFF). MAWG is a partnership between DAFF and the South African horticulture (mainly fresh fruit) industry. It was launched in 1995 to coordinate phytosanitary issues related to market access and maintenance for horticulture exports. Its activities have provided access to new markets and improved access to existing ones, which have contributed to job creation and rural economic development. For instance, in the early stages of the citrus export program for the US market, 70% of all fruit presented for inspection in South Africa was rejected for non-compliance with export requirements. Through ongoing collaboration and service provisioning by members of MAWG, the situation has dramatically improved: in 2011 the rejection rate was reduced to less than 10% (Hopper and others, 2012).

The Kenyan experience shows the need for more customized standards for fresh fruits and vegetables, which was addressed with the development of a specific standard called KenyaGAP Initiative (Otieno and Knorrington, 2012). In turn, MéxicoGAP was developed with the support of the Ministry of Agriculture. KenyaGAP Initiative has incorporated concepts and standards of GAP and HACCP aligning the Kenyan standards with GLOBALGAP, EuropGAP and other international certifications. As Otieno and Knorrington (2012) argue, KenyaGAP, developed by the Fresh Produce Exporters Association of Kenya (FPEAK), is at present the only comprehensive quality assurance scheme on the entire African continent to have acquired an equivalent to EuropGAP and GLOBALGAP.

MéxicoGAP is a certification created with the aim of increasing the competitiveness of Mexican agricultural products in domestic and international markets. MéxicoGAP is similar to EuropGAP and is operated by Mexico Supreme Quality.¹⁷ It was designed and developed with the technical assistance of the Ministry of Agriculture through the national agro-food quality service. The objective of MéxicoGAP is to provide a tool of good manufacturing practices based on legislation from different markets to facilitate global trade in Mexican fruits and vegetables. It is endorsed and recognized by the major supermarkets in Europe and the US; Wal-Mart has also accepted this award for its suppliers in Latin America through its Global Procurement arm.

As the KenyaGAP and MéxicoGAP experiences show, this quality assurance scheme could provide new spaces for the development of certification service suppliers and national brands or labels. These services bring together private and public sector stakeholders with an interest in increasing capacity to address issues affecting a particular value chain, such as horticulture products in Kenya or organic products in Mexico, in order to expand production and increase exports. Often these partnerships address a range of issues including, but not limited to, SPS requirements. Value chain management places a premium on effective coordination and linkages among stakeholders in support of services, such as,

¹⁷ For the producers to use this label, they must go through an evaluation process (with different inspections carried out for third party organisations) of production systems to ensure SPS standards are met. It also conducts biological effectiveness assessments of inputs (fungicides, insecticides, and nematicides) to control pests/disease in organic agriculture.

information exchange, production processes, standards, innovation, product development and other business activities. This often creates opportunities for new suppliers of services (Hopper and others, 2012).

In Guatemala and El Salvador, agricultural R&D is largely undertaken by public research centres and universities (Stads and others, 2008). Agricultural R&D conducted by the private sector has expanded in recent years. Nevertheless, the role of the private sector is, and is likely to remain small given the weakness of funding incentives for private research in these countries and the entire Central American region. Many private-sector companies demand applied research to optimize production, reduce costs, and control pests and diseases, only after new crops have been introduced.

The Argentinean and Chilean experiences show the advisability of monitoring for diseases, pests, and beneficial organisms. Agricultural engineering services are required to set monitoring parameters. For example, the Patagonian Zoo-Phytosanitary Barrier Foundation (FUNBAPA, for its Spanish acronym) in Argentina provides a wide range of services in order to declare and maintain Patagonia as a disease and pest free area using a sustainable development approach, and ensuring compliance with regional, national and international SPS standards (Hopper and others, 2012).

The Danish Technology Institute offers bacteria detection and identification services through traditional cultivation of bacteria and molecular biological analyses. The Institute conducts R&D to support farmers and other links of the agro-food value chain. For instance, it has developed a user-friendly test that monitors fruits and vegetables for human faecal contamination and the presence of human norovirus, which may cause gastrointestinal infections. This institute follows a collaborative strategy for its R&D projects, working together with producers, firms and other research organisations.

In the same way, Webstech, a Danish R&D firm, offers technological services for agriculture, such as Sensseed, a robust system for remotely monitoring stocks of grains and seeds. According to a survey of Sensseed users in December 2012, farmers agreed the technology resulted in energy savings, time savings and quality improvement.¹⁸

There are also organisations that serve as a bridge between researchers and producers by processing and conveying the latest knowledge from research organisations, companies and universities. For instance, the Knowledge Centre for Agriculture in Denmark adapts and communicates the latest knowledge for the agriculture sector, providing services to Danish farmers and horticulturalists aiming to produce high quality products. In the field of crop production, this organisation generates new knowledge through national trials, farm tests and cooperative efforts with research scientists; conveys knowledge through Internet and physical channels; develops and offers information technology (IT) solutions for data management, and provides advisory services to Danish farmers, mainly through local advisers.

It is important to mention that Guatemala has launched initiatives to support value chains through R&D services. AGEXPORT recently launched the Agricultural Research and Development Program (PIDA, for its Spanish acronym) to support local exporters and producers and to promote agricultural research projects that can be implemented immediately. The purpose of the program is to improve the quality of nontraditional agricultural products for export by providing technical assistance in the execution of experiments, field activities, and technology transfer activities. Considering current bottlenecks in Guatemala, this program could be complemented with diverse, high-yield varieties that endure infertile soils, drought, pests, and diseases, research to help farmers exploit the full potential

¹⁸ Information available on the web, see <www.webstech.dk>.

of improved seeds while conserving soil and water resources, and training opportunities in management research.

Third, as we saw in the case of the shrimp value chain, market information can strengthen the ability of producer capabilities to commercialize their vegetables, find new markets and develop new processed products to meet consumer tastes and needs. These could result in higher revenues, arising from increased sales and higher value added.

For instance, MasAgro Mobile System, implemented in Mexico by the International Maize and Wheat Improvement Centre (CIMMYT), provides pricing, technical and weather information to farmers, extension agents, researchers, input suppliers and marketers, thus reducing the information gap in rural areas and improving farmers' bargaining power with local intermediaries and input suppliers.

Yet mobile information services, such as MasAgro Mobile, rarely make an impact if they are not bundled with financial services. Bundling information and financial services has a greater impact because users are actually able to upgrade both process and products with the new information they have. Furthermore, bundled services help reduce financial risks by creating new guarantees based on information obtained by mobile apps, supporting new models of insurance.

C. FINE WOODS VALUE CHAIN IN PETÉN, GUATEMALA

There is an important role for services in the following five areas. First, research and development services and technical assistance may improve quality, revenues and competitiveness in general. These knowledge-intensive services can support a better exploitation and commercialization of secondary fine woods (such as Guatemalan cherry, Santa María and Tropical walnut). It may also help improve technological processes for the cutting and transformation of wood. R&D services are also needed to enhance tree growth processes, for instance through better seeds, fertilizers and pesticides.

For instance, FPIInnovations is a Canadian non-profit research centre working in forest research that helps the Canadian forest industry developing innovative solutions based on the unique attributes of Canada's forest resources. It offers services in 11 research programs in diverse areas such as forest operations, primary wood products manufacturing, biomaterials and sustainability. FPIInnovations offers a wide array of knowledge-intensive services for all links of the value chain including new tools and technologies for identifying wood fibre characteristics and their locations, providing applied research for primary and secondary producers, and developing non-traditional wood products (FPIInnovations, 2013). This research centre, for example, developed a new method to optimize the selection and cutting process, increasing long-term production by 7% (Meek, 2012).

R&D services may be also provided by public organisations. In Mexico, the National Institute of Forestry, Agriculture and Livestock Research (INIFAP) provides technical assistance and offers technical knowledge in diverse areas, such as sustainable management of forests, analysis and application of fungi to replace fertilizers in forests and new technology to improve wood brushing. Similarly, the Forest Institute of Chile (INFOR) provides technical support to promote innovation and improve competitiveness, develop new products, increase quality and optimize revenues.

Second, the fine woods value chain in Petén would be greatly benefited by training services for improving local knowledge and skills. Training services may be offered in a wide array of areas: strategic planning, market protocols, management, as well as certification and production methods, among others.

Private enterprises, local governments, non-governmental organisations and other joint initiatives may provide these services. For instance, in 2005 Rainforest Alliance, with the support of Gibson Musical Instruments, launched a project to provide technical assistance to community cooperatives that harvest timber and non-timber forest products in Honduras. This project offered enterprise training in business management and organisation, techniques for value-added production, inventory and cost control, strategic alliance formation and international certifications. By 2008, the cooperatives had achieved significant success: raising revenues (+128%) as well as production (+33%); lowering the percentage of rejects from 83% in 2005 to 49% in 2008, and improving sawmill performance by 12%, among other benefits (Fortin and others, 2010).

Third, financial support for primary and secondary wood producers is crucial. Financial services that offer loans better suited for this chain, in terms of interest rates and conditions, are needed. Farmers often find it difficult to access credit lines since banks commonly consider them high-risk borrowers incapable of meeting loan application requirements (financial statements, guarantees, credit history, etc.). Forestation, re-forestation, new equipment and machinery, among other activities, demand significant amounts of financial resources that forest concessions in Guatemala do not possess.

In Norway, the Forest Trust Fund was built through compulsory contributions from all forest owners. Almost all direct public financing of forestry is channelled through this fund. It provides financial support services for regeneration and reforestation, fertilization, drainage and improvement of existing drainage, as well as construction and improvement of forest roads and transport, among other activities (Bergseng and Solberg, 2007). In Costa Rica, the National Fund for Forest Financing is an example of public financial services for this value chain. The fund supports local producers by offering low interest rates and repayment terms that are suitable for their capabilities.

Other kinds of services are provided by organisations, such as Rainforest Alliance, that help farmers identify their financial needs and draft borrower profiles, support them with business and financial management technical assistance, and link them with the appropriate financial institutions.¹⁹ For example, Rainforest supported the Mexican community of San Bernardillo de Milpillas, in the state of Durango, to map its financial needs and develop a raise-funding plan. From 2006 to 2008, this community invested 1.1 million of US dollars, with 46% of the funds coming from the community operation and the remainder from federal and state programs. The investments went toward light sawmill mechanization, wood classification tables, wood dryers, work trucks and new electrical systems. The benefits were significant: a 15% gain in annual allowable cut achieved, a 43% lowering of production costs, improved product quality (a 5% increase in top quality lumber and 9% decrease in worst quality timber), and a 19% increase in average sales price, among others (Butterfield and others, 2009).

Fourth, market intelligence would contribute to strengthen competitiveness of this value chain through enhanced information on new markets, new products, competitors and suppliers, among others. Better and timely market information supports producers to obtain higher prices; address new customers demands and purchase better inputs, among other benefits.

As part of the already mentioned technical assistance project run by Rainforest Alliance in 2005 to provide support to community cooperatives in Honduras, a commercial alliance with the international buyer North American Wood Products (a supplier of Gibson Guitars) was signed to sell eleven containers of guitar necks exported to Gibson (78,251 board feet of mahogany) with total value of 345,304 of

¹⁹ See <<http://www.rainforest-alliance.org/work/finance>>.

US dollars. A marketing alliance between the cooperatives and a domestic buyer, Caobas de Honduras, agreed to sell 64,340 board feet of mahogany for 146,272 of US dollars (Fortín and others, 2010).

There are international providers of market information relevant to this value chain. For instance, the International Tropical Timber Organisation (ITTO) provides market trends and trade news from around the world, as well as indicative prices for over 400 tropical timber and added-value products. In the same way, Resource Information Systems Inc. (RISI) provides market information and transaction prices for North American timberland markets.

Table 2 summarizes the services identified for overcoming bottlenecks in each value chain. The first row presents examples of specialized services for specific links, while the second illustrates services provided across the value chain. Services have a positive impact in terms of product and process and, to a lesser extent, functional upgrading. And technological upgrading is closely related to higher value added. R&D and technical assistance services provide input suppliers and producers with new knowledge to improve intermediate and final goods. Their impact on productivity, product quality and incomes is significant. Market research and market intelligence services are valuable to the design of new products and improving the existing ones.

Services to support certification and best practices labels improve diverse processes across the value chain. Along with logistics and transportation services, they have positive effects in terms of costs, efficiency and quality. As for functional upgrading, services such as R&D and training may help producers engage in more complex activities associated with higher value added.

Some services, such as financing and IT, are supplied across the value chain. Local stakeholders of agro-industry value chains in developing countries usually face limited access to formal sources of credit. Loans at competitive rates, as well as financial advice, result in better product quality, lower cost and higher profits. By the same token, IT services support all links of agro-industry value chains, through improved market information, new tools for enhancing management processes and access to new technological knowledge, among others.

Lastly, the analysis of agro-industry value chains in El Salvador and Guatemala, as well as the search for best international practices, shows that few local firms provide PS services in developing countries. These services are mainly provided by non-governmental organisations, non-profit international organisations and public agencies. In contrast, in developed countries private firms play a more active role in supplying PS services. On the one hand, the demand for PS services in developing countries is reduced. Local producers do not always possess financial resources to afford them, since they are frequently expensive. On the other, the supply of those local services is limited. For instance, certification processes are commonly conducted by foreign firms.

TABLE 4
PROFESSIONAL AND SUPPORTING SERVICES FOR UPGRADING THREE SELECTED VALUE CHAINS

Inputs		Production/manufacturing			Transport and commercialisation			
Shrimp	Vegetables	Wood	Shrimp	Vegetables	Wood	Shrimp	Vegetables	Wood
R&D to improve inputs' quality and safety	Agricultural R&D to produce seeds, and improve fertilizers and pesticides	R&D to improve seeds, fertilizers and pesticides	Certification s and BPA	Certification s and BPA	Training and technical assistance	Transportation of shrimp in safe conditions	Market intelligence	Market research and market intelligence
Across the value chain								
Shrimp			Vegetables			Wood		
IT services for better information on markets and technologies		IT services for better information on markets and technologies		IT services for better information on markets and technologies		Financial services for better access to inputs, technologies, market information and transportation		

Source: Own elaboration.

VI. CONCLUSIONS

Professional and supporting services play a key role in the technological upgrading of primary goods and manufacturing value chains. This paper examined the case of three agro-industry value chains: fine woods and non-traditional vegetables in Guatemala, and shrimp in El Salvador. R&D services, technical assistance, market research, training and certifications, and logistics and transportation, among others, offer access to new knowledge and technologies to improve products and processes, and engage in more technologically complex activities (i.e. product, process and functional upgrading). By doing so, services have a significant impact in terms of technological upgrading and increasing domestic value added of domestic sales and exports of primary goods and manufactures.

Professional and supporting services are needed across the value chain. The supply of inputs is enhanced, for instance, through R&D services to create new or improved seeds, fertilizers and pesticides. The production of agricultural products, the second link, is technologically upgraded through services aimed at supporting international certification processes and implementation of best international practices. In turn, transport and commercialization are improved through diverse services such as logistics, market research, market intelligence, and cargo and handling services.

Professional and supporting services are not only important to increasing domestic value added of agro-industry value chains., they are also crucial for improving the share of total value added captured by core links of the chain. For instance, better market information and enhanced cultivation processes for shrimp growers, through IT services and technical assistance, would improve their capabilities to negotiate better prices (with the intermediaries) and benefit from higher revenues. Furthermore, in international value chains, services are crucial for higher domestic appropriation of total value added; that is stronger capabilities and technological upgrading, are associated with higher revenues for local producers.

These services may be provided by private enterprises, public organisations, non-profit national and international organisations or mixed-capital organisations. In developing countries such as El Salvador and Guatemala, and in value chains dominated by small and rural producers, private services can rarely be afforded. Certifications and R&D services, for instance, are frequently too expensive for rural producers. In addition, there are few private local firms that offer PS services, in contrast to developed countries in which service firms possess stronger capabilities and there is higher demand from local producers.

Therefore, the government plays at least three important roles to foster both supply and demand for professional and supporting services. First, public organisations focused on supporting SMEs, public research centres and sectorial public bodies provide technical assistance to producers and other links of the value chain, that is professional and supporting services are directly supplied by public agencies. Second, public policies to support the creation and strengthening of domestic providers of professional and supporting services are needed, for instance financial support for human capital formation and investment in new technologies. Third, public initiatives oriented to financing access to professional and supporting services by all actors of the value chain are required to facilitate access of small producers to professional and supporting services.

There is room also for public policies aimed at supporting specific value chains. In the shrimp farming value chain, the government, for instance, with the support of cooperatives, might create a research and technology centre, which would conduct research on the sustainable development of shrimp aquaculture, genetic improvement of shrimps and innovations of productive systems.

In the non-traditional vegetable value chain, the government may provide technical and financial assistance to industry associations and consultants to strengthen their capabilities for supporting certification and best-international-practices implementation processes. In turn, in the fine woods value chain, forge links with local training organisations for the formation of technicians in areas such as general carpentry, door-making, windows and furniture making, and dowelling and carving among others.

This document illustrates the importance of the value chain approach for industrial policy making. The detailed study of each link, relationships among them, and public and private actors that affect directly or indirectly the chain contribute to a better understanding of strengths and opportunities to promote technological upgrading and increasing domestic value added.

As a line of further research, the supply of services to primary goods and manufacturing value chains represents a window of opportunity for local SMEs. International value chains of goods usually demand complex requirements that cannot be met easily by SMEs in developing countries, such as high quality, sanitary and phytosanitary measures (SPS), large scales, just-in-time production schemes, and rapid technical change. The supply of professional and supporting services may demand significant investments in qualified human resources, information technologies, and access to new sources of knowledge, but they can be overcome easier than those barriers in goods. Moreover, local knowledge and networks are a significant advantage when supplying these services.

Finally, this document underlines a useful application of comparative analysis across value chains. Another areas open to future research is the impact of services on value chain governance. If the chain is strongly dominated by one actor, such as intermediaries or middlemen, market intelligence and transportation services may help reduce their power over prices or revenue appropriation. Therefore services may increase competition and fairer conditions for small producers.

BIBLIOGRAPHY

- Asociación Guatemalteca de Exportadores (AGEXPORT) (2014), *Noticias*, Guatemala.
- _____ (2013), *Noticias*, Guatemala.
- Ángel, A. (2011), *Panorama productivo e infraestructura para el desarrollo rural en El Salvador*, Proyecto Estado de la Región/RUTA/FIDA-Determinantes de la pobreza rural en Centroamérica: desafíos y oportunidades para la acción, San Salvador, available on line: <<http://amyangel.webs.com/pobreza%20rural%20ES%20final.pdf>>.
- Barrientos, S., G. Gereffi and A. Rossi (2010), “Economic and social upgrading in global production networks: Developing a framework for analysis”, *Capturing the Gains working paper*, 2010/03, available on line <www.capturingthegains.org>.
- Baumesiter, E. (2013), *Concentración de tierras y seguridad alimentaria en Centroamérica*, Coalición Internacional para el Acceso a la Tierra y Fondo de Desarrollo Noruego, Rome.
- Bergseng, E. and B. Solberg (2007), *Evaluating financing of forestry in Europe (EFFE) Country report–Norway*, INA fagrappport 8, Institutt for naturforvaltning Universitetet for miljø-og biovitenskap, Norway.
- Beteta, H. and J. C. Moreno-Brid (2014), “Cambio estructural y crecimiento en Centroamérica y la República Dominicana”, *Libro de la CEPAL N° 122*, United Nations, Santiago, Chile.
- Butterfield, R., R. Fortin, T. Hernández and M. Manzanero (2009), *Strengthening the value chain for indigenous and community forestry operations through increased investment and use of technical assistance*, Rainforest Alliance, Washington, D. C.
- Castillo Juárez, H. (2005), *Instrumentación de un programa de selección genética del camarón blanco del Pacífico Litopenaeus vannamei*, Universidad Autónoma Metropolitana, Xochimilco-México.
- Charoen Pokphand Foods Public Company Limited (2005), *Annual Report*, Bangkok.
- CIBNOR (2011), *Bioseguridad y ecoeficiencia en el cultivo de camarón*, CIBNOR, AERI, FORDECYT, La Paz.
- Conserjería de Agricultura, Pesca y Desarrollo Rural de la Junta de Andalucía (2012), “Requisitos de exportación a terceros países”, available on line: <<http://www.juntadeandalucia.es/agriculturaypesca/portal/areas-tematicas/agricultura/sanidad-vegetal/requisitos-de-export.-a-terceros-paises.html>>.
- Consultative Group to Assist the Poor (W/D), “About CGAP, CGAP-World Bank”, Washington, D.C., available on line: <<http://www.cgap.org/>>.
- Cordero, M. (2014), “Cadena de hortalizas de exportación no tradicionales en Guatemala”, in R. Padilla Pérez, “Fortalecimiento de cadenas de valor como instrumento de política industrial”, *Libros de la CEPAL N° 123*, United Nations-ECLAC and GIZ, Santiago, Chile.
- Díaz, A. (2010), *Mejora de la competitividad y acceso a mercados por medio del desarrollo y aplicación de normas de inocuidad y calidad: el caso de los espárragos peruanos*, IICA, Buenos Aires.
- ECLAC/FAO/IICA (Economic Commission for Latin America and the Caribbean/Food and Agriculture Organization of the United Nations/Inter-American Institute for Cooperation on Agriculture) (2014), *The outlook for agriculture and rural development in the Americas: A perspective on Latin America and the Caribbean 2014*, United Nations, Santiago, Chile.
- ECLAC (Economic Commission for Latin America and the Caribbean) (2013a), *Comercio y desarrollo inclusivo: Los caminos del comercio internacional y la integración hacia la igualdad*, United Nations, Santiago, Chile.
- _____ (2013b), *Statistics yearbook for Latin America and the Caribbean*, United Nations, Santiago, Chile.
- _____ (2012), *Cambio estructural para la igualdad*, United Nations, Santiago, Chile.
- Escuela Agrícola Panamericana Zamorano (2013), “Planta de concentrados”, available on line: <<http://www.zamorano.edu/campus/parque-agroindustria/planta-de-concentrados/>>.
- Fernández-Stark, K., P. Bamber and G. Gereffi, (2014), “Global value chains in Latin America: A development perspective for upgrading” in *Global value chains in Latin America*, United Nations-ECLAC, Santiago, Chile (forthcoming).
- Food and Water Watch (2008), “Suspicious shrimp: The health risks of industrialized shrimp production”, F&WW, Washington, D. C.
- Fortín, R., R. Butterfield and B. D. Hodgdon (2010), *The impacts of training, technical assistance and new market access for community forest enterprises in the Rio Platano Biosphere Reserve-Honduras*, Rainforest Alliance, Washington, D. C.
- FPInnovations (2013), *Annual report and review of activities 2012-2013*, Quebec.

- Francois, J. and J. Woerz (2007), “Producer services, manufacturing linkages, and trade”, *Tinbergen Institute Discussion Paper* (TI 2007-045/2), Tinbergen Institute, Amsterdam.
- Frederick, S. and G. Gereffi (2011), “Value chain governance”, *USAID Briefing Paper*, USAID, Washington, D. C.
- Gereffi, G., J. Humphrey and T. Sturgeon (2005), “The governance of global value chains”, *Review of International Political Economy*, Vol. 12, N° 1.
- Gereffi, G. (2001), “Beyond the producer-driven/buyer-driven dichotomy. The evolution of global value chain in Internet era”, *IDS Bulletin*, Vol. 32, N° 3.
- _____ (1999), “International trade and industrial upgrading in the apparel commodity chain”, *Journal of International Economics*, Vol. 48, N° 1.
- _____ (1994), “The organisation of buyer-driven global commodity chains. How US retailers shape overseas production networks”, in Gereffi, G. and R. Korzeniewicz (editors), *Commodity Chains and Global Capitalism*, Praeger Publisher, Westport.
- Gereffi, G. and M. Korzeniewicz (editors) (1994), *Commodity Chains and Global Capitalism*, Praeger Publishers, Westport.
- GSMA (2013), “Scaling mobile for development”, GSMA, London, available on: <<https://gsmaintelligence.com/files/analysis/?file=130828-scaling-mobile.pdf>>.
- Hopper, M., J. Salles Almeida, M. Garcia, H. Rodríguez Vázquez and J. Gilpin (2012), *Public-private partnerships to enhance SPS capacity: What can we learn from this collaborative approach?*, Standards and trade development facility/Inter-American Development Bank, Geneva.
- Humphrey, J. and H. Schmitz (2002), “How does insertion in global value chains affect upgrading in industrial clusters?”, *Regional Studies*, Vol. 36, N° 9.
- Jensen, R. (2007), “The Digital Divide: Information (Technology), Market Performance, and Welfare in the South Indian Fisheries”, *The Quarterly Journal of Economics*, Vol. 122, N° 3.
- Kaplinsky, R. and M. Morris (2000), *A handbook for value chain research*, IDRC, United Kingdom.
- Lodefalk, M. (2012), “The role of services for manufacturing firms exports”, *Working Paper 10*, Swedish Business Scholl, Sweden.
- López, A., D. Ramos and I. Torre (2009), “Las exportaciones de servicios de América Latina y su integración en las cadenas globales de valor”, Project Document, United Nations-ECLAC, Santiago, Chile.
- Meek, P. (2012), “Forest operations: Research results”, Presentation delivered at Hardwood Initiative Workshop, April 24th and 25th, Quebec.
- Milberg, W. and D. Winkler (2010), “Economic and social upgrading in global production networks: Problems of theory and measurement”, *Capturing the Gains Working Paper*, 2010/04, available on line <www.capturingthegains.org>.
- Ministerio de Agricultura, Alimentación y Medio Ambiente (2012), “Manual de aplicación de CEXVEG–Campañas específicas de Exportación”, Madrid.
- Ministerio de Agricultura y Desarrollo Rural–Observatorio de Agrocadenas (2005), *La cadena de camarón de cultivo en Colombia. Una mirada de su estructura y dinámica, 1991-2005*, Bogotá.
- Nordás, H. K. and Y. Kim (2013), “The Role of Services for Competitiveness in Manufacturing”, *OECD Trade Policy Papers*, No. 148, OECD Publishing, Paris.
- Oddone, N. and C. Beltrán (2014), “La cadena de valor del camarón de cultivo en El Salvador”, in R. Padilla Pérez, “Fortalecimiento de cadenas de valor como instrumento de política industrial”, *Libros de la CEPAL N° 123*, United Nations-ECLAC and GIZ, Santiago, Chile.
- _____ (2013), *Diagnóstico de la cadena de camarón de cultivo en El Salvador (LC/MEX/L.1137)*, United Nations-ECLAC and GIZ, Mexico, available on line: <http://www.eclac.org/cgi-bin/getProd.asp?xml=/publicaciones/xml/9/52059/P52059.xml&xsl=/publicaciones/ficha.xsl&base=/publicaciones/top_publicaciones.xsl>.
- Oddone, N., R. Padilla-Pérez and B. Antunes (2014) “Metodología del Proyecto CEPAL-GIZ para el diseño de estrategias de fortalecimiento de cadenas de valor”, in R. Padilla Pérez, “Fortalecimiento de cadenas de valor como instrumento de política industrial”, *Libros de la CEPAL N° 123*, United Nations-ECLAC and GIZ, Santiago, Chile.
- OECD (2013), *Interconnected economies: Benefiting from global value chains*, OECD Publishing, Paris.
- Otieno, G. and P. Knorrinda (2012), “Localizing global standards. Illustrative examples from Kenya’s Horticulture Sector”, in Van Dijk, P. and Trienekens, J. (editors), *Global Value Chains: Linking Local Producers from Developing Countries to International Markets*, Amsterdam University Press and European Association of Development Research and Training Institutes, Amsterdam.

- Padilla Pérez, R. and J. Alvarado (2014), “Desempeño exportador y heterogeneidad estructural en Costa Rica”, en *Estado de la Nación*, Serie-Aportes para el análisis del desarrollo humano sostenible N° 12, Programa Estado de la Nación, San José, Costa Rica.
- Padilla Pérez R. (editor) (2013), “Sistemas de innovación en Centroamérica. Fortalecimiento a través de la integración regional”, *Libros de la CEPAL N° 118*, United Nations-ECLAC and GIZ, Santiago, Chile.
- Padilla Pérez R. and R. A. Hernández (2010), “Upgrading and competitiveness within the export manufacturing industry in Central America, Mexico, and the Dominican Republic”, *Latin American business review*, Vol. 11, N° 1.
- Paul, S., M. S. Reza, F. MShikha, M. Khan and M. Kamal (2010), “Culture practices and quality loss of shrimp and prawn at different stages of handling and transportation in Bangladesh”, *Int. J. BioRes*, Vol. 1, N° 4.
- Porter, M. (1990), *The competitive advantage of nations*, Free Press, New York.
- Rentzhog, M. (2010), *At your service: The importance of services for manufacturing companies and possible trade policy implications*, National Board of Trade, Sweden.
- Ricardo, M. (2014), “La cadena de valor de los productos maderables de las concesiones forestales de Petén, Guatemala”, in R. Padilla Pérez, “Fortalecimiento de cadenas de valor como instrumento de política industrial”, *Libros de la CEPAL N° 123*, United Nations-ECLAC and GIZ, Santiago, Chile.
- SESAN (Secretaría de Seguridad Alimentaria y Nutricional)/INE (Instituto Nacional de Estadística) and FAO (Food and Agriculture Organization of the United Nations) (2011), *Prevalencia de inseguridad alimentaria del hogar en Guatemala. Encuesta Nacional de condiciones de vida 2011 (ENCOVI)*, Guatemala.
- SELA (Sistema Económico Latinoamericano y del Caribe) (2012), “Cadenas de valor, pymes y políticas públicas. Experiencias internacionales y lecciones para América Latina y el Caribe”, Foro sobre el diseño de políticas públicas: Inserción de PYMES en cadenas de valor, globales y regionales, Caracas.
- Stads, G. J., F. Hartwich, D. Rodríguez and F. Enciso (2008), *Agricultural R&D in Central America. Policy, investments and institutional profile*, International Food Policy Research Institute and Inter-American Institute for Cooperation in Agriculture, Washington, D. C., available on: <http://www.asti.cgiar.org/pdf/ASTI_CentralAmerica-En.pdf>.
- Thai Ministry of Agriculture and Cooperatives (2009), *Good aquaculture practices for marine shrimp farm*, National Bureau of Agricultural Commodity and Food Standards, Bangkok.
- The Fish Site (2012), *Small-scale shrimp farmers and global markets*, available on line: <<http://www.thefishsite.com/articles/1322/small-scale-shrimp-farmers-and-global-markets>>.
- UNDP (United Nations Development Program) (2011), *Human development report*, United Nations, New York.
- UNIDO (United Nations Industrial Development Organisation) (2009a), *Value chain diagnostics for industrial development. Building blocks for a holistic and rapid analytical tool*, United Nations, Vienna.
- _____ (2009b), *Developing a value chain diagnostics tool for common practice at UNIDO. Expert group meeting report*, United Nations, Vienna.
- _____ (2006), *Global value chains in the agrifood sector*, United Nations, Vienna.
- US Food and Drug Administration (2011), “FSMA Proposed rule for focused mitigation strategies to protect food against intentional adulteration”, Washington, D. C., available on line: <<http://www.fda.gov/Food/GuidanceRegulation/FSMA/ucm378628.htm>>.
- Van Dijk, P. and J. Trienekens (editors) (2012), *Global value chains: Linking local producers from developing countries to international markets*, Amsterdam University Press and European Association of Development Research and Training Institutes, Amsterdam.
- Van Nhuong, T, C. Bailey, and N. Wilsom, (2011), “Governance of Global Value Chains. Impacts shrimp producers in Viet Nam”, *Global Aquaculture Advocate*, World Fish Centre, Penang, available on line: <http://www.worldfishcenter.org/resource_centre/WF_3003.pdf>.
- Wati, L., W. Chang and M. Mutadjab, (2013), “Competitiveness of Indonesian shrimp compare with Thailand shrimp in export market”, *Wacana*, Vol. 15, N° 1, Universitas Brawijaya, Jakarta, available on line: <<http://wacana.ub.ac.id/index.php/wacana/article/viewFile/270/230>>.