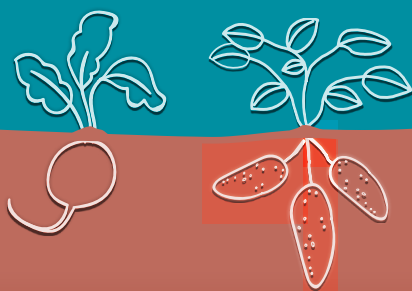




Food and Agriculture
Organization of the
United Nations

Logistics in the horticulture supply chain in Latin America and the Caribbean

Regional report
based on five country
assessments and findings
from regional workshops



Logistics in the horticulture supply chain in Latin America and the Caribbean

Regional report
based on five country
assessments and findings
from regional workshops

by
Jorge M. Fonseca
and **Natalie Vergara**



Recommended citation

FAO. 2015. *Logistics in the horticulture supply chain in Latin America and the Caribbean – Regional report based on five country assessments and findings from regional workshops.*
By Fonseca, J. M. & Vergara, N. Rome, Italy.

Back cover photographs:

©Daniel Ramirez

©FAO/Saul Palma

The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations (FAO) concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these have been endorsed or recommended by FAO in preference to others of a similar nature that are not mentioned.

The views expressed in this information product are those of the author(s) and do not necessarily reflect the views or policies of FAO.

ISBN 978-92-5-108819-7

© FAO 2015

FAO encourages the use, reproduction and dissemination of material in this information product. Except where otherwise indicated, material may be copied, downloaded and printed for private study, research and teaching purposes, or for use in non-commercial products or services, provided that appropriate acknowledgement of FAO as the source and copyright holder is given and that FAO's endorsement of users' views, products or services is not implied in any way.

All requests for translation and adaptation rights, and for resale and other commercial use rights should be made via www.fao.org/contact-us/licence-request or addressed to copyright@fao.org.

FAO information products are available on the FAO website (www.fao.org/publications) and can be purchased through publications-sales@fao.org.

Contents

PREFACE	vi
ACKNOWLEDGEMENTS	vii
EXECUTIVE SUMMARY	viii
ABSTRACT	xii
ABOUT THE AUTHORS	xiii
ABBREVIATIONS AND ACRONYMS	xiv
Chapter 1	
Introduction	1
1.1 Objective	1
1.2 Target audience	1
1.3 Methodology	1
1.4 Conceptual framework	2
1.5 Structure of the report	3
Chapter 2	
Macroeconomic country profiles	5
Chapter 3	
Logistics in the regional agrifood market	9
3.1 Logistics performance in the region	9
3.2 Trade in the regional market	14
3.3 Distribution for selected food supply chains	16
3.4 Logistics costs in the food supply chain	19
Chapter 4	
Logistics components in the produce sector – main challenges	27
4.1 Infrastructure and transportation	27
4.2 Information and communication technology	31
4.3 Electricity and the cold chain	32
4.4 Human capital and logistics management decisions	33
4.5 Procedures for trade facilitation	34
4.6 Other difficulties in logistics processes	36
4.7 Country-specific analysis	36
Chapter 5	
Results from the expert workshop	39
5.1 Validation of logistics components	39
5.2 Policy and action prioritization	42

Chapter 6	
Further ideas and efforts to promote logistics development	45
6.1 Food safety in transportation	45
6.2 Models to improve supply chain management at enterprise level	46
6.3 Free trade zones to promote logistics efficiencies	47
6.4 Partnerships to increase human capital and knowledge information	47
6.5 Further suggestions from the caribbean	48
Chapter 7	
Recommendations and plans of action	51
Chapter 8	
Final remarks	55
BIBLIOGRAPHY	57
ANNEXES	
1 SWOT analysis	61
2 Main policies and institutions affecting logistics development	63
BOXES	
1 Producers' and exporters' organizations in Chile	18
2 Walmart procurement from smallholders in Guatemala	19
3 Producers' and exporters' organizations in Chile	23
4 Exporters' association in Guatemala	23
5 Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be used for such Carriage	45
6 Sanitary Food Transportation Act	46
7 Georgia Tech Panama Logistics Innovation and Research Center	47
8 Institute of Food Technology in Brazil	47
9 Center for Latin American Logistics Innovation in Colombia	48
FIGURES	
1 Logistics activities	3
2 GDP growth rate in LAC	6
3 Logistics Performance Index, 2007–2012	10
4 Relation between GDP per capita and LPI scores for LAC countries	11
5 Exports to trading blocks in LAC, as a percentage of total exports	15
6 General processes in the food supply chain	17
7 Food logistics supply chain	17
8 Hortifruti operational model	19
9 Logistics costs as a percentage of GDP	20
10 Average logistics costs by component as a percentage of total value of company sales, as affected by enterprise size	21
11 Grape export costs from Chile to the United States of America – shares	24
12 <i>Uchuva</i> export costs from Colombia to the Netherlands – shares	25
13 Components in infrastructure and transportation activities	27
14 Container export costs (in US\$)	31
15 Criteria for logistics outsourcing	34

TABLES

1	Macroeconomic variables	5
2	Economic activities in national GDP	6
3	Demographic characteristics (2011)	6
4	Human Development Index (2011)	6
5	Poverty headcount and Gini Index	7
6	Logistics Performance Index	9
7	LPI main indicators	10
8	Fuel costs	12
9	Global Competitiveness Index	12
10	Ease of Doing Business Index	13
11	Enabling Trade Index	13
12	Summary of indicators to assess logistics and competitiveness performancex	14
13	Exports/imports of agricultural products (2011)	14
14	Degree of buyer sophistication and consumer orientation	18
15	Country enterprise classification	21
16	Grape export costs from Chile to the United States of America	24
17	<i>Uchuva</i> export costs from Colombia to the Netherlands – shares	24
18	Infrastructure level according to the Global Competiveness Index	30
19	Infrastructure level according to the Enabling Trade Index	30
20	Use of information and communication technology	32
21	Population density per m ³ of cold supply chain (2010 estimate)	32
22	Access to electrical energy	33
23	Quality of electrical energy	33
24	Processes to import/export merchandise	35
25	Enabling Trade Index – border administration	35
26	Logistics components for the produce sector – issues and proposed indicators	40
27	Action prioritization for developing logistics systems in the produce industry	43
28	Logistics components for the produce sector – issues and proposed indicators	61

Preface

Food as a trade commodity has the singularity of deteriorating over time. This is particularly true with perishable foods such as horticultural products. Perishability and subsequent decline in quality largely determine the fate of producers and enterprises in the produce market. Constraints to achieving provision of “the right food at the right time” may be classified as those encountered during production and those encountered during food distribution. In this regard, the emphasis of states and international cooperation has traditionally been towards improving production technology, practices and services. More recently, post-production issues such as distribution and marketing of food have been addressed from different perspectives, including engineering design improvement, post-harvest physiology-based practices, value chains and agribusiness management approaches. However, logistics in its whole concept has been overlooked. Logistics includes the management of various aspects that are critical for the competitiveness of smallholders, such as commodity characteristics, infrastructure, market requirements and social practices. This report aims to provide a basic understanding of what logistics systems are and how they function, in order to determine opportunities for improving efficiency all along the supply chain. A common preconception that logistics are mere storage and transportation is challenged by providing an analysis that ranges from international trading to employers’ knowledge of food handling.

Food and Agriculture Organization of the United Nations (FAO) recognized that logistics is an area that warrants more attention, in order to achieve FAO’s objective of enabling inclusive and efficient agricultural and food systems. With the goal of increasing knowledge on food logistics, a project was implemented to assess the logistics systems in five countries in the Latin America and the Caribbean (LAC) region. The project was updated with additional information beyond specific country appraisals. This report first provides a general panorama of where the five selected countries stand in terms of logistics performance. It continues with an analysis of the main logistics components (infrastructure and transportation; information and communication technology (ICT); electricity and cold chain capacity; human capital; trade facilitation) and their impact on the produce sector within different countries. Specific aspects are discussed for each country, based on a strengths, weaknesses, opportunities and threats (SWOT) analysis produced after the country appraisals. Information gathered is complemented by that from experts in the Caribbean, and with additional reviews of different services and institutions involved in logistics. The last two chapters summarize the findings and formulate recommendations for improvement at macro- (state), meso- (subsector) and microlevel (enterprise).

While this document may be easily read by a general audience, it was elaborated to provide practitioners with tools that conceptualize logistics in its broadest dimension, using general background information (from country performance) and real-world examples (that are specific to produce operations). It should aid logistics managers and quality assurance staff in analysing the efficiency of their operations as well as technical bodies in public institutions and decision-makers in prioritizing work plans.

Acknowledgements

Many thanks go to Maritza Rodríguez and Elena Repetto for their work in the country assessments and the initial regional synthesis used as basic reference for this document, and for providing comments on the document.

The authors thank participants at the workshop in Panama City – Fernando G. Duque Soto, Roberto Montiglio (who also prepared the Chile appraisal), Jorge M. Jaramillo, Raúl Alemán, Rodolfo Hernández, Miguel Berna, César Catalán, Yessica de Maitin, Yoira Guillén, Melissa Sánchez and Sara Troetsch. Mr Jaramillo was instrumental in revising the technical content of all appraisals, suggesting the need for extra information and providing several figures, some of which have been used in this publication.

Further thanks to Dr Majeed Mohammed, convener of the Third International Conference on Post-harvest and Quality Management of Horticultural Products of Interest for Tropical Regions, in Port of Spain, Trinidad and Tobago, and to the participants of the side event on food logistics that contributed with presentations followed by perceptive discussions from which information was gathered for this report (Chapter 8) – Dr Govind Seepersad, Dr Arlington Iton and Nkosi Felix.

The authors also thank key informants for their help. These include Roberto Castañeda, Marco Tulio Santos, Elmer Juárez, Nancy Cárdenas, Carolina Castellanos, Bryan Garza, Nohemy Sánchez, Lesly de Bu, Esher Alemán, Ana Belén Rodríguez, Luis Sandi, Darío Gámez, Mohand Merzkani, Mario Perdomo, Tito Livio Zúñiga, Yuritza Oliver, Mila B. de Pereira, Miguel Berna, José A. Gago, Aristides Romero, Fernando G. Duque, Carlos R. García, Javier Díaz M., Catalina Crane, Rosario Córdoba, Fernando Matallana, César García, Daniel Castro, Luis F. Trujillo, Mónica López, Shirley Gómez, Janneth Siabatto, Andrés Garzón, Jorge Carulla and Pablo H. Martínez.

Our final thanks to Joseph Mpagalile and Idman Ahmed (FAO [AGS]), internal reviewers of the document, Larissa D'Aquilio (FAO [AGS]) for publishing coordination, Roberta Mitchell for copy editing; Claudia Tonini for design and layout and Lynette Chalk for proofreading.

Note: This report relies substantially on information generated through in-country assessments by Maritza Rodríguez and Elena Repetto (2012) commissioned by FAO, and a regional synthesis of the country reports entitled *Análisis de la cadena logística del sector agroindustrial agroalimentario en América Latina y El Caribe* (Rodríguez and Repetto, 2013). It also utilizes entire key messages and secondary information taken from the analysis in Fonseca and Vergara, 2014.

Executive summary

This report analyses the logistics processes undertaken by supply chains involving small and medium-sized enterprises (SMEs) in the produce supply chain in five countries in Latin America and the Caribbean (LAC): Chile, Colombia, Guatemala, Honduras and Panama. Its main purpose is to identify the primary challenges in the development of efficient logistics systems for the produce industry in the region. Preliminary assessments in the selected countries revealed the importance of horticultural products for smallholders, which justifies focusing here on fruit and vegetables.

The document aims to serve as a source of information for state decision-makers and the different actors in the produce supply chain, providing insights into logistics dimensions at micro-, meso- and macrolevels. Furthermore, it formulates recommendations to improve logistics processes.

It is hoped that the report will fill an important gap in information for the produce industry in the LAC region. A review of the literature shows two groups of publications addressing logistics at different levels in produce supply chains. The first group relates to those publications that give priority to post-harvest systems, with a particular emphasis on understanding the physiology or determining the efficiency of technologies. The second group highlights the mechanisms of logistics and process control management without necessarily relating to specific food produce or geographic area. Popular wisdom holds that logistics in the produce industry is limited to transportation and storage services. However, the present report challenges this notion by analysing how macro-economic performance, policies and institutions, business management operations, and food engineering practices affect logistics efficiency and the final quality of products.

Information in this report has been sourced from:

- secondary data available in studies assessing logistics performance;
- interviews with relevant actors in the agroindustry sector;
- mission trips to the five countries assessed, including visits to SMEs;
- an expert regional workshop held in Panama City; and
- information presented by Caribbean experts at a symposium held in Port of Spain, Trinidad and Tobago, as a side event of a conference of the International Society for Horticultural Science (ISHS).

OVERALL LOGISTICS PERFORMANCE

Available indicators accounting for logistics performance suggest that the LAC region is below the global standards set by most industrialized countries. The Logistics Performance Index (LPI), an indicator of the friendliness of logistics processes within a country, averages 2.70 in LAC, significantly lower than the average score (3.63) for countries in the Organisation for Economic Co-operation and Development (OECD). Other indicators are also useful for monitoring key contributions to logistics processes, including those to evaluate infrastructure, market efficiency, and customer and buyer sophistication. Some examples are the Global Competitiveness Index (GCI), the Enabling Trade Index (ETI) and ease of doing business ranking. In all these indicators, LAC countries on average are significantly below top performing countries.

Although LAC countries fall in general behind developed countries in logistics development, the level of performance varies greatly within the region. Chile is the top performing country, with the highest score in all four indicators consulted. It has a particularly high ETI score, where it is ranked 13th, while in the other indicators it ranks between 33rd and 39th. The worst performing countries in the region include Haiti and the Bolivarian Republic of Venezuela, which are in the bottom five of global rankings¹.

Chile is worth studying in order to understand the type of actions and policies implemented to outperform other countries in the region. Within the scope of this study, it is relevant to note how Chile has developed mechanisms to become one of the main global exporters of table grapes and other temperate fruit. Producers and exporters have been able to associate and work together to facilitate the movement of

¹ Haiti is ranked 153 out of 155 countries in LPI, and 142 out of 144 countries in GCI, while the Bolivarian Republic of Venezuela is ranked 130 out of 132 countries in ETI, and 180 out of 185 countries in the ease of doing business ranking.

products from farms to consumers around the world in an efficient and cost-effective manner, offsetting challenges such as high fuel costs that significantly increase transportation costs.

Trade globalization has become an additional challenge for logistics operations in the LAC produce industry. Despite the large production of agricultural products in LAC, most of the net food exporting countries also import a large portion of the food they consume. In the current scenario of increased agricultural trade, there is a need to optimize intermodal transportation which, for fruit and vegetables, generally includes ground and maritime transportation and, in particular cases, ground and air transportation.

Countries have tried to promote intraregional trade with the establishment of integration schemes that cut tariffs among different countries. However, the level of intraregional trade is still low, accounting for only around 20 percent of total trade in the region, mainly because of high costs. The main trading partners for most countries in LAC are Europe and the United States of America. The latter also constitutes the main hub for the reshipment of consignments from and to other countries in the region.

Because of inefficiencies in the logistics processes, fruit and vegetable export costs in LAC are high. Studies suggest that, at the macrolevel, logistics costs in LAC represent between 18 and 26 percent of gross domestic product (GDP) compared with 9 percent for OECD countries. As to the value of products in LAC, logistics processes make up a large part of the costs of food products, representing between 18 and 32 percent of the value of commodities, compared with about 9 percent in OECD countries. Moreover, the share of logistics costs in the region for individual companies depends mainly on their size, with small enterprises having logistics costs accounting for 42 percent of the total company sale, compared with between 17 and 18 percent for large companies.

KEY COMPONENTS IN THE LOGISTICS SYSTEMS FOR FRUIT AND VEGETABLES

From the individual country assessments and expert consultations, it was possible to identify six main components affecting the logistics performance of agro-industries. These are: (i) infrastructure and transportation; (ii) information and communication technology (ICT); (iii) electrical energy and cold chain; (iv) human capital; (v) post-harvest management, packaging and traceability; and (vi) institutional policies and frameworks.

Infrastructure

LAC countries face great challenges regarding infrastructure for storing and moving products within the national territory. They have underdeveloped secondary and tertiary roads, in particular, with large stretches of unpaved paths connecting production centres to markets. Additionally, maintenance is poor which, in some countries, even affects the quality of main highways connecting main cities. Over the last few years, countries have invested heavily in modernizing ports, usually through public-private partnerships. Although there have been great improvements, further efforts are needed to increase efficiency in ports and ensure that they have the proper equipment to guarantee that fruit and vegetables are handled properly in order to maintain their quality and preserve their shelf-life.

Another aspect greatly affecting the performance of logistics systems is the lack of efficiency in trade facilitation and processes resulting from institutions and policies. Although countries in LAC have implemented policies such as the single-window system for exports in Colombia to facilitate trade, there is still a high level of bureaucracy and inefficiency in trade processes. In general, 52 percent more documents are required to export from LAC, compared with OECD countries, as well as 111 percent more time. One of the main bottlenecks is the random way that customs officers interpret the norms, regulating controls and inspections on products to be imported or exported. This causes delays, generating longer export/import times, which average 18 days in the region. It is noteworthy that Chile, a country with relatively high marks in different logistics components, underperforms in this context, with 21 days to expedite export consignment, compared with the region's average.

ICT

ICT plays an important role in logistics, as efficient food systems not only depend on the flow of products but also on adequate information flows. Trustworthy and opportune information enables the different actors along the supply chain to make better decisions. Additionally, ICT enables product information to be transferred to consumers who are becoming more concerned about the food they eat. Currently, LAC countries have underdeveloped ICT systems for food products. Some analysts even consider this the

major bottleneck for improving competitiveness. Nevertheless, there are opportunities for improvement, for example, by using mobile phones that have a significantly high national coverage, reaching almost 100 percent of the population.

Electrical energy and cold chain

An appropriate cold chain at each step of the food supply chain plays a key role in preserving the quality of fruit and vegetables, in particular. Taking population density per cold storage capacity into account, the LAC countries have insufficient capacity to manage refrigerated products. Chile is the exception, with almost 4 million cm³ of cold chain capacity, representing 4.3 people per cm³ of cold capacity, close to the values of the United States of America and Germany.

Human capital

People involved in handling and transportation usually lack proper training and knowledge about the appropriate techniques to ensure that product quality is preserved. There has been a surge in logistics programmes and institutions promoting logistics knowledge such as the Georgia Tech Panama Logistics Innovation and Research Center, and the Center for Latin American Logistics Innovation in Colombia. Yet knowledge about logistics systems for food products, particularly perishable products such as fruit and vegetables, is limited. It is important that countries have educational institutions that offer programmes but these programmes need to be made available to actors in the agro-industry sector, including managers and technical personnel. The creation of public and private partnerships for the provision of technology transfer services in logistics is warranted. However, it is not clear how to ensure that all personnel along the supply chain have the required skills and capabilities to perform their roles efficiently.

Post-harvest management, packaging and traceability

Good post-harvest handling practices are key to ensuring the final quality of fruit and vegetables by preventing damages throughout the supply chain. However, there is generally a lack of appropriate packaging and procedures to ensure the quality of products during storage and transportation. This is particularly true of products destined for local markets, but also of certain export products scrutinized in this study. Packaging has great significance in the efficiency of the food supply chain since it increases costs and can generate losses.

Institutional policies and frameworks

Governments in LAC have established different policies and institutions to promote logistics development. While some countries are clearly ahead in establishing regulations that may increase competitiveness, all countries in the region still need to establish improved policies and frameworks that support the development of efficient logistics operations.

These general issues apply across countries. Although each country has particular needs and levels of development, it is evident that all countries need to work to some degree on the six components listed above to improve their logistics systems for fruit and vegetables. However, some additional country issues do not relate specifically to those listed. In Colombia, for example, because of its history of illicit drug dealing there is a lack of trust among actors in the food supply chain, which leads to inefficient inspections in ports and makes it more difficult for SMEs to group and develop mechanisms to benefit from economies of scale. In Guatemala, a critical issue regards ground transportation since there is a lack of security along national roads, which results in a high incidence of theft. In Chile, higher salaries in the mining industry have resulted in low labour supply in the agricultural sector, forcing companies to develop mechanisms to ensure the availability of workers to produce and harvest agricultural products. In the Caribbean, where there is a significant flux of tourists, commodities can be transported by air. However, in many cases, these have to be commercialized immediately since there is no adequate refrigeration in most airports. Moreover, imports of products via tourist cruise shipments limit the development of local producers.

RECOMMENDATIONS

Through consultations with experts from different countries, it was possible to generate recommendations for each of the key logistics system components identified. These include proposed indicators to measure progress at three levels: government, produce sector and enterprises. Despite specific challenges and inef-

iciencies observed for each of the countries, general recommendations were also formulated to improve logistics systems in the produce subsector.

It is particularly important for LAC countries to continue to invest in infrastructure, with a special focus on secondary and tertiary roads linking production centres to markets. Also important is the continuation of appropriate public-private models to manage ports and modernize their services. It is imperative that ports have the appropriate infrastructure to deal with perishable products so that, for example, access to electrical power is guaranteed during the entire process and the cold chain is not broken. Not only is physical public infrastructure important, but also infrastructure that is privately owned, such as refrigerated trucks to transport products from production centres to collection/distribution centres and thence to final customers. With regard to infrastructure, there is also concern about the inadequate facilities of many wholesale markets that are key for the provision of produce to urban areas.

It is fundamental for countries to develop policies to promote logistics systems with a special focus on food products and perishable products such as fruit and vegetables. It is essential to establish clear and direct policies with regard to product safety, but without adding complex and unnecessary processes that prolong the time needed to move products. In this sense, it is important to develop mechanisms that increase coordination among ports, customs and inspecting agencies in order to define clear roles and tasks for efficient processes.

There needs to be additional support for producer and exporter associations within the agro-industry sector to work together towards solutions for increasing efficiency across the sector. Producer organizations need to work with public institutions and learning centres (universities and technical institutes) to develop appropriate training programmes covering key subjects for the logistics management of food products.

Post-harvest management and packaging systems are critical areas that need to be addressed in most LAC countries. Producers and exporter associations in Chile have promoted standard packages that facilitate the transportation of fruit such as grapes and apples, and established a market brand that is recognized worldwide.

FURTHER STEPS

This report is a first step to understanding the current state of the logistics systems for fruit and vegetables, and for food products in general, in the LAC region, including identification of the main challenges and opportunities. The study confirms the key role of logistics in the development of the agrifood sector and especially for perishable products warranting further analyses to strengthen the managerial capacity of logistics operations. Nevertheless, some issues still have no clear solutions. How can one accurately determine the effectiveness of logistics management? Under what conditions will outsourcing logistics operations be feasible overall? What has been the role of supermarkets and other institutional buyers in the food supply chain and how can they contribute to development? These and other questions require further analysis and study in order to develop efficient logistics systems for fruit and vegetables, and food products as a whole. This document raises some academic issues with the hope of motivating future study on the subject.

Abstract

Today, logistics systems and management are considered key for the growth of the perishable food sector, and particularly for those supply chains that involve smallholders. However, there is limited information on the state of logistics systems for food products in most non-industrialized countries. The present report seeks to help fill this gap by providing information on logistics in the produce subsector of five countries in the Latin America and Caribbean (LAC) region. The methodology used to develop the report includes: (i) country appraisals, with fieldwork and desk study; (ii) an expert meeting to discuss findings in the appraisals; (iii) a symposium with experts from the Caribbean subregion; and (iv) subsequent integration of all findings, with background information and an overall analysis. The document describes the general principles used to determine the performance of logistics systems and highlights key limitations of logistics in produce supply chains. Identified challenges are described, taking into consideration supply chains with involvement of small and medium-sized enterprises (SMEs). A subsequent discussion reveals logistics failures and recommends priorities for action depending on the scenario in each country.

About the authors

Jorge M. Fonseca is an Agro-Industry officer in the FAO AGS Division. He has experience in the food sector in over 20 countries working for the University of Arizona, as well as for private business and public institutions. He holds a Ph.D in Food Technology from Clemson University, a M.Sc. in Horticulture also from Clemson, and a MBA from the University of Costa Rica and the National University of San Diego.

Natalie Vergara is an Agribusiness International Consultant in the FAO AGS Division. She has experience in management consulting and project management in the private sector. She holds a M.Sc. in Development Economics and International Cooperation from Tor Vergata University, Rome and a bachelor degree in Industrial Engineering from Los Andes University, Colombia.

Abbreviations and acronyms

3PL	Third-party logistics
4PL	Fourth-party logistics
ATP	Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be used for such Carriage
BASC	Business Alliance for Secure Commerce
CAN	Andean Community of Nations
CARICOM	Caribbean Community
CEPAL	Economic Commission for Latin America and the Caribbean
CLI	Center for Latin American Logistics Innovation
CSI	Container Security Initiative
CSCMP	Council of Supply Chain Management Professionals
DIAN	National Tax and Customs Directorate
ECLAC	Economic Commission for Latin America and the Caribbean
EDI	Electronic Data Interchange
ENEE	National Electrical Energy Company
ETI	Enabling Trade Index
EU	European Union
FDA	Food and Drug Administration (United States of America)
GAP	Good agricultural practice
GCI	Global Competitiveness Index
GDP	Gross domestic product
GMP	Good manufacturing practices
HACCP	Hazard Analysis and Critical Control Points
HDI	Human Development Index
ICT	Information and communication technology
IDB	Inter-American Development Bank
IICA	Inter-American Institute for Cooperation on Agriculture
IMO	International Maritime Organization
INVIAS	National Institute of Roads
ISHS	International Society for Horticultural Science
ISPS	International Ship and Port Facility Security
ITAL	Institute of Food Technology (Brazil)
LAC	Latin America and the Caribbean
LPI	Logistics Performance Index
MCCA	Central American Common Market
Mercosur	Common Market of the South
MIT	Massachusetts Institute of Technology
OECD	Organisation for Economic Co-operation and Development
SAG	Agricultural and Livestock Service
SCC	Supply Chain Council
SCM	Supply chain management
SCMP	Supply Chain Management Professionals
SCOR	Supply Chain Operations Reference
SENASA	National Service for Agrifood Health and Quality
SEZ	Special economic zone
SMEs	Small and medium-sized enterprises
SPS	Security and Protection Systems

SWOT	Strengths, weaknesses, opportunities and threats
TBT	Technical barriers to trade
TEUs	Twenty-foot equivalent units
UNDP	United Nations Development Programme
USDA	United States Department of Agriculture
WCO	World Customs Organization

Chapter 1

Introduction

Logistics are relevant to the production, storage and distribution of products. The efficiency of logistics processes and costs prevails in a country's competitiveness and in the price that consumers pay for products. In the case of food products, appropriate logistics systems are determinant in ensuring that people have access to safe and affordable food.

The Food and Agriculture Organization of the United Nations (FAO) has identified logistics as an important area that needs to be addressed in order to achieve its objective of enabling inclusive and efficient agricultural and food systems. With the aim of increasing knowledge about this subject and developing guidance to improve operations along food chains, a project was implemented to assess the logistics systems in five countries in Latin America and the Caribbean (LAC).

Three main groups of decision-makers affect logistics operations. First, the government, which makes infrastructure investment decisions, establishes policies to motivate trade and establishes institutions that regulate markets and commerce. Second, logistics service providers make decisions concerning investments in assets and how they are employed (i.e. liner services, trucks and container ships). Finally, enterprises make decisions regarding private infrastructure to support product transportation and storage. High performance supply chains depend on these three groups of actors making compatible decisions. Consequently, this report focuses on challenges and actions that could be undertaken by these three major groups.

The document is based on individual country assessments commissioned by FAO, as well as the regional report consolidating individual study findings. The objective of the country studies was to appraise the logistics system in the fruit and vegetable subsector. The countries studied were Chile, Colombia, Guatemala, Honduras and Panama. Findings from a regional expert workshop in Panama and a workshop in Trinidad and Tobago have also been incorporated.

1.1 OBJECTIVE

The purpose of this document is fourfold.

- Consolidate the results of the country assessments on the logistics processes for small and medium-sized enterprises (SMEs) in the fruit and vegetable subsector in five countries in Latin America: Chile, Colombia, Guatemala, Honduras and Panama.
- Identify challenges and opportunities in the logistics process of SMEs in the fruit and vegetable subsector.
- Propose recommendations to enable determining actions in the short, medium or long term.
- Provide a basis for further academic discussion on relevant issues affecting logistics performance, including identification of lessons learned and best practices.

1.2 TARGET AUDIENCE

This report aims to address a broad audience of professionals from different disciplines. The main target audience includes professionals already working in food supply chains, technical bodies in the public sector (e.g. national agriculture ministries) and state decision-makers seeking to expand their knowledge on the dimensions of logistics and find solutions to current inefficiencies in the produce supply chains in LAC.

1.3 METHODOLOGY

Country assessments were based on primary data from key stakeholders in the agro-industry and logistics service providers. Primary data were collected between March and August 2012 through field visits to agrifood enterprises, ports and local markets; personal and telephone interviews; and an online survey of companies and institutions. This information was complemented by secondary data on available logistics performance indicators and studies of the logistics systems and food supply chain in the LAC region.

At the initial stage of the project, it was considered beneficial to assess a selected supply chain

outside the agrifood sector (i.e. textiles) to determine whether any lessons might be transferred to the food sector. However, as interviews with institutions and entrepreneurs progressed, it became evident that this was not feasible, given the particularities of the perishable food supply chain, which requires specific logistics operations including a robust cold chain. It was therefore deemed appropriate, using the resources available, to focus on an analysis of the fruit and vegetable subsector and on particular aspects inherent to the industry such as methods of handling, storage and transportation.

Once the individual country assessments had been concluded, a regional workshop on “Instruments to Promote and Strengthen the Logistics Development of the Agrifood Sector in Latin America” was held from 30 to 31 August 2012, in Panama City. Participants included experts from the five countries studied and a representative from Mexico. The objectives of the workshop were to:

- understand the situation of logistics systems for food products in the selected countries;
- identify critical factors in the logistics performance of the agrifood sector in the region as an input to designing indicators for the development of models to optimize logistics performance;
- formulate recommendations for the public and private sector on how to promote logistics development in the agrifood sector.

As a further way of sourcing information on logistics in LAC, the lead author participated in the Symposium on Postharvest Logistic Systems for Horticultural Commodities in Latin America and Caribbean, which was held on 2 July 2013 in Port of Spain, Trinidad and Tobago. It formed part of the Third International Conference on Postharvest and Quality Management of Horticultural Products of Interest for Tropical Regions. The event was organized to provide an opportunity to discuss findings from the FAO-commissioned country appraisals, as well as to discuss briefly critical factors in logistics systems in the Caribbean food industry.

The scope of this report is necessarily limited because of the few enterprises interviewed and scarce availability of data. Nevertheless, the assessment included inputs of key actors in the public and private arena, and an analysis providing a general view of the main difficulties in the logistics systems for the fruit and vegetable subsector in each of the countries studied. The report constitutes a first step for further analysis to show progress in terms of indicators and actions promoting the improvement

of logistics operations for the fruit and vegetable subsector in the region.

1.4 CONCEPTUAL FRAMEWORK

In order to facilitate the country studies, it was necessary to establish clear criteria for the concept of agro-industry, food supply chain and logistics management.

Agro-industry concept

Given that the assessment focused on the logistics operations of SMEs in the fruit and vegetable subsector, it was important to have a clear definition of agrifood industries. FAO refers to agro-industry as “the subset of manufacturing that processes raw materials and intermediate products derived from the agricultural sector. Agro-industry thus means transforming products originating from agriculture, forestry and fisheries” (FAO, 1997). On the other hand, the Inter-American Institute for Cooperation on Agriculture (IICA), defines it as “the sector that groups the set of transformation, conservation, preparation and conditioning operations of agricultural and fishery products or intermediate consumption of these ones, performed by industrial or artisanal production units for human or animal consumption” (Loma-Ossorio, Castillo and Rio, 2000). Moreover, the Economic Commission for Latin America and the Caribbean (ECLAC), states that “agro-industry refers to all activities that include processing of products generated by agriculture or fisheries” (Torrealba, 1999).

This report appraises the situation of fruit and vegetable products and focuses on the processes that take place from on-farm production until products reach final consumers.

Food supply chain

Food supply chain management (SCM) is defined as the task of integrating organizational units along the supply chain and coordinating products, materials, information and financial flows in order to meet customer demand (Rong, Akkerman and Grunow, 2009).

SCM also refers to the way that the management of businesses focuses on the links and relationships among actors. A driving force behind the growing importance of supply chains is that it is necessary to coordinate goals and activities among organizations to optimize the results of the chain rather than of individual enterprises (Van der Vorst, Beulens and Van Beek, 2005). This is even more relevant for food products because of their limited shelf-life and consumer need for safe products.

Logistics management

The Council of Supply Chain Management Professionals (CSCMP) defines logistics management as “an integrating function, which coordinates and optimizes all logistics activities” typically including “inbound and outbound transportation management, fleet management, warehousing, materials handling, order fulfilment, logistics network design, inventory management, supply/demand planning, and management of third party logistics services providers. To varying degrees, the logistics function also includes sourcing and procurement, production planning and scheduling, packaging and assembly, and customer service” (CSCMP, 2013). In general, logistics can be divided into three types of activities: control, execution and value-added activities, as illustrated in Figure 1.

The World Bank simply states that logistics include “the movement of goods and services over time and space” (World Bank, 2012b). Logistics are commonly used to describe the transport, storage and handling of products as they move and transform from raw materials to final consumer goods (McKinnon *et al.*, 2010).

Logistics ensure the availability of products (agreed or expected), with the right quality, at the right time, in the right quantity, at the right place to the right customer, and at a fair price. In this report, logistics management in agro-industries includes the actions directed at managing the processes for planning, implementing and controlling production, transportation, storage and information, between producer farms and end-consumers.

1.5 STRUCTURE OF THE REPORT

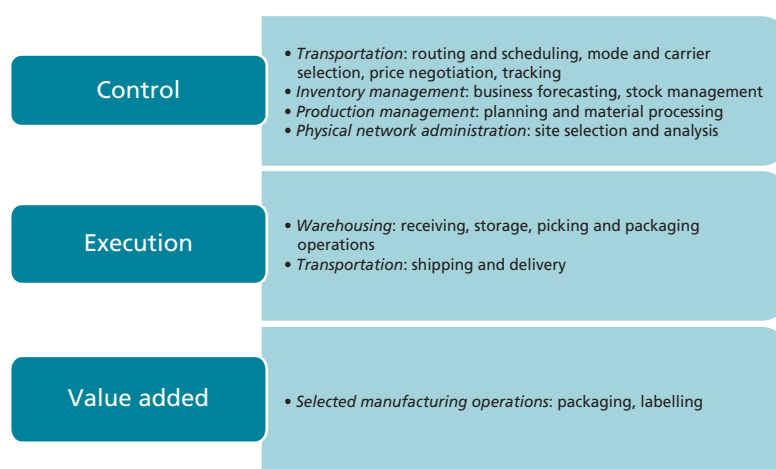
This report is organized into nine chapters. The Introduction forms Chapter 1. Chapter 2 provides a basic profile of the countries analysed, including macroeconomic variables, main economic activities, Human Development Index (HDI) and poverty profile in order to understand the national context and gain insights to analyse logistics performance with regard to national economic development.

Chapter 3 describes the logistics performance of the countries included in this report. The target of the study is the agrifood sector and, more specifically, the fruit and vegetable subsector; however, there is a lack of specific indicators or data to account for the logistics of a specific sector in the economy. Therefore, indicators presented refer to overall logistics performances and additional insight is provided based on the information collected through interviews with key stakeholders and secondary data concerning food supply chains.

In Chapter 4, taking as reference the overall logistics performance and the characteristics of the agrifood sector, the main difficulties in the logistics components for the distribution and commercialization of fruit and vegetables are identified. These include infrastructure and transportation, information and communication technology (ICT), electricity and the cold chain, human capital and trade facilitation and border management.

Chapter 5 presents the results of the regional workshop that took place in Panama City. It includes an action prioritization of areas that need

FIGURE 1
Logistics activities



Source: Pullman and Zhaohui, 2011.

to be addressed to support logistics development in the region and a matrix in which each of the components affecting the logistics performance, critical issues and indicators are presented at three levels: government, sector and enterprise.

Chapter 6 describes different tools that might be useful in assessing the logistics development

of an enterprise and supporting further actions to increase efficiency in logistics operations.

Chapter 7 includes recommendations and action plans for each of the critical components, specifically targeting the government and private sector. Chapter 8 highlights aspects considered relevant to further analysis in future work.

Chapter 2

Macroeconomic country profiles

To contextualize a country's logistics performance, it is important to understand the macroeconomic variables. LAC can be geographically subdivided into three: South America, Central America, and the Caribbean. However, countries belonging to each region have different levels of economic and human development.

The largest economy in the region is Brazil, followed by Mexico and Argentina. Colombia is the fourth largest economy, Chile the seventh, Guatemala the tenth, Panama the 14th and Honduras the 17th. Chile, Colombia and Panama are classified by the World Bank as upper middle-income countries. In fact, Chile has the highest GDP per capita in the region. Meanwhile, Honduras and Guatemala are considered lower middle-income countries. Economic growth in LAC was affected by the international economic crisis in 2009, but the region has still managed a positive economic growth over the last few years. In 2012, this ranged from 3.3 percent in Guatemala to 10.5 percent in Panama. Detailed macroeconomic variables are given in Table 1 and Figure 2.

In each country, economic activities contribute differently to GDP. Financial services represent the largest sector in Panama, Chile and Colombia with 27, 24 and 20 percent respectively of GDP, while public services and administration are the largest sector in Guatemala and Honduras with

22 and 21 percent respectively of GDP. The contribution of the agricultural sector (including forestry, fisheries and cattle) to GDP ranges between 3 percent for Chile and 14 percent for Honduras. Meanwhile, transportation and communication² have a significant importance in Panama's GDP, representing 19 percent, while for the other countries it ranges between 7 and 8 percent. Table 2 describes the participation of economic sectors in country GDP.

Demographic characteristics among countries are also different. Colombia is the third largest country in the region in terms of population (behind Brazil and Mexico) with 48 million people, while Panama has one of the smallest populations with only 3.6 million people. Honduras and Guatemala have a large proportion of rural population with 50 and 43 percent respectively, whereas Chile only has 13 percent and has a low population growth rate. (See Table 3 for detailed information about demographic characteristics.)

HDI, which measures a country's development in terms of education, life expectancy and income, evidences the large social differences among countries in the region. Chile has high human

² Logistics service operators are included in this sector.

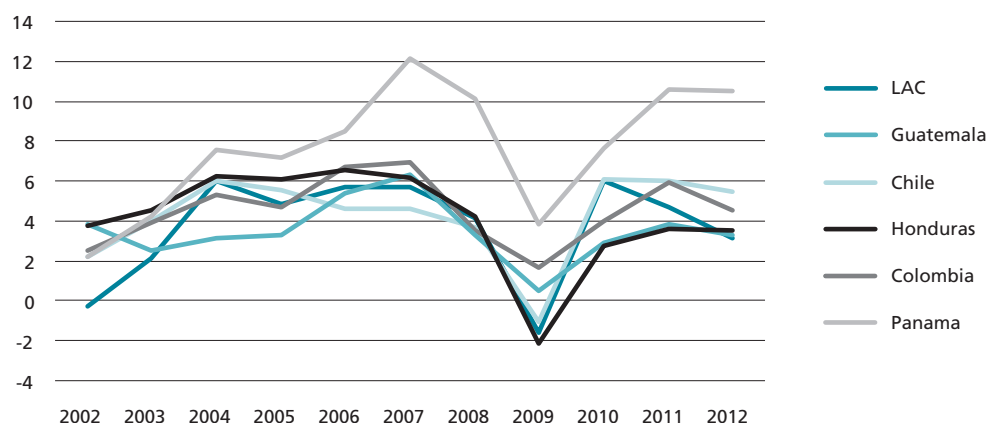
TABLE 1
Macroeconomic variables

Country	GDP (current US\$)	GDP per capita (current US\$)	GDP growth (%)	Unemployment	Inflation
	2011	2011	2012	2012	2011
Chile	248 585 499 941	14 394	5.5	6.4	3.0
Colombia	333 371 937 903	7 104	4.5	11.3	3.6
Guatemala	46 900 000 257	3 178	3.3	2.7	5.8
Honduras	17 426 574 426	2 247	3.5	6.8*	6.6
Panama	26 778 100 000	7 498	10.5	4.8	5.4

Sources: World Bank, 2013a.

* Value is for 2011.

FIGURE 2
GDP growth rate in LAC



Source: World Bank, 2013a.

TABLE 2
Economic activities in national GDP

Country	Participation of GDP (2011 percentage)								
	Financial services	Public admin.	Industry	Mining	Commerce	Construction	Agric.	Transport/Communic.	Electricity, water, gas
Chile	24	16	12	17	10	8	3	7	3
Colombia	20	16	14	12	12	8	7	7	4
Guatemala	12	22	20	3	18	4	11	8	3
Honduras	16	21	18	1	17	5	14	7	2
Panama	27	15	6	2	19	7	4	19	3

Sources: ECLAC, 2013.

TABLE 3
Demographic characteristics (2011)

Country	Population ('000)	Population growth (%)	Urban population (%)	Urban population growth (%)	Rural population growth (%)
Chile	17 603	0.8	87.5	1.1	-0.4
Colombia	48 374	1.3	78.5	1.6	-0.4
Guatemala	15 419	2.4	57.2	4.5	-0.9
Honduras	8 075	1.9	50.5	2.9	0.8
Panama	3 635	1.5	68.7	2.1	-0.2

Sources: ECLAC, 2013.

development and is ranked 44th out of 187 countries. Panama also has high human development and is ranked in 58th position. Both Chile and Panama have an HDI value above the LAC average (0.767). Colombia is below the average and is classified as a high development country, while Honduras and Guatemala are classified as medium development countries. Details of ranking and values for each country are given in Table 4.

TABLE 4
Human Development Index (2011)

Country	Rank	HDI value (2011)	Classification
Chile	44	0.805	Very high
Colombia	87	0.710	High
Guatemala	131	0.574	Medium
Honduras	121	0.625	Medium
Panama	58	0.768	High

Despite economic growth and social investments, countries in the region continue to have unequal income distributions and a high incidence of poverty. The five countries in this report are among the 20 countries with the highest Gini Index accounting for the level of inequality; Honduras, Colombia and Guatemala are ranked 9th, 10th and 11th respectively out of 136 countries, while Chile is ranked 15th and Panama 17th. As shown in Table 5, the number of people living below US\$1.25 per day is significant, especially in Honduras and Guatemala. In these two countries, more than half of the population lives below the national poverty line. Colombia and Panama also have high poverty numbers with close to one-third of the population living below the national poverty line.

TABLE 5
Poverty headcount and Gini Index

Country	Poverty at US\$1.25/ day (% population)	Poverty at national poverty line (% population)	Gini Index
Chile	1.4 (2009)	15.1 (2009)	52.1 (2009)
Colombia	8.2 (2010)	34.1 (2011)	55.9 (2010)
Guatemala	13.5 (2009)	53.7 (2011)	55.1 (2007)
Honduras	17.9 (2009)	66.2 (2010)	57.0 (2009)
Panama	6.6 (2010)	32.7 (2008)	51.9 (2010)

Sources: ECLAC, 2013.

The economic and social development of these countries provides a framework to analyse the performance of logistics operations, which is presented in the next chapters.

Chapter 3

Logistics in the regional agrifood market

Logistics operations to enable harvesting, storage and distribution of agrifood products are of special importance in establishing the final price and quality of food products. Fruit and vegetables in particular are highly perishable with specific requirements regarding temperature and relative humidity for transport and storage in order to extend their shelf-life. Thus, efficient logistics management in storage and movements is a key component to ensure that products are delivered to clients in a timely manner and satisfy requirements regarding quality and price.

3.1 LOGISTICS PERFORMANCE IN THE REGION

Currently, the only available indicator to assess the logistics performance of a country is the Logistics Performance Index (LPI) created by the World Bank to measure logistics “friendliness”. The index reflects perceptions of a country’s logistics based on the efficiency of the customs clearance process, quality of trade and transport related infrastructure, ease in arranging competitively priced shipments, quality of logistics services, possibility to track consignments, and frequency with which shipments reach the consignee within the scheduled time.

LPI ranges from one (low performance) to five (high performance). In 2012, the country with the

highest score was Singapore with 4.13. High-income OECD countries have an average index of 3.63, while the average for LAC is far below (2.70). Chile has the highest score in the region (3.17), ranking 39th out of 160 countries. However, its performance has not been steady – it decreased from 3.25 in 2007 to 3.09 in 2010, to increase in 2012. Panama has also had an irregular performance, increasing in 2010 to decreasing later in 2012 but, with a score of 2.93, Panama is still above the regional average. Colombia and Guatemala have constantly improved and are currently above the region’s average with a score of 2.87 and 2.80, respectively. Honduras has also had an irregular performance and is currently below the region’s average with 2.53. Details on the scores and changes in performance over the last few years can be found in Table 6 and Figure 3.

In detail, the key components measured with LPI are the following.

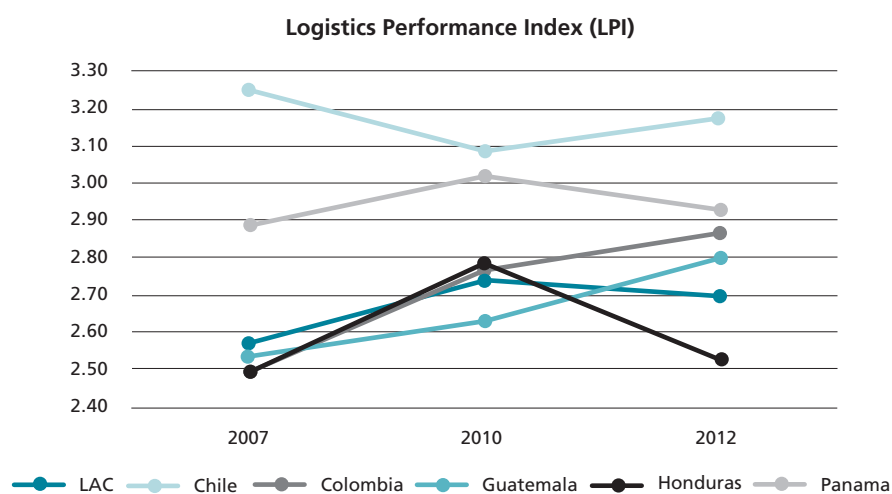
1. *Customs*: efficiency of the clearance process (i.e. speed, simplicity and predictability of formalities) by border control agencies, including customs.
2. *Infrastructure*: quality of trade and transport related infrastructure (i.e. ports, railways, roads, information technology).
3. *International shipments*: ease of arranging competitively priced shipments.

TABLE 6
Logistics Performance Index

Country	2007		2010		2012	
	LPI	Rank	LPI	Rank	LPI	Rank
Chile	3.25	30	3.09	49	3.17	39
Colombia	2.50	79	2.77	75	2.87	64
Guatemala	2.53	73	2.63	91	2.80	74
Honduras	2.50	80	2.78	71	2.53	105
Panama	2.89	51	3.02	51	2.93	61
LAC	2.57		2.74		2.70	
Upper middle-income countries	2.66		2.79		2.81	

Sources: World Bank, 2012b.

FIGURE 3
Logistics Performance Index, 2007–2012



Source: World Bank, 2012b.

4. *Logistics competence*: competence and quality of logistics services (i.e. transport operators, customs brokers).
5. *Tracking and tracing*: ability to track and trace consignments.
6. *Timeliness*: timeliness of shipments in reaching destination within the scheduled or expected delivery time/date.

Table 7 summarizes the scores in 2012 for each of these six components. For Colombia, Guatemala and Honduras, which have low LPI scores, the areas with the poorest performance are customs efficiency and infrastructure, prob-

ably indicating that these countries need to continue investing in modernizing infrastructure and facilitating the customs process. In Panama, the areas poorly ranked are customs and international shipments and, for Chile, logistics competence and international shipments have the lowest score. When comparing these indicators with those of Singapore, Hong Kong and Finland, which are the countries with the highest LPI scores, it is clear that there is significant room for improvement in all areas. This even applies to Chile and Panama, which are highly ranked among LAC countries, but perform worse than most industrialized countries with regard to the six LPI main indicators.

TABLE 7
LPI main indicators

Country	Customs	Infrastructure	International shipments	Logistics competence	Tracking and tracing	Timeliness
Chile	3.17	3.18	3.06	3.00	3.22	3.47
Colombia	2.65	2.72	2.76	2.95	2.66	3.45
Finland	3.98	4.12	3.85	4.14	4.14	4.10
Germany	3.87	4.26	3.67	4.09	4.05	4.32
Guatemala	2.62	2.59	2.82	2.78	2.80	3.19
Honduras	2.39	2.35	2.70	2.44	2.35	2.90
Hong Kong	3.97	4.12	4.18	4.08	4.09	4.28
Japan	3.72	4.11	3.61	3.97	4.03	4.21
Panama	2.56	2.94	2.76	2.84	3.01	3.47
Singapore	4.10	4.15	3.99	4.07	4.07	4.39
United States of America	3.7	4.14	3.56	3.96	4.11	4.21
Average	2.68	2.76	2.82	2.80	2.81	3.30

Sources: World Bank, 2012b.

Logistics performance appears to correlate in general terms with level of economic development. Countries with higher GDP per capita have higher logistics performances (World Bank, 2012b). However, the difference between LPI scores within countries with similar incomes suggests that other factors such as policy affect the development of logistics systems (World Bank, 2012b).

When analysing the performance of LAC countries (Figure 4), Chile, as might be expected from its GDP, has the highest logistics performance. Panama and Colombia are slightly above the LAC average, outperforming countries such as Costa Rica that have a higher GDP. Guatemala has an anomalous situation. Despite the fact that it has one of the lowest GDPs in the region, it has a higher logistics performance than several other countries with similar or even higher GDPs, such as Ecuador, the Dominican Republic, El Salvador, the Bolivarian Republic of Venezuela and Costa Rica. It would be interesting to investigate further which types of policies have prompted such logistics development in Guatemala.

This anomaly suggests that income is not the only factor affecting the development of efficient logistics systems. As already mentioned, policy and institutions are also considered to be significant drivers of logistics development. Another factor affecting differences in logistics performance is labour productivity, defined as the ratio of a volume measure of output to a measure of input use (OECD, 2001). A recent report showed an

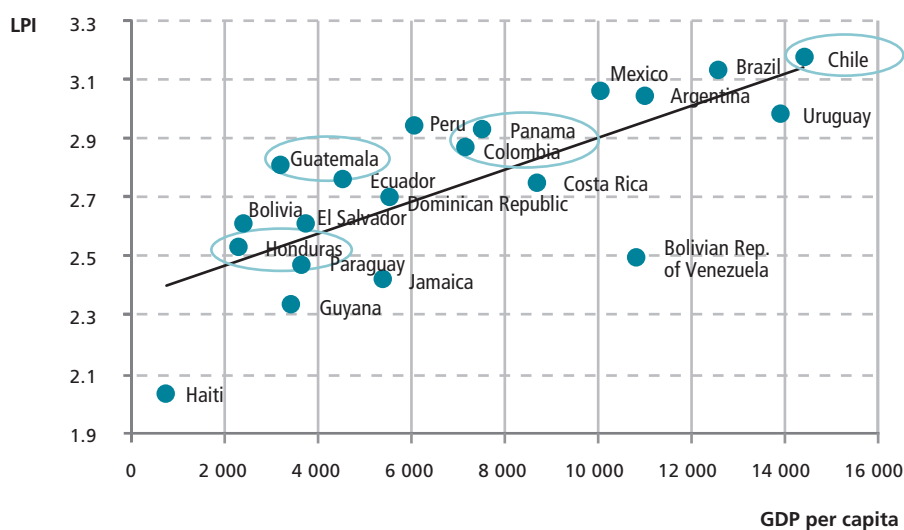
improvement of one point in the LPI scored, which may be associated with an increase in labour productivity of up to 35 percent (OECD, UN-ECLAC and CAF, 2013).

It is pertinent to mention that, with the exception of Honduras, all five countries studied have a higher logistics performance than Caribbean countries such as the Dominican Republic, Jamaica and Cuba (World Bank, 2012b). However, no information is available on World Bank logistics performance indicators for some countries in the Caribbean, including Trinidad and Tobago, a country that would be expected to perform better than the regional average.

Fuel cost is a factor that significantly affects logistics operations. High fuel costs have a direct impact on transportation costs. While crude oil is traded in the global market, petrol (gasoline) is part of a regional market in which each country establishes the price according to international prices and a set of subsidies and taxes. Fuel taxation is considered a powerful instrument to generate revenues for road infrastructure and maintenance. The international fuel price in March 2013 was US\$3.07/gallon,³ while the average for Latin America was US\$3.37/gallon (approximately 3.8 litres). Prices per gallon are given in Table 8. From the individual country assessment in Chile, high fuel costs were identified as one of

³ Reformulated Blendstock for Oxygenate Blending (RBOB) gasoline (petrol) quoted by Bloomberg on 26 March 2013.

FIGURE 4
Relation between GDP per capita and LPI scores for LAC countries



Source: authors' elaboration, with data from World Bank, 2012b.

TABLE 8
Fuel costs

Country	Fuel costs (US\$/gallon)
Chile	4.39
Colombia	4.14
Guatemala	3.38
Honduras	3.21
Panama	2.79

Sources: Fendipetróleo, 2013.

the main obstacles for food logistics. However, the report also highlighted that factors such as relatively easy access to markets and ports, good road infrastructure and, above all, efficient technology and adequate human resource capabilities, have allowed a sharp growth in the sector over the last two decades. This explains why high fuel costs have not been an obstacle for Chile to have the highest logistics efficiency in the region. This suggests that countries can get round high costs that affect competitiveness by investing in infrastructure and efficient procedures to increase logistics performance.

The Global Competitiveness Index (GCI) assesses the competitiveness landscape of national economies and provides insight into the drivers of their productivity and prosperity.⁴ The countries with the highest scores are Switzerland (5.72), Sin-

⁴ The Global Competitiveness Index (GCI) evaluates 12 groups of variables: institutions, infrastructure, macro-economic infrastructure, health and primary education, secondary education and formation, product market efficiency, labour market efficiency, financial market development, technological formation, size of markets, business sophistication and innovation.

TABLE 9
Global Competitiveness Index

Country	2011–2012		2012–2013	
	Rank	Index	Rank	Index
Chile	31	4.70	33	4.65
Colombia	68	4.20	69	4.18
Finland			3	5.55
Guatemala	84	4.00	83	4.01
Honduras	86	3.98	90	3.88
Panama	49	4.35	40	4.49
Singapore			2	5.67
Switzerland			1	5.72
LAC				3.97

Sources: World Economic Forum, 2012a.
Note: scores are between one and seven.

gapore (5.67) and Finland (5.55), while the mean for LAC is far below (3.97). Chile again has the highest score among the countries in the region, ranked 33rd, followed by Panama in 40th place. Colombia is placed 69th after other countries in the region such as Brazil, Mexico, Costa Rica and Peru. Guatemala and Honduras have low scores and are ranked 83rd and 90th over 144 countries. Panama improved its performance in the 2012–2013 period, from 4.35 to a score of 4.49, while other countries' performances had only slight variations over the two periods (World Economic Forum, 2012a). Details on scores and rankings are given in Table 9.

The Ease of Doing Business Index ranks economies from one to 185 as to how the regulatory environment is conducive to business operations. The indicator provides a measure in ten regulatory areas, expressing to what degree regulations enable or impede business. Rankings are given in Table 10. The three economies with the most business friendly regulations are Singapore, Hong Kong and New Zealand.

Chile has the friendliest business regulation in LAC, ranked 37th, with significant improvements over the last few years in facilitating trade across borders and enforcing contracts. Peru has the second best score in the region (43rd) and Colombia the third (45th). In the last eight years, the Government of Colombia has implemented 25 institutional and regulatory policies with a focus on improving efficiency in regulatory processes, which have facilitated tax payment and trade across borders with the implementation of a single window. This has allowed Colombia to improve its business regulation consistently and to stand out in the region as being the eighth economy with

TABLE 10
Ease of Doing Business Index

Country	Doing Business (2011)	Doing Business (2013)
Chile	33	37
Colombia	44	45
Guatemala	98	93
Honduras	129	125
Panama	62	61

Sources: World Bank, 2013b.

the most improvement since 2005 (it improved by 15.3 percent, jumping from 79th to 45th position).

In the LAC region, Colombia is followed by Panama, which is ranked 61st in the ease of business regulations, with significant improvements in access levels to electricity and credit. Guatemala is ranked 93rd, with a significant improvement of 10.3 percent since 2005, especially in allowing easier access to credit (ranked 12th). Honduras lags behind in 125th place with some improvements in making it easier to obtain credit by maintaining a unified registry. Other countries in the region with lower scores include Brazil (130), Ecuador (139), Bolivia (155), Haiti (174) and the Bolivarian Republic of Venezuela (180) (World Bank, 2013b).

The Enabling Trade Index (ETI) measures the extent to which economies have developed institutions, policies and services facilitating the free flow of goods over borders and to destinations, providing an assessment of factors that enable trade in four categories: market access, border administration, infrastructure and business environment, all of which are relevant areas that contribute to efficient logistics operations. Singapore (6.14) is the top economy performer, followed by Hong Kong (5.67) and Denmark (5.41). Chile has the highest score in LAC and is ranked in 14th position out of 132 economies. The country has made efforts to facilitate trade in terms of market access by having a significant share of duty-free imports

and low tariffs for exports. Additionally, it has set uniform tariffs for imports that have helped reduce the complexity of processes, and has taken action to modernize its customs regime, which have led Chile to outperform other countries and become a high performer in logistics.

Panama is ranked in 60th position behind Uruguay, Costa Rica and Peru, but the country is looking forward to improving its performance significantly with new regulations related to the administration of the Panama Canal. The scores of Guatemala and Honduras decreased in the 2010–2012 period and are currently ranked 77th and 78th, respectively. Colombia lags behind in 89th place. Its poor performance is partially explained by its low score in the business environment pillar, which is associated with physical security (ranked 123rd). Details are given in Table 11 (World Economic Forum, 2012b).

Chile is the country in LAC with the highest performance in indicators that assess logistics performance, competitiveness, ease of doing business and trade. As described in the previous chapter, Chile has a GDP per capita that is almost twice that of Panama and Colombia, and more than four times higher than that of Guatemala and Honduras. This suggests that, as countries experience economic growth, they invest in infrastructure and facilitate procedures to perform business and move products across the supply chain more efficiently. Thus, according to GDP per capita and economic growth, Panama follows Chile in all indicators and is surpassed only by Colombia in ease of doing business, where Colombia ranks 45th and Panama 61st. Colombia is behind Chile and Panama in logistics performance and competitiveness, but falls behind Guatemala and Honduras in facilitating trade, as measured by ETI. This is because of its significantly low scores in the business environment area that measures physical security, probably influenced by the country's internal conflict. Guatemala is behind

TABLE 11
Enabling Trade Index

Country	ETI 2012		ETI 2010	
	Rank	Index	Rank	Index
Chile	14	5.12	18	5.11
Colombia	89	3.78	87	3.80
Guatemala	77	3.90	68	4.01
Honduras	78	3.89	71	3.98
Panama	60	4.16	60	4.12

Sources: World Economic Forum, 2012b.

Colombia in logistics performance and competitiveness. Lastly, Honduras is the country in the report with the lowest score in all indicators (except ETI, where Colombia is lowest), on average 68 places behind Chile. A summary of the indicators analysed in this section is given in Table 12.

The indicators show that there is still much to be done to increase overall logistics performance in the LAC region. However, the challenge is even greater in the fruit and vegetable subsector, which requires additional components such as a cold chain, and trained personnel in post-harvest handling of products to preserve their quality, as well as value addition. These and other issues are debated in following parts of this report. However, it is important to consider that the components or pillars included in the indicators presented could be further developed or adapted to measure the logistics performance specifically for food supply chains. Furthermore, it is clear that income has a strong influence on the level of logistics performance, but not all countries invest in the same components and hence have diverse performances. Some aspects are inherent to the geography of the country, and some concern its recent history and political development. For example, countries in the Caribbean have a clearer need to develop ports than inland countries. Countries with a long history of civil war and internal

conflicts tend to bear the consequences, resulting in longer processes for delivering products.

3.2 TRADE IN THE REGIONAL MARKET

Countries in LAC export a significant amount of agricultural products. On average, agricultural exports represent 20 percent of total exports, while agricultural imports average 8 percent of total imported merchandise (CEPAL, FAO and IICA, 2013). Chile exports US\$19 066 million of agricultural products, which constitute 24 percent of total exports, just behind fuels and mining products. Fresh grapes and apples constitute the main agricultural products exported. Colombia exports US\$7 059 million of agricultural products, which is equivalent to 12 percent of total exports. Guatemala exports US\$4 700 million of agricultural products, representing the most important export commodity group, with 48 percent of total exports. In Honduras, agricultural exports account for 32 percent of total exports behind commodities (see Table 13). Panama represents a particular case since agricultural imports account for double the value of agricultural exports.

It would be interesting to analyse further how agricultural exports have contributed to improving the logistics system within a country. Values might suggest that, as the share of agriculture exports

TABLE 12
Summary of indicators to assess logistics and competitiveness performance

Country	LPI (2012)	GCI (2012–2013)	Ease of business (2008–2012)	ETI (2012)
Chile	3.17 (39)	4.65 (33)	39	5.12 (14)
Colombia	2.87 (64)	4.18 (69)	45	3.78 (89)
Guatemala	2.80 (74)	4.01 (83)	93	3.90 (77)
Honduras	2.53 (105)	3.88 (90)	125	3.89 (78)
Panama	2.93 (61)	4.49 (40)	61	4.16 (60)

Sources: authors' elaboration, based on World Economic Forum (2012b).

TABLE 13
Exports/imports of agricultural products (2011)

Country	Agricultural exports (million US\$)	Agricultural imports (million US\$)	Agriculture share of total exports (%)	Agriculture share of total imports (%)
Chile	19 066	5 992	23.4	8
Colombia	7 059	5 718	12.4	10.5
Guatemala	4 651	2 432	44.7	14.6
Honduras	2 333	1 487	32.4	14.4
Panama	830	1 669	5.7	7.7

Sources: World Trade Organization, 2013.

increases (particularly value-added products or products requiring certain conditions such as a cold chain), countries invest to improve efficiency in logistics processes. For instance, in Chile, the country with the highest logistics performance in the region, agricultural exports are almost a quarter of total exports. Another interesting example is Guatemala where the fact that agriculture exports account for almost half of total exports could be part of the reason why the country has a higher logistics performance than might be expected from its GDP per capita level, as illustrated in Figure 4. However, data are not conclusive and further analysis is necessary to see how the type of products a country exports affects the development of its logistics process.

Most products traded within the region are transported by sea, travelling long distances before arriving at their final destinations. In 2006, only one-third of food imports in the LAC region came from intraregional trade (World Bank, 2012a). Total intraregional exports have fluctuated between 12 percent and 20 percent in the past 25 years (Durán Lima and Lo Turco, 2010). Recent data show an increase in intraregional trade, but this has only reached 27 percent of total trade, substantially lower than regional trade (63 percent) in the European Union (EU) and Asia (52 percent). This evidences the high costs of trading within LAC (OECD, UN-ECLAC and CAF, 2013). LAC's main trading partner has traditionally been the United States of America which, in 2000, accounted for 60 percent of total exports

from LAC. However, trade to that country has diminished significantly over the last ten years. Similarly, trade with the EU has decreased from nearly 30 percent in 1985 to just under 10 percent in 2012 (ECLAC, 2013). In contrast, China, which represented less than 1 percent of exports before 2000, currently receives 7 percent of total exports from LAC (Durán Lima and Lo Turco, 2010).

Governments have tried to promote intraregional trade through economic agreements between LAC countries, such as the Caribbean Community (CARICOM),⁵ Common Market of the South (Mercosur),⁶ Andean Community of Nations (CAN)⁷ and Central American Common Market (MCCA),⁸ which have low or no tariffs for different types of products. Figure 5 illustrates the percentage of exports from the countries included

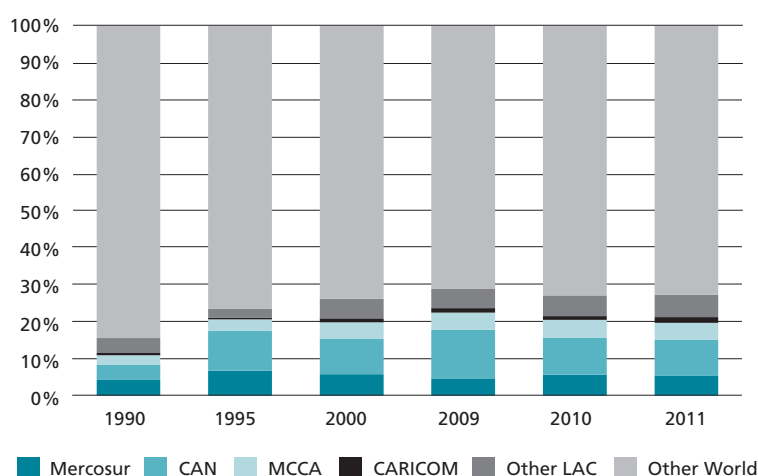
⁵ CARICOM was established in 1973 as a free trade area, including the following countries: Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Montserrat, Saint Lucia, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Suriname and Trinidad and Tobago. In 1989, the common market was transformed into a single market.

⁶ Mercosur was created in 1991 to promote free trade among the following member countries: Argentina, Brazil, Paraguay, Uruguay and the Bolivarian Republic of Venezuela. The Plurinational State of Bolivia became a member in 2012. Agricultural products have zero tariffs.

⁷ CAN is a customs union created in 1969 between the Plurinational State of Bolivia, Colombia, Ecuador and Peru. The Bolivarian Republic of Venezuela was a member until 2006.

⁸ MCCA was created in 1993 and includes Guatemala, Salvador, Honduras, Nicaragua and Costa Rica.

FIGURE 5
Exports to trading blocks in LAC, as a percentage of total exports



Source: authors' elaboration, based on data from ECLAC, 2013.

Note: data correspond to exports to selected destinations from Chile, Colombia, Guatemala, Honduras and Panama.

in this report (Chile, Colombia, Guatemala, Honduras and Panama) to the main integration schemes in LAC. Intraregional trade has increased over the last ten years, yet economic agreements among countries have not had a significant impact on trade across the region, accounting for the destination of only 20 percent of total exports. In 2012, the Pacific Alliance⁹ was launched as an attempt to constitute a common regional market. Analysts believe that the characteristics of this alliance are different because it is based on a market approach that is actually implementing policies to smooth border procedures and standardize regulations, such as on labelling and rules of origin. However, it is still too early to know whether the alliance will be successful in increasing intraregional trade.

Regional integration schemes still have a long way to go in order to reach a more enhanced stage of “deep integration” (Kuwayama, 2005). Constraints that limit development of the intraregional market include: (i) persistence of non-tariff barriers; (ii) lack of customs standardization; (iii) inadequate regional infrastructure; (iv) limited coordination of macroeconomic and sector policies; and (v) tax systems that do not work for integrated markets (IDB, 2010). Additionally, similarities in the supply of products across the countries in the region and difficulties in connectivity, resulting from low terrestrial connectivity between Central and South America because of interruptions between Panama and Colombia in a region called the Darién Gap,¹⁰ affect the low level of regional trade.

The size of food commerce in LAC countries, plus the fact that the main destination markets require maritime transportation of products for long distances, reinforce the importance of logistics systems facilitating product transportation and handling. These are particularly needed for perishable horticultural commodities that require specific conditions in order to prolong their shelf-life.

In some areas of LAC, the problem of intraregional export is aggravated by poor coordination and information problems. This situation leads many to suggest the consolidation of standardized practices within country borders and even

the development of road corridors (OECD, UN-ECLAC and CAF, 2013).

3.3 DISTRIBUTION FOR SELECTED FOOD SUPPLY CHAINS

Schemes for internal distribution of food are dictated by demand. As buyers become more demanding, value chain and hence logistics processes need to be optimized to offer high-quality products at competitive prices. The logistics chain may be targeted to the domestic or foreign market. Depending upon the product and final client, different actors intervene in the value chain.

The food supply chain consists of the interaction of different actors producing, storing and transporting products. Producers are generally located in rural areas, so that many stages usually take place before products reach consumers.

Figure 6 highlights the main overall processes (selection, classification, packaging, cold chain transportation) before products reach the national market, agro-industries and foreign markets. Retail points where consumers access final products range from local markets and typical small neighbourhood shops, to large supermarket chains.

Figure 7 illustrates general processes along a food supply chain involving SMEs. Since volumes in SMEs are not large, producers generally take their products to collection centres where they are aggregated to gain economies of scale. The products are then transported to ports for international shipment, and additional transportation and storage take place at destination markets. Hence, appropriate vehicles and modern infrastructure play a key role in efficient logistics operations. It is important to have efficient logistics operators for ground transportation both in the national territory and in the export market. Box 1 illustrates the value chain for grape exports from Chile to the United States of America as an example to understand the different activities that take place in the logistics processes for food products.

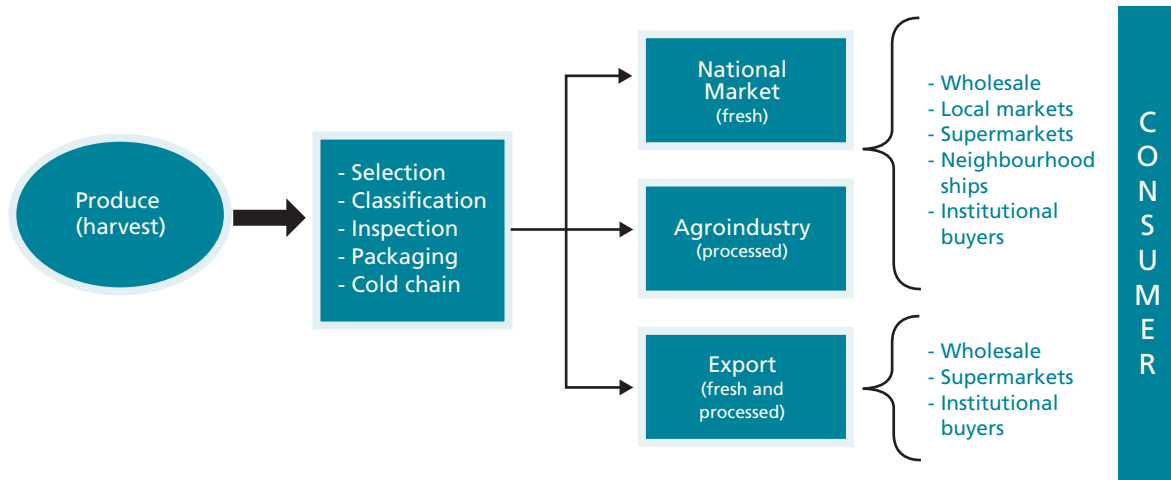
In recent years, together with traditional concerns for food products to be safe and for consumers to access them at affordable prices, the challenge of sustainability has assumed greater relevance, as it is questioned whether food can be supplied, distributed and consumed in a more sustainable way without increasing costs. Here, the efficient management of logistics operations gains even more relevance.

Global consumers are becoming more demanding about the products they purchase, and are

⁹ The Pacific Alliance was launched in June 2012 between Chile, Colombia, Mexico and Peru. In 2013, the countries removed tariffs on 90 percent of their merchandise trade.

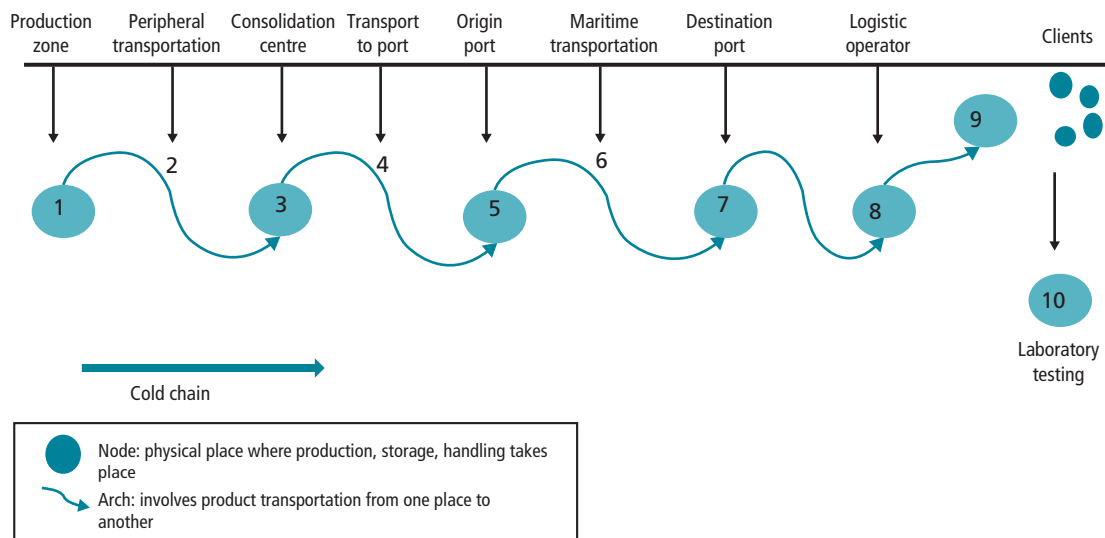
¹⁰ Darién Gap is a large swathe of undeveloped swampland and forest separating Panama's Darién Province in Panama from Colombia where the Pan-American Highway connecting North, Central and South America is interrupted.

FIGURE 6
General processes in the food supply chain



Source: authors' elaboration.

FIGURE 7
Food logistics supply chain



Source: Jaramaillo and Gonzalez, 2012.

increasingly concerned as to where and how food is produced. Customers are more demanding in some countries than in others for cultural and historic reasons. The World Economic Forum aims to assess the role of consumers in GCI through the degree of buyer sophistication. In this regard, Chile has the most sophisticated buyers in the region, ranking 28th out of 142 countries. Colombia and Guatemala are behind in 42nd and 59th position, respectively. Panama and Honduras have the lowest apparent degree of sophistication (69th and 70th, respectively). The low level of buyer sophistication in Panama is interesting, since the country has a

high share of imported food products. Moreover, Panama has been largely influenced by the food standards of the United States of America, which has the tenth highest buyer sophistication (score of 4.6), so that one would expect a higher buyer sophistication level. For details, see Table 14.

It is generally accepted that in efficient markets it is possible to produce the appropriate products according to exact demand requirements. Market efficiency depends on demand conditions such as buyer sophistication and customer orientation. Buyer sophistication is important since it can generate efficiencies in the market, forcing companies

to find innovative solutions and become more customer oriented. However, this is not necessarily the case for the countries included in this report. Chile, which has a high level of buyer sophistication (ranked 28th), has a low degree of consumer orientation (ranked 68th). On the contrary, Guatemala with a medium level of buyer sophistication (ranked 59th) has a high degree of consumer orientation (ranked 33rd). Colombia is similar, ranked 52nd in buyer sophistication and with a much better score in degree of consumer orientation (ranked 39th). Panama also performs better in degree of consumer orientation (ranked 59th) than in buyer sophistication (ranked 69th). Honduras has the lowest degree of consumer orientation and is ranked in 82nd position. With regard to global references, the top two countries in buyer sophistication and degree

of consumer orientation are Japan and Switzerland, ranked first and second in both categories. Japan has a score of 5.4 in buyer sophistication and 6.4 in consumer orientation, while Switzerland has 5.2 in buyer sophistication and 5.9 in consumer orientation. Hence, the countries included in this report are still far from attaining the high level of market development measured by these two variables.

Food franchises and supermarkets establish strict parameters for the supply of food. Together with the wholesale market, retailer and neighbourhood shops, they are the main distribution channels for fruit and vegetables. Enterprises encounter issues in fulfilling these customers' requirements because of inappropriate logistics operations. Some challenges identified in the countries assessed include the following.

TABLE 14
Degree of buyer sophistication and consumer orientation

Indicator	Chile	Colombia	Guatemala	Honduras	Panama
Buyer sophistication	4.14 (28)	3.67 (52)	3.57 (59)	3.41 (70)	3.46 (69)
Consumer orientation	4.61 (68)	4.99 (39)	5.13 (33)	4.53 (82)	4.68 (59)

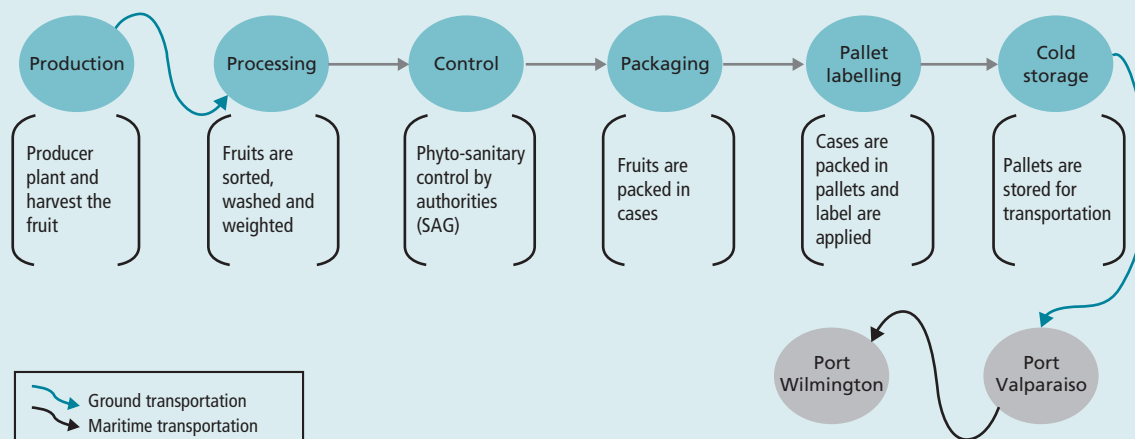
Sources: World Economic Forum, 2012a.

BOX 1

Producers' and exporters' organizations in Chile

Chile is the world's largest exporter of fresh grapes with more than 781 000 tonnes exported in 2010. Grapes need to be handled carefully because of the risk of a grey mould caused by the fungus *Botrytis cinerea*. To forestall this occurrence, it is important to have integral management in the field, sulphur dioxide (SO₂) pads inside each box, and proper control over the entire value chain. The steps required to export grapes from Chile (Valparaíso) to the United States of America (Wilmington) are illustrated.

Value Chain for Grape exports from Chile to The United States of America



Source: authors' elaboration from Chile report and GS1, 2012.

- Lack of appropriate traceability systems.
- Inadequate vehicles for food transportation. Some vehicles are used to transport other products, which can affect the quality of fruit and vegetables.
- Insufficient supply of refrigerated vehicles and, in general, poor infrastructure for the cold chain.
- Lack of training for workers and transporters in food manipulation and handling of the cold chain (which is often interrupted) and in overall logistics management.
- Use of inadequate packaging.

These factors, together with infrastructural issues such as lack of proper roads or markets with poor hygienic conditions, constitute a high incidence in fruit and vegetable losses and in final prices.

Large supermarket chains have been central to food chain development, dominating trade, processing and distribution. It is worth mentioning that Chile has the highest supermarket share in the

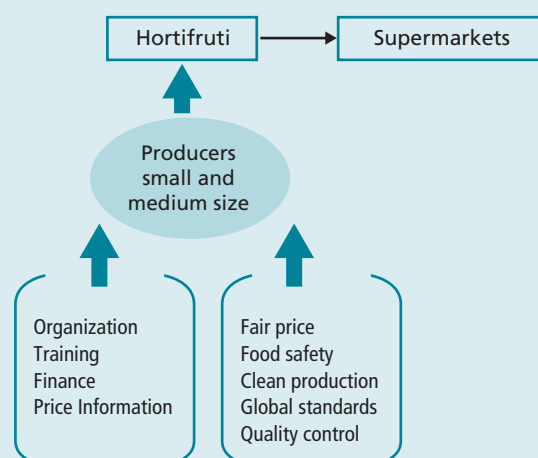
region, significantly surpassing other countries. For example, its share of supermarkets in 2006 was 62 percent, whereas for Guatemala, Honduras and Colombia, it was 35, 42 and 47 percent, respectively (Traill, 2006). On the other hand, Chile is the country in the region where investment comes mainly from local sources, as opposed to foreign investment that commonly establishes international grocery store chains (Reardon, Berdegue and Farrington, 2002). The presence of food franchises has had a significant effect, particularly in Central America, on the improvement of food systems that involve implementation of programmes such as good agricultural practice (GAP), good manufacturing practice (GMP) and Hazard Analysis and Critical Control Points (HACCP). An example of the improvements achieved in the logistics supply chain for food products is the case of Hortifruti in Guatemala, which supplies fruit and vegetables to Walmart supermarkets in Central America (Box 2). It is interesting to note that, not only have the strict parameters established by supermarkets influenced

BOX 2

Walmart procurement from smallholders in Guatemala

Hortifruti Walmart in Guatemala works with a number of small and medium-size producers under the programme Tierra Fértil. The programme helps producers with good agricultural and managerial practices to produce high-quality products. Suppliers are required to follow certified logistics processes such as GAP, GMP and HACCP. Walmart also has special product requirements regarding packaging and transportation that promote producer efficiency. Figure 8 illustrates the Hortifruti operational model.

FIGURE 8
Hortifruti operational model



Source: Jaramaillo and Gonzalez, 2012.

the development of improved logistics to reduce losses during transit, but the high stringent quality standards have also posed a higher risk of losses from rejections caused by unacceptable quality (Lundqvist, De Fraiture and Molden, 2008).

3.4 LOGISTICS COSTS IN THE FOOD SUPPLY CHAIN

Logistics costs and their share in the final price is the result of an interaction of different stages, which cannot always be controlled by companies or the government. Available level of infrastructure, distance between production centres and consumption or dispatch centres, development of support services, mobilized volume and buyers' sophistication differ among countries and contribute to forming diverse food supply chains. A country's LPI relates largely to its level of logistics costs (Rantasila and Ojalá, 2012).

This report focuses on the food supply chain for the fruit and vegetable subsector. Nevertheless, information specifically on fruit and vegetables in the agroprocessing industry is limited. There is a lack of reliable data and, when data are available, they are aggregated with other agricultural products of a diverse nature, which does not allow for detailed analysis.

Logistics costs account for a large part of food product costs in LAC. They represent between 18 and 32 percent of the value of commodities, compared with close to 9 percent in OECD countries (World Bank, 2012b). On a macrolevel, logistics costs in Colombia are 26 percent of GDP, in Chile

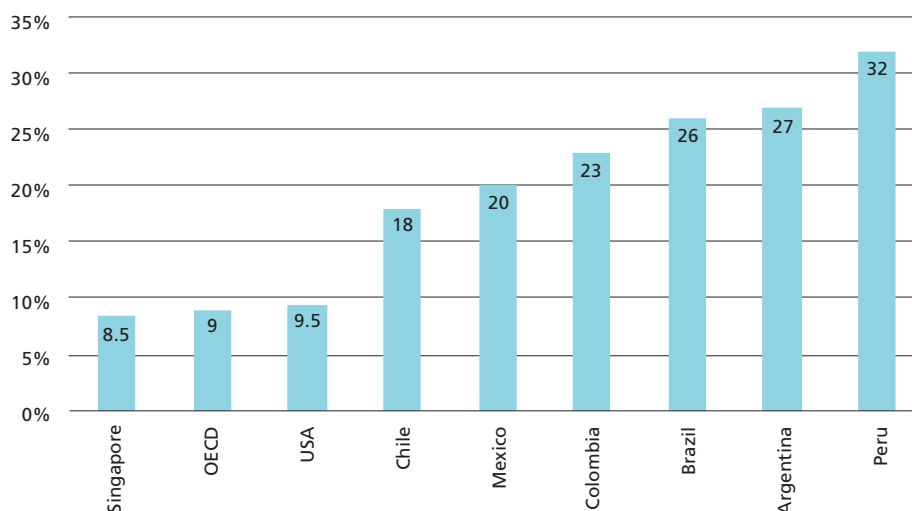
they account for 18 percent of GDP and the average of the LAC region is between 16 and 26 percent of GDP compared with 9 percent in OECD countries.¹¹ Figure 9 illustrates the logistics costs for the different countries in the study, relative to those countries with a high logistics performance such as Singapore and the United States of America.

Between 2000 and 2007, all forms of shipping costs related specifically to food increased, trucking costs rose by 40 percent, maritime costs doubled and air shipments increased even further (Schwartz et al., 2009). Yet the impact of logistics costs on food prices in LAC has been relatively constant. As estimated by the World Bank, the maritime burden on the cost of imported food in LAC was between 8 and 9 percent in the 2000–2007 period. Similarly, the road transportation share of final costs oscillated between 7 and 8 percent during the same period (Schwartz et al., 2009).

SMEs are an important sector in the economy. According to the World Bank, "in almost the entire world small and medium-size enterprises are often the largest employment generators" (World Bank, 2013b). In Chile, SMEs play a significant role in the economy with 6.6 of total exports – Chile considers SMEs to be those managing up to 200 ha. SMEs are particularly active in the production of fruit,

¹¹ Costs are derived from macro measurements based on assumptions to estimate logistics costs across different sectors. They include costs for inventories, transport and management.

FIGURE 9
Logistics costs as a percentage of GDP



Source: IDB, 2011a.

accounting for 75 percent of production area in the country, with more than 300 000 ha. Fruit is the main agrifood product exported, with 52.6 percent of total agricultural exports, while vegetables represent 3 percent of total agricultural exports. In Colombia, 50 percent of export enterprises are SMEs (Montoya *et al.*, 2010). In Guatemala, 64 percent of enterprises in the food sector are classified as small companies (Loma-Ossorio, Castillo and Rio, 2000).

Enterprise classification differs across countries, which limits the depth of comparisons. A summary is provided in Table 15. Each country uses different criteria such as the number of employees, annual sales or area of cultivated land. In any case, regardless of the parameters used, it is clear that SMEs play a major role in fruit and vegetable production and commercialization.

From the perspective of enterprises, domestic logistics costs in LAC may be the largest single

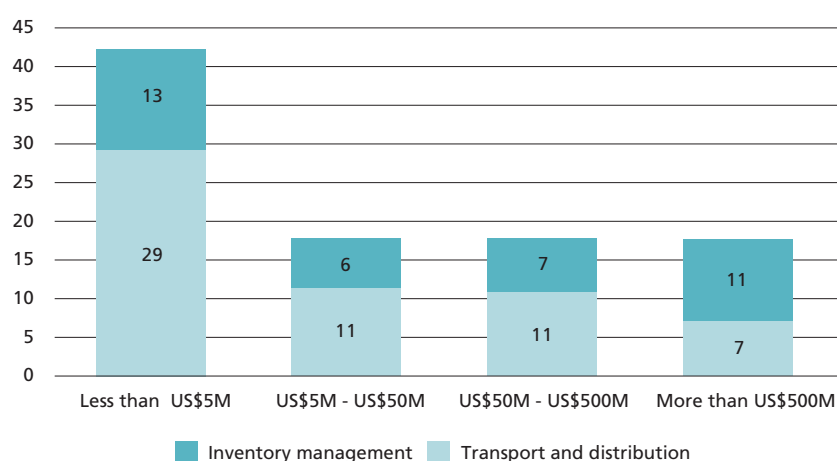
cost element in the final price of a product. There are differences between countries and the type of companies, but in LAC, logistics costs are most sensitive to the size of the company (Schwartz *et al.*, 2009). The Center for Latin American Logistics Innovation (CLI) surveyed 153 enterprises in LAC to assess their logistics performance. Figure 10 illustrates how logistics costs in terms of inventory management and transport and distribution vary according to total sales of enterprises. Results of the study suggest that the logistics performance of SMEs is considerably lower than that of large industries. SME logistics costs can total over 42 percent of the total company's sale, compared with between 17 and 18 percent for larger companies. For small companies, inventory management and warehousing make up the largest part of logistics costs, with almost one-third of the sales price; for medium-size companies, the share of inventory

TABLE 15
Country enterprise classification

Country (classification criteria)	Micro		Small		Medium		Large	
Colombia (number of employees)	1–10	14.9	11–50	49.3	51–200	24.4	>200	12.1
Guatemala (number of employees)			5–19	63.8	20–49	14.4	>50	21.8
Honduras (number of employees)	1–10	98.0	11–50	2.0	51–150			
Panama (annual sales)	>150 000		150 000– 1 000 000		1 000 000– 2 500 000			
Chile	SMEs exploit 200 ha and represent 75 percent of exploited land area in the country							

Sources: FAO country document.

FIGURE 10
Average logistics costs by component as a percentage of total value of company sales, as affected by enterprise size



Source: Schwartz *et al.*, 2009 from CLI data.

management is between 10 and 12 percent, while for large companies the share is significantly lower (7 percent). It is worth noting that transportation costs do not decrease consistently with enterprise size. The share of transportation costs for small and large companies is similar, ranging from 11 to 13 percent, whereas for medium-size companies, the share is significantly lower, ranging from between 6 to 7 percent. It would be interesting to assess the different transportation systems for small, medium and large companies in order to understand the variations in the share of costs.

An important piece of information derived from these data, which could apply to fruit and vegetable products in general, is that storage (defined as cost of the infrastructure for storage purposes) makes up more than twice the cost of transportation across SMEs and could be twice the cost in SMES as compared with large corporations. It is likely that this situation (storage/transportation ratio and difference in costs between smallholders and large enterprises) may be even more prominent in areas where the logistics to harvest large volumes per year have not been established. For fresh commodities without refrigeration, transportation is the most important cost, followed by customs and taxes when delivery is out of the country. For example, transportation costs for tomatoes shipped from Costa Rica to Nicaragua by a smallholder are almost a quarter of total costs, while customs account for 11 percent and taxes 6 percent of costs (Fernandez *et al.*, cited by OECD, UN-ECLAC and CAF, 2013). On the other hand, for larger enterprises, the main cost is customs with 10 percent of total costs (Fernandez *et al.*, 2011 cited by OECD, UN-ECLAC and CAF, 2013). It is clear from these examples that small enterprises that are working as individual units and with low volumes will bear high costs of either transportation (when shipped immediately after harvest) or storage (of a processed or minimally processed product).

In Colombia, logistics costs vary significantly according to the size of the enterprise. For companies with annual sales of less than US\$4 million, these costs represent 17.5 percent of the total value of products, while for companies with annual sales of more than US\$107 million, logistics costs represent 10.1 percent of the total value. The tendency in the group of companies interviewed in the country assessments was similar to data from Schwartz *et al.* (2009), but differences in costs between those incurred by small enterprises and those by large enterprises were found to be greater. Based on personal communication, it was found that the

influence of logistics costs on the value of products ranged from 15 percent in large companies to 30 percent for smaller ones.

The reasons for increased logistics costs for SMEs can be attributed to the low volume of products that cannot benefit from economies of scale, as well as less capacity to organize the flow of products along the supply chain because of specific requirements such as refrigerated transportation and technology and inventory management. For many SMEs, logistics integration with suppliers and clients is currently a major challenge.

Some of the main difficulties that SMEs face in international trade are:

- export of small quantities that do not usually fill a container, thus requiring the consolidation of products from different companies;
- problems in mixing products in trucks and containers since product characteristics and requirements differ;
- low bargaining power with logistics operators;
- lack of capacities for efficient logistics management;
- difficult access to financial services;
- lack of logistics operators oriented to serve SMEs.

Some countries have been able to overcome these difficulties by promoting organizations of producers and exporters that coordinate product delivery, creating economies of scale and reducing transportation costs. Moreover, these organizations have the bargaining power to negotiate with logistics service providers and to work with government institutions in support of specific areas. Examples of this type of organization are the Federation of Fruit Producers of Chile (Fedefruta) and ASOEX, which have been able to ease the commercialization process for fruit producers in Chile (Box 3), and AGEXPORT in Guatemala (Box 4).

The effects of logistics costs differ across the region, depending on both product characteristics and destination. Differences in the percentage and characteristics of imported goods, and the type of transportation used also determine the type of infrastructure required.

Several examples of logistics costs for different food products that are exported and/or imported in LAC are given below. The first two examples have been documented in Schwartz *et al.* (2009). The examples regarding grapes in Chile and *uchuva* (*Physalis peruviana*) derive from data compiled in the country assessments. They also confirm the large differences in costs between logistics involving LAC countries and those involving industrialized

countries (in this case, the United States of America and Canada).

1. Pineapple imports from Costa Rica to Saint Lucia

Pineapples are imported to Saint Lucia from Costa Rica via a consolidation centre in Miami. The analysis shows that the price paid to producers represents only 10 percent of the delivery price. It is important to note that transportation costs represent the largest share, with 43 percent of total costs (maritime transport 35 percent, and ground transport 8 percent). Moreover, wholesale consolidation and other costs represent 17 percent of the share prices. Saint Lucia has a low economy of scale in shipping, which limits the number of direct services offered,

compelling the consolidation centre in Miami to be used, which significantly increases maritime transportation costs (Schwartz *et al.*, 2009).

2. Wheat imports from Canada to Ecuador

Logistics costs at Quito mills for wheat imported from Canada represent 30 percent of total costs. However, ground transportation of processed wheat to other cities in Ecuador can add between 20 and 25 percent to total costs. It is twice as expensive to transport 1 kg wheat between two cities in Ecuador that are 171 km apart,¹² than it is

¹² Cost of ground transportation between Manta on the Pacific Ocean and Quevedo in central Ecuador.

BOX 3

Producers' and exporters' organizations in Chile

In Chile, both producers and exporters have created organizations that have enabled the obstacles facing SMEs to be overcome, by providing higher negotiation powers and granting an identity platform for national products. The main organizations are Fedefruta and ASOEX, which bring together more than 1 000 producers. The organizations are financed by fees paid for each exported box of products and by funds from ProChile, an institution of the Ministry of Foreign Affairs that promotes exports. The organizations have had a positive impact in terms of:

- coordinating members' exports to win economies of scale in terrestrial and maritime transportation;
- marketing campaigns to promote a national brand instead of individual producers – ASOEX created the "Fruits from Chile" brand to bring the fresh and dried fruit sectors together under one banner, which key importers and distributors worldwide agree has helped to create a positive perception of Chilean products;
- standardizing packages for different types of exported fruit – packages have the same logo, size and weight to ease transportation and gain customer recognition;
- development of pre-shipment programme between SAG and the United States Department of Agriculture (USDA) to ensure that products are free of plagues to facilitate the commercialization of fresh fruit from Chile to the United States of America.

Source: Chile country report.

BOX 4

Exporters' association in Guatemala

In Guatemala, the AGEXPORT export association was created in 1982 to diversify export offers in the country. Some of its main accomplishments regarding logistics development in Guatemala are:

- help in creating the single-window trade facilitation system to simplify procedures relating to international trade through an integrated electronic system handling export/import procedures;
- establishment of the *Oficina de Regímenes de Perfeccionamiento Activo* (OPA), an office providing useful and high-quality information for exporters;
- implementation of supply chain projects that promotes partnerships among small producers and SMEs to establish beneficial long-term commercial relationships.

Source: Guatemala country report.

to transport the same amount thousands of nautical miles from Vancouver to the port of Manta in Ecuador (Schwartz *et al.*, 2009). This shows why it is so important for countries to strengthen different infrastructure components such as national roads, ports and airports. Although grain has been used as an example, similar situations apply to imported produce such as apples. Clearly, part of this large difference has to do with the fact that maritime shipment moves a considerable mass of products. However, such a difference is not seen when comparing movement of products in the opposite direction (south-north), as the following examples show.

3. Grapes exported from Chile to the United States of America

Chile is the number one global exporter of table grapes. Table 16 and Figure 11 show approximate costs to export a box of grapes weighing 8.2 kg to the United States of America. Production costs are 20 percent of total costs. Transportation costs have the largest share in the final price with internal land transportation accounting for 22 percent of total costs, while ocean transportation accounts for 35 percent.

4. Uchuva exported from Colombia to the Netherlands to the Netherlands

Table 17 and Figure 12 show the costs for exporting a 40-ft (approximately 12-m) container of *uchuva* from Colombia to the Netherlands. Pro-

TABLE 16
Grape export costs from Chile to the United States of America

Concept	US\$	Weight (%)
Production costs	4.05	20
Costs from farm to production centre	0.5	3
Materials	2	10
Harvesting, selection and cold packaging	2.5	13
Ground transportation to port of Valparaiso	3.95	20
Ocean transportation to United States of America	7	35
Total costs	20	

Sources: authors' elaboration from country assessments.

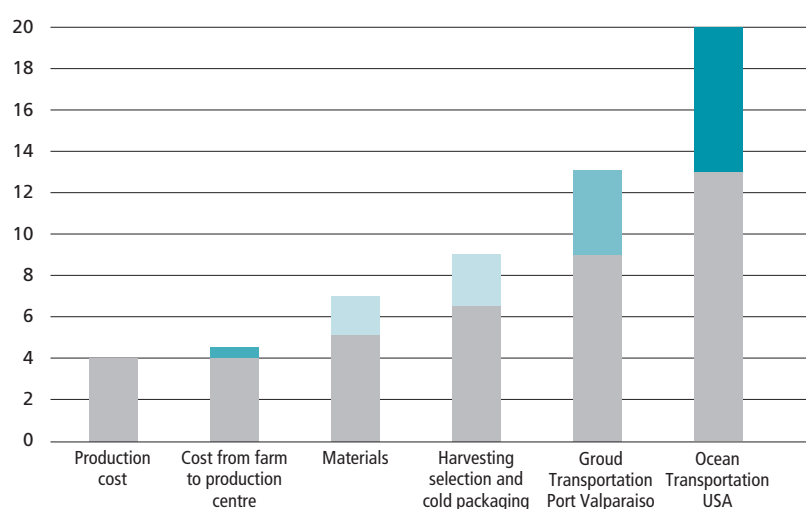
TABLE 17
Uchuva export costs from Colombia to the Netherlands – shares

Concept	US\$	Weight (%)
Value at farmgate	10 056	33
Losses	4 525	15
Margin for exporter	7 919	26
Ground transportation	2 011	7
Port operations	1 397	5
Ocean transportation	3 017	10
Nationalization	1 027	4
Total costs of products for buyer	30 132	

Sources: authors' elaboration from country assessments.

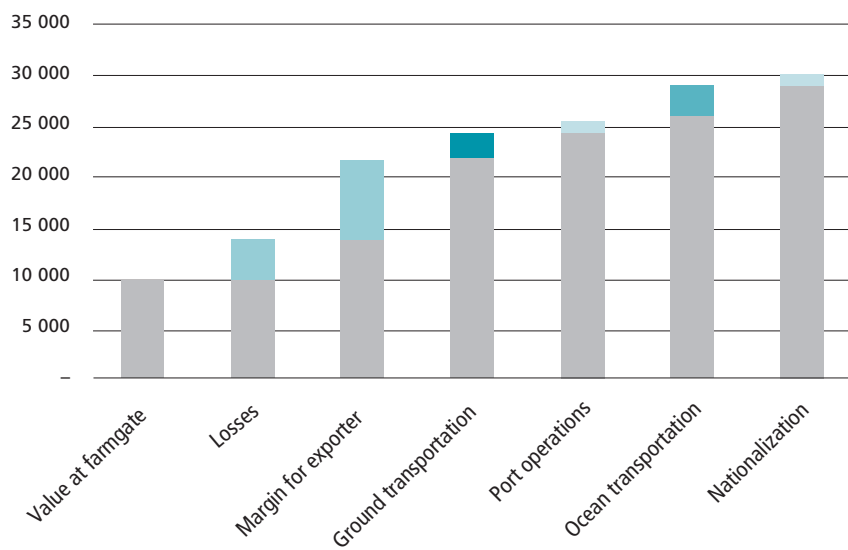
FIGURE 11

Grape export costs from Chile to the United States of America – shares



Source: authors' elaboration from country report.

FIGURE 12
Uchuva export costs from Colombia to the Netherlands – shares



Source: authors' elaboration with data from Colombia country report.

duction costs constitute 33 percent of total costs, while transportation costs represent 17 percent of the total (10 percent ocean and 7 percent ground transportation). Product losses and other logistics operations such as port operations, customs and processes amount to a high share of total costs with 24 percent.

As evidenced by these four cases, logistics costs can vary greatly, depending on the type of product, and the origin and destination market that

determines how much transportation is required, both by land and by sea. However, in all cases, logistics costs (especially transportation costs) represent a substantial amount of the final price customers pay for products. Hence, it is crucial to understand what the main challenges in the logistics systems in countries in LAC are, and how these can be overcome to gain competitiveness, reduce costs and ensure products are delivered to the right quality.

Chapter 4

Logistics components in the produce sector – main challenges

Based on the analysis of available indicators to assess logistics performance and interviews with relevant stakeholders, it was possible to identify the components that have the greatest impact in logistics operations for fruit and vegetable products. These components are the following.

1. Infrastructure and transportation.
2. Information and communication technology (ICT).
3. Electricity and the cold chain.
4. Human capital and logistics management decisions.
5. Trade facilitation and border management.

The main challenges for each of these components are discussed in this chapter.

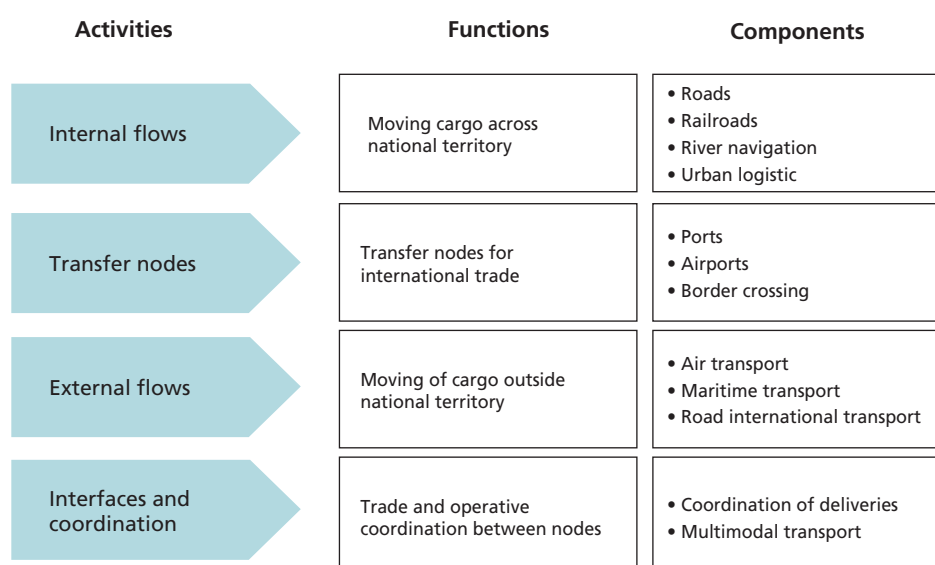
4.1 INFRASTRUCTURE AND TRANSPORTATION

Infrastructure plays a key role in efficient logistics operations. According to the Inter-American Development Bank (IDB), logistics connected to infrastructure can be divided into four main activities: internal flows, transfer nodes, external flows, and interfaces and coordination. Each activity has a function, and specific components such as roads, railways, ports and airports. Figure 13 illustrates the main activities, functions and components of infrastructure.

Roads

The overall network of roads in LAC is underdeveloped because of low coverage and poor maintenance.

FIGURE 13
Components in infrastructure and transportation activities



The coverage of the road network is 156 km for each 1 000 km of surface, which is lower than the global average of 241 km. However, in terms of population, it is 5.7 km per 1 000 people, compared with a global average of 4.8 (IDB, 2010). Moreover, according to World Road Statistics, road maintenance in LAC is significantly lower than that of developed regions, including Europe and northern Pacific Asia, and even compared with some developing regions such as North Africa and the Middle East.

All the LAC countries analysed have a poor network of national secondary roads that provide access to rural areas where most horticultural crops are produced. A common characteristic is that there is major dependency on a few main roads that, in some cases, are not necessarily in the best condition for the transportation of various types of products. For example, Panama has only one main road in good condition that crosses the country (the Pan-American Highway) – alternative or secondary roads are in poor or very poor conditions.

In the region, the average percentage of paved roads is only 16 percent, significantly lower than the percentage of paved roads in developed countries, which is close to 100 percent (IDB, 2010). In Honduras, less than a quarter of the roads are paved, while in Guatemala this value is only marginally higher. In Colombia, where responsibility for road maintenance is distributed among different institutions and administrative levels, 74 percent of the roads managed by the National Institute of Roads (INVIAS), are paved. For the roads managed by other departments, 42 percent of km are graded as good and very good (*Ministerio de Transporte* [Ministry of Transport], 2011).

In Guatemala, the road network was built to support the commercialization of agricultural products such as coffee and bananas for export. Hence, the areas with high agricultural potential are relatively well connected. The World Bank estimates that the country has around 26 000 km of roads divided into national and regional roads. Of the national roads, 75 percent are classified as being in good condition, while only 45 percent of regional roads are good (World Bank, 2007). This is a significant observation for the country that, as stated before, has a better performance than its GDP per capita level would indicate.

In spite of difficulties with national roads, ground transportation by truck plays a major role in the internal movement of products. In Colombia, 80 percent of the volume of merchandize transported internally is moved by truck (World Bank, 2006). Transportation by truck in developed

countries is slightly lower with 70 percent of the total volume (IDB, 2010), while a larger proportion is moved through rail networks.

Ports

Ports in LAC are the main point of entry and exit for international trade. In 2011, ports in LAC handled 41.3 million 20-foot (6 m) equivalent units (TEUs)¹³ representing a 10 percent increase from 2010 (ECLAC, 2013). The region is a net exporter of primary commodities with ports moving 80 percent of exports and 20 percent of imports (IDB, 2010).

Many ports have been subjected to substantial reform over the last 15 years, with concessions and privatizations as the main models used. In general, transformations have had a positive effect with improvements in quality, capacity, efficiency and costs. However, there are issues regarding trade facilitation, exchange of information, inspections and restricted terrestrial access.

Panama has a large network of ports. The main ones are Manzanillo International Terminal, Colón Container Terminal and Cristóbal on the Atlantic Ocean, and Balboa and PSA Panama International Terminal on the Pacific Ocean. Ports are managed either by private companies under concession, or directly by the government. In 2012, Colón and Balboa moved the largest amount of merchandize in LAC with 3.3 and 3.2 million TEUs, respectively. They are well equipped to handle refrigerated products and have the capacity to manage more than 5 000 refrigerated containers. Currently, Panama is in the process of enlarging the Panama Canal, which connects the Pacific and the Atlantic Ocean, making it a key connection point for global trade.

In Colombia, policies are in place to modernize the five main maritime ports: Santa Marta, Barranquilla and Cartagena on the Atlantic Ocean, and Buenaventura in the Pacific Ocean. Ports are managed under a concession whereby the government has ownership, but private societies are the administrators. The port of Cartagena is the fourth port in LAC in terms of container traffic, moving nearly 1.8 million TEUs in 2011.

All ports in Colombia have the infrastructure to manage refrigerated products by using refrigerated containers and warehouses. However, the main inefficiencies in port operations are related to excessive and inappropriate inspection of merchandise. Even if some ports use surtcontainers (refrigerated containers that enable inspections to be carried out

¹³ TEU is the unit used to measure cargo traffic, equivalent to one container of 1 360 cubic feet (38.5 m³).

while the temperature remains constant and regulated) and scanners to facilitate product inspection, standard protocols for food product inspection are lacking, which can cause delays and product losses through inappropriate handling. Moreover, even if companies have a certification such as the Business Alliance for Secure Commerce (BASC), which should guarantee product safety, products are subject to inspections that cause inefficiencies in operations.

In Chile, the model of public-private partnerships (PPPs) for the management of ports has enabled the modernization of infrastructure and an increase in shipping capacity. The main ports in the country are Valparaiso and San Antonio and are those used mostly for fruit exports since they have adequate infrastructure to handle refrigerated containers. In 2012, the port of Valparaiso was the 12th most important in LAC in terms of container traffic.

Guatemala has ports in both oceans that operate with autonomous authority, are decentralized and have an independent budget. Two of the ports (Puerto Quetzal and Santo Tomas) have the BASC certification. Additionally, Santo Tomas is certified under the International Ship and Port Facility Security (ISPS) code. Barrios, a third port, is managed by the Chiquita company to export bananas.

Honduras has five ports. The main port in the country is Puerto Cortés, ranked as a mega port by the United States Department of Homeland Security. It has different certifications for goods operations such as the Container Security Initiative (CSI) and the ISPS granted by the International Maritime Organization (IMO). Within the port, a United States customs office undertakes security checks and pre-approved containers are exported from Honduras to the United States of America to facilitate trading producers. Additionally, a system of gamma rays inspects all containers that enter and leave the port. The port of La Ceiba mainly operates for the Standard Fruit Company, which exports bananas.

In the Caribbean region, despite the fact that logistics performance is low overall, investments in ports in some countries are notable. In fact, two ports in the Caribbean countries are particular in that they are able to provide direct services to and from ports in East Asia, Europe and North America with a capacity to receive large ships with a deep draught. These are Caucedo (in the Dominican Republic) and Kingston (in Jamaica) which, in addition to the ports in Panama, are the only options in Central America and the Caribbean. Because of the anticipated change in dynamics with the expan-

sion of the Panama Canal, a new logistics centre is being constructed in the Dominican Republic's multimodal Caucedo port (OECD, UN-ECLAC and CAF, 2013).

Airports

Air transportation in LAC grew 4.1 percent between 1997 and 2007, which is a significant number, but far below the growth in maritime transportation, which was 9.8 percent in the same period (IDB, 2010). Because of its cost, air transportation is used for high-value products and those for which delivery time is crucial in product competitiveness. Perishable high-value products are consequently transported by air, such as fully ripe mangoes shipped from the Dominican Republic to Canada and Europe.

In some LAC countries, many products (in value terms) are transported by air. There is a major air trade (65 percent) in South America, particularly in Brazil, Colombia and Chile; 25 percent originates in Central America, where Mexico has most trade flows; and 9 percent in the Caribbean, where the Dominican Republic is the origin or destination of half of product movements (IDB, 2010). For LAC, the United States of America is the main destination by air.

Air transportation includes both passengers and merchandise. Forty percent of merchandise is transported in the belly of the aircraft. When volumes are significant, products are transported in specific freighters. Passenger and freighter aircraft generally share airport infrastructure and services, but have their own terminals. In the region, there is a tendency to move forward with the development of specialized terminals to manage certain types of products such as fruit and flowers.

In Colombia, air transportation has been concentrated on El Dorado International Airport in Bogotá. This is the main airport in LAC for the transportation of refrigerated products, mainly flowers and fresh fruit. In Chile, the airport network has 330 airports. Of these, seven deal with services for the national police and SAG.

Panama has a network of 68 airports, five of which have infrastructure for international operations. Tocumen International Airport has become an important hub for connecting North and South America. It connects passengers and moves cargo to more than 33 countries. In 2011, the cargo terminal handled over 110 000 tonnes of cargo (logistics.gatech.pa).

Guatemala has two international airports, La Aurora and Mundo Maya, which have both been recently modernized to enlarge their capacities. In

Honduras, there are four international airports and 25 small national airfields.

Transportation of products

Intermodal or multimodal shipment is most common in international transportation. It is the combination of two primary modes of travel such as truck-sea, truck-air or train-ship. Factors to be considered when choosing transport for the food industry include costs and time-based constraints because of limited shelf-life. In LAC, the most common method of transporting fruit and vegetables is a combination of land transportation by truck and by sea.

Transportation of fruit and vegetables by truck, from production centres to national customers and/or ports, accounts for a significant amount of time in the food supply chain. This activity is mainly carried out by private logistics operators. According to the few available studies, the general efficiency of the transportation sector is low; indicators suggest that for nearly 30 percent of the time trucks travel empty compared with 25 percent in developed countries (IDB, 2010).

In the United States of America, an estimated 4 percent of every dollar spent on food goes towards costs of transportation, which is primarily in trucks (Pullman and Zhaohui, 2011). In LAC, given the poor condition of roads, this proportion is significantly higher.

In general terms, according to available indicators, the level of infrastructure development differs for the five countries included in this report. Table 18 shows the infrastructure assessment of GCI that accounts for the quality of roads, railways, ports, airports and transportation. Table 19 shows the level of infrastructure according to the availability and quality of transport infrastructure, services and ICT as evaluated by ETI.

Panama, followed by Chile, has the highest level of infrastructure among the countries included in this report. Panama outscores Chile in quality of railways (ranked 32nd), quality of ports – one of the highest worldwide because of the Atlantic-Pacific canal (ranked 4th), quality of air transport (ranked 6th), and availability and quality of transport infrastructure (ranked 26th). Chile tops the list in overall

TABLE 18
Infrastructure level according to the Global Competitiveness Index

Country	Infrastructure	Indicators				
		Overall infrastructure	Quality of roads	Quality of railways	Quality of ports	Quality of air transport
Chile	4.6 (45)	5.39 (31)	5.62 (23)	2.62 (64)	5.22 (34)	5.49 (39)
Colombia	3.4 (93)	3.38 (108)	2.60 (126)	1.60 (109)	3.16 (125)	3.79 (106)
Guatemala	3.8 (75)	4.39 (67)	3.32 (91)	1.25 (118)	3.96 (84)	4.94 (58)
Honduras	3.1 (101)	3.66 (97)	3.66 (97)	1.14 (120)	4.61 (55)	4.50 (71)
Panama	4.8 (37)	5.06 (44)	4.53 (49)	4.04 (32)	6.42 (4)	6.36 (6)

Sources: World Economic Forum, 2012a.

Note: value of the indicators is between one and seven, where seven is the highest qualification.

TABLE 19
Infrastructure level according to the Enabling Trade Index

Country	Transport and communication infrastructure	Pillars		
		Availability and quality of transport infrastructure	Availability and quality of transport services	Availability and use of ICT
Chile	4.23 (50)	4.40 (57)	3.75 (65)	4.56 (44)
Colombia	3.72 (78)	3.63 (92)	3.39 (84)	4.13 (56)
Guatemala	3.53 (86)	3.67 (89)	3.35 (91)	3.57 (75)
Honduras	3.34 (97)	3.84 (79)	2.79 (122)	3.38 (83)
Panama	4.36 (43)	5.23 (26)	3.43 (82)	4.41 (49)

Sources: World Economic Forum, 2012b.

Note: value of the indicators is between one and seven, where seven is the highest qualification.

infrastructure (ranked 31st), quality of roads (ranked 23rd), availability and quality of transport services (ranked 65th), and availability and use of ICT (ranked 44th). On the other hand, according to the available indicators, Honduras has the lowest infrastructure level. Colombia also has a particularly low score in the quality of roads, railways, ports and air transport.

The availability and quality of infrastructure affect logistics costs. Colombia has one of the highest costs for exporting containers, with US\$2 255 per container. Only the Bolivarian Republic of Venezuela has higher costs (US\$2 590), while in Chile the average cost is US\$980, Guatemala US\$1 307, Honduras US\$1 342 and in Panama the cost is lowest at US\$615. Worldwide, Singapore is the only country where exporting a container is less expensive, at US\$456 (World Bank, 2013b). Exporting a container from Colombia is almost five times as expensive as from Singapore, while in Honduras the cost is 2.7 times more (see Figure 14). Further analysis is needed to estimate the costs of refrigerated containers, where the actual value of perishable products through depreciation and loss of quality is considered.

4.2 INFORMATION AND COMMUNICATION TECHNOLOGY

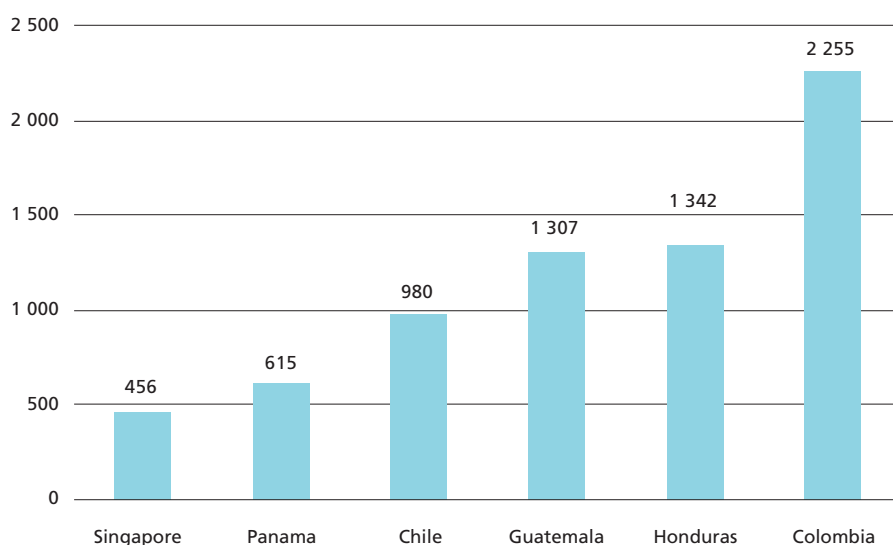
At present, ICT is indispensable in reducing costs. Moreover, fostering innovation in food systems can now only be achieved with ICT. Unfortunately, for the countries included in this report, ICT development is extremely low. The number of people

with access to the Internet are still few in most LAC countries. In Chile, Panama and Colombia, between 40 and 50 percent of the population has access to the Internet, but only 6 to 11 percent has access to high-speed use. In Guatemala and Honduras, access is lower (12 and 16 percent, respectively), and people with access to high-speed Internet is close to zero. Specific data for each country are presented in Table 20. In general, the use of ICT in the fruit and vegetable subsector is marginal, which is considered one of the major obstacles for competitiveness (Schwab, 2013), and for growth of the produce industry in the region.

In LAC, the use of mobile technology has largely increased in recent years. Currently, as reflected by the number of subscriptions for mobile telephones, almost everyone (including the rural population) has access to a phone. Agro-industries and logistics operators should take advantage of this and develop traceability systems and ICT to be implemented by mobile phones.

At the Sixth Summit of the Americas held in 2012 in Cartagena, Colombia, many Latin American leaders agreed on the need to invest in ICT, where LAC countries lag behind, as a way to increase productivity and competitiveness. ICT networks are essential to reduce transaction costs in running operations and interacting with different actors along the supply chain (suppliers, clients and administrators), as well as being key enablers of innovation when interacting with other economic activities.

FIGURE 14
Container export costs (in US\$)



Source: World Bank, 2013b.

TABLE 20
Use of information and communication technology

Country	People using the Internet (%)	Subscription to high-speed Internet (100 population)	Mobile telephone subscriptions (100 population)
Chile	53.89 (50)	11.65 (48)	129.71 (30)
Colombia	40.40 (70)	6.94 (70)	98.45 (88)
Guatemala	11.73 (115)	1.80 (94)	140.38 (23)
Honduras	15.90 (104)	0.03 (133)	103.97 (79)
Panama	42.70 (62)	7.92 (65)	203.88 (2)

Sources: World Economic Forum, 2012a.

4.3 ELECTRICITY AND THE COLD CHAIN

Because of the characteristics of fruit and vegetables, an adequate cold chain capacity is one of the main components for an appropriate logistics process. When considering population density per cold storage capacity, the countries in this report fall behind in global standards (Table 21). Chile has the highest cold storage capacity in LAC with more than 4 million m³, which represents 4.3 persons per m³ of cold capacity, close to the values of the United States of America and Germany (2.9 and 3.7, respectively) and even higher than many industrialized countries (data not shown). Panama and Guatemala have a far lower storage capacity with under 1 million m³, which is not significant for the size of the population. Colombia's storage capacity is particularly low with only 900 000 m³ of cold storage capacity, clearly insufficient for the size of the population.

Despite the fact that there is no available information concerning Honduras, "the cold supply chain in the country is deficient" according to the

TABLE 21
Population density per m³ of cold supply chain (2010 estimate)

Country	Persons/m ³ cold chain capacity
Brazil	35.6
Chile	4.2
Colombia	497.0
Germany	3.7
Guatemala	18.4
Honduras	n/a
India	11.3
Mexico	27.9
Panama	7.7
United States of America	2.9

Sources: Fonseca and Njie, 2014.

technical secretary of the fruit and vegetable supply chain. A review of secondary information does not reveal any major project on the horizon to increase cold storage capacity. Furthermore, there are insufficient containers and refrigerated vehicles.

Another outstanding issue in LAC is the lack of proper specialized trucks to transport perishable products such as fruit and vegetables. In some countries, vehicles are not properly equipped for transporting food products. Worst of all, vehicles can sometimes also be used for transporting other types of products such as construction materials or cattle, which creates health and safety issues.

In close relation to the cold chain is electrical coverage, which is of particular importance in rural areas where most agroprocessing industries are located and where the availability of electricity is a critical factor for efficient logistics operations.

According to the World Bank report summarized in Table 22, countries included in the report need to work on decreasing electricity costs and making electricity more readily available for the population. The average number of procedures required to access electrical energy in LAC is five, with Chile and Honduras having the greatest number (six and eight, respectively). Colombia is particularly inefficient as regards the time needed to get an electrical connection (165 days), which is almost three times the LAC average. Colombia and Honduras have significantly higher electricity costs than the other countries, twice larger than the LAC average and far larger than those of Chile and Panama.

With regard to quality of electricity services, according to the World Economic Forum (Table 23), Panama and Chile have a relatively high quality (ranked 43rd and 53rd, respectively). Colombia and Guatemala follow in 62nd and 67th positions, respectively. Honduras clearly needs to improve its quality of electrical energy since it is ranked 107th and, according to the National Electrical Energy

TABLE 22
Access to electrical energy

Country	Number of procedures to access electricity	Time in days to access electricity	Cost of electricity (percentage per capita income)
Chile	6	31	77.6
Colombia	5	165	1 081.30
Guatemala	4	39	624.9
Honduras	8	33	1 082.20
Panama	5	35	15.4
LAC	5	65	593.7

Sources: World Bank, 2013b.

TABLE 23
Quality of electrical energy

Country	Quality of electrical coverage
Chile	5.36 (53)
Colombia	5.06 (62)
Guatemala	4.99 (67)
Honduras	3.57 (106)
Panama	5.50 (43)

Sources: World Economic Forum, 2012a.

Company (ENEE), its electrical coverage is 83.61 percent of the national territory. Guatemala's electrical coverage reaches 87 percent of this territory.

Besides electrical coverage challenges, the greatest problem that agro-industries face is the cost of energy. In Colombia, the cost of the industrial energy supply is 10 cents of US\$/kilowatt, in Chile 9 cents and in Peru 6 cents, while in the United States of America it is 7 cents and in the EU 8 cents (Rodríguez and Repetto, 2013). In Chile, enterprises often use alternative electricity generators that operate with diesel as a means to offset high electricity costs.

The assessment undertaken in the different countries makes it possible to infer that the cold chain is not regarded as a critical factor for product quality and opportunity, or that affordability of the technology is questionable. There is an inadequate offer of standardized vehicles for refrigerated food products. Tariffs are expensive and there is a low response capacity by service providers.

The Global Competitiveness Report (World Economic Forum, 2012a) compares performance in transport infrastructure, ICT use and electricity supply between LAC and OECD countries. The report evidenced how the LAC region lags behind in global standards in each of these three areas, especially in ICT use, where LAC scores two, while

OECD countries are above five. LAC is slightly better off in terms of electrical supply, with a score closer to that of OECD countries.

4.4 HUMAN CAPITAL AND LOGISTICS MANAGEMENT DECISIONS

Even with appropriate conditions such as modern infrastructure, there are often complaints and rejections in destination markets because of defects in quality (Fonseca and Njie, 2014). Most of these rejections are caused by inappropriate product handling. This may include overexposure to extremely low temperatures and use of non-sanitized water because of untrained personnel handling fruit and vegetables along the supply chain.

During fieldwork, different stakeholders indicated that there is a need for human capital with knowledge in logistics concepts who can manage infrastructure limitations or design alternative solutions. Lack of trained personnel is especially critical in two areas. First, logistics service providers lack sufficient knowledge about product requirements and handling of fruit and vegetables, which can affect product quality. Second, managers of SMEs lack appropriate training in logistics concepts, which limits their abilities to design appropriate solutions to store and transport their products in an efficient manner.

In the countries assessed, it appears that there are a considerable number of educational programmes (bachelor's degrees, masters' degrees and specific courses), including topics on logistics operations. However, it seems that trained personnel prefer to work for large companies instead of SMEs, probably because of the higher salaries, generating a lack of appropriate trained professionals in SMEs dedicated to the production and commercialization of fruit and vegetables. Additionally, even if the number of programmes addressing logistics topics has increased in recent years, few cover specific issues concerning food products and the specific challenges for fresh produce.

Academics believe that a higher percentage of outsourcing logistics activities leads to greater efficiency. In LAC, 70 percent of enterprises hire third parties for internal and international transportation and 62 percent do this for storage (IDB, 2010). However, considering the particular requirements of fruit and vegetable products, it is important to analyse whether efficiencies are indeed gained through outsourcing the logistics process or whether is better to have greater control over the entire food supply chain. In industrialized countries, it is common to have logistics firms providing

pre-cooling and cold warehouse services to growers as well as internal transportation across the country or region. However, there are still no clear criteria to determine whether logistics activities should be carried out by producers or be outsourced. Further research needs to be undertaken in this area, particularly to determine those scenarios where outsourcing is feasible. However, some believe decisions to outsource and how many functions to outsource are influenced by product characteristics, network, processing and markets, and by the main competences of enterprises (see Figure 15 for main criteria for logistics outsourcing).

Another decision is to whom to outsource. There are third-party logistics (3PL) that undertake activities such as packaging, warehousing and transportation. These 3PL often have assets on the production side and sometimes assist with the overall strategic and capacity planning of growers. They can maximize resource utilization by enabling clients to avoid capital investments and the risks involved in managing transportation equipment and warehouses. The 3PL in the fruit and vegetable subsector need to be trained particularly for the specific requirements of products concerning temperatures and proper handling. In general terms, it has been observed that the greater the share of 3PL in national markets, the lower the overall logistics cost. However, the complexity of the produce industry (e.g. with most production areas being distant from markets, the large number of smallholders and the “fragility” of the product) seems to be limiting the increase of 3PL in LAC.

There are also fourth-party logistics (4PL) that do not have assets but instead act as chain managers. Essentially, they are ICT consultants that manage their clients’ logistics activities (Pullman and Zhao-hui, 2011). However, they are still unusual in the

food industry and even more so in the fruit and vegetable subsector. During the course of this study, it was verified that only in sporadic cases do 4PLs function in LAC, and normally as the result of a “side business” of an entrepreneur in LAC already having a trade partner that imports commodities in North America or Europe. The presence of 5PLs, which are essentially providers that organize the electronic information of supply chains, is also not recorded in the region, but will start to appear in the near future, particularly as ICT develops.

4.5 PROCEDURES FOR TRADE FACILITATION

Procedures concerning trade-related documents, fulfilling clearance requirements by customs and other technical control agencies are important logistics steps that often become obstacles in many countries for expediting the flow of products (World Bank, 2012a). In LAC, the time used for paperwork accounts for more than 50 to 60 percent of the total time to export and import in many countries. According to the World Bank (2013b), 52 percent more documents are required to export in LAC than in OECD countries, and 111 percent more time is needed. For imports, the quotas are 61 percent and 129 percent, respectively.

It appears that a serious obstacle is the inconsistency of customs officers interpreting the norms, regulating controls and conducting inspections on products to be imported or exported. There are also difficulties in port operations because of an administrative autonomy that creates inefficiencies among logistics operators through the lack of standard processes.

Trade procedures generally include import and export documentation; regulations regarding com-

FIGURE 15

Criteria for logistics outsourcing

Service improvement	Cost reduction and risk management	Focus on corporate core competences	Operational flexibility
<ul style="list-style-type: none"> • Better handling of logistic complexity • Unique service available from logistics service providers 	<ul style="list-style-type: none"> • Avoid capital investments • Hedge against uncertainties with logistics-related ICT • Cost reduction and risk management 	<ul style="list-style-type: none"> • Delegate non-critical activities • Leverage unique skills and expertise in transportation • Reduce operational complexity 	<ul style="list-style-type: none"> • Access to technology upgrades • Hedge technological uncertainties • Handle growth and expansion to new markets

merce and transport (Security Protection Systems [SPS] and Technical Barriers to Trade [TBT]); payments, insurance and other financial requirements; commercial policy (antidumping and security guarantees) and trade agreements; and safety. The latter is an additional requirement stemming from concerns about theft, piracy, smuggling and terrorism.

The estimated time needed to export products from each country is summarized in Table 24. Panama is the country with the greatest customs efficiency, with nine days for export. However, by global standards this is twice the amount of time required to export a container in Singapore, for example. The other countries lag far behind in this area. Chile, despite its high level of infrastructure, is the country where it takes longest to export a product (21 days), which suggests that even Chile has ample room to be more efficient. Although data refer to merchandise in general, they are likely similar for specific food products. Colombia's 14 days for export are below the LAC average. The country has gained efficiency in this area through implementation of the single-window trade system and the MUISCA management model of the Department for Tax and Customs (DIAN), which have enabled processes to be accelerated.

With regard to the number of documents required to export/import merchandise, France requires only two documents – the least number – while some countries require as many as 11. Of the countries assessed, Guatemala requires 11 documents, the maximum, whereas Panama requires only three, placing it on a comparable level with Japan and Canada (see Table 24).

According to the ETI border administration component (Table 25), Chile is highly efficient in customs administration and transparency of border administration. Panama follows in overall border administration and has highly efficient import-export procedures. Colombia and Honduras have a relatively low performance in all three pillars of border administration (efficiency of customs administration, efficiency of import-export procedures and transparency of border administration).

Most LAC countries have policies that regulate or influence logistics, including trade facilitation. However, these regulations are diluted into many laws and policies (e.g. policies to promote export of non-traditional commodities; environmental protection regulations; laws to promote rural development; and taxation of transportation means), which are not aligned towards improvement of logistics. Some may

TABLE 24
Processes to import/export merchandise

Country	Days to export	Number of documents to export	Days to import	Number of documents to import
Chile	21	6	20	6
Colombia	14	5	13	6
Guatemala	17	11	17	9
Honduras	18	6	22	8
Panama	9	3	9	4
LAC	18	6	20	7

Sources: World Bank, 2013b.

TABLE 25
Enabling Trade Index – border administration

Country	Border administration (2012)	Pillars		
		Efficiency of customs administration	Efficiency of import-export procedures	Transparency of border administration
Chile	5.28 (23)	5.18 (24)	5.06 (43)	5.60 (18)
Colombia	3.60 (82)	3.48 (94)	3.92 (97)	3.40 (64)
Guatemala	3.94 (68)	4.67 (37)	4.08 (90)	3.07 (78)
Honduras	3.55 (84)	3.29 (101)	4.32 (82)	3.04 (80)
Panama	4.23 (58)	3.73 (86)	5.80 (15)	3.17 (69)

Sources: World Economic Forum, 2012b.

even contradict each other and limit logistics development (Fonseca and Vergara, 2014). This suggests that a macro interpolicy approach is warranted in order to create an ideal environment that enables logistics development and trade facilitation.

4.6 OTHER DIFFICULTIES IN LOGISTICS PROCESSES

Besides the main components identified, other issues affect the development of logistics and measurement of progress. Three important constraints are described below.

Lack of proper indicators

One of the challenges identified in the five country assessments was the lack of proper indicators and information to track logistics performance in the agro-industry sector and, more specifically, the fruit and vegetable subsector. Additionally, at enterprise level, there is a lack of logistics indicators and proper logistics planning. This reflects, in a number of cases, that logistics as a whole are not regarded as important. The concept that logistics mean efficient transportation remains in the mind of many small enterprise managers.

Security in road transportation

In some LAC countries, theft of merchandise transported on national roads has increased. Trucks are also dismantled and sold for parts. Products are targeted because of their value and ease of commercialization. The most common products stolen include food and beverages, electronic products, cigarettes, clothing and medicines. These thefts create great economic losses by increasing logistics costs because of higher insurance, need for better traceability systems and security posts. Additionally, they cause delay in product delivery, and damage the logistics operator's company image. The issue of insecurity on the roads was raised in Guatemala and Colombia.

Illicit trade

In developing countries, such as those in this report, tampered supply chains are part of a daily reality. The most common tampering in merchandise includes smuggling of alcohol and cigarettes and transport of illicit drugs. Illicit activities are by nature hard to monitor, yet many of them could be detected and prevented with a more rigorous control protocol for quality and provenance. However, it would also be important to develop efficient monitoring and controlling mechanisms, since excessive control and product scanning may

create inefficiency in the logistics process, which increases costs, transportation time and even affects product quality if the cold chain is broken.

Inventory management

Inventory management has four main purposes: localization, decoupling, supply and demand balance, and buffering (Pullman and Zhaohui, 2011). However, this is particularly difficult to manage for agro-industries, especially in the fruit and vegetable subsector, because of perishability and cold maintenance requirements, which impede the use of safety stocks to fill gaps during spikes in demand or delays in production. In LAC, the situation is even more critical because of poor logistics in harvesting and extreme climate conditions. Moreover, just-in-time production has reduced overall inventories in the food supply chain, but this type of planning is particularly feasible with perennial crops since it is more challenging to coordinate inventory management with annual crops (such as tree fruits). Some technology (e.g. growth regulation, biostimulants) has been developed either to promote the induction of fruit (flowering) or to slow down its development by keeping it attached longer to the main plant. Some examples are inducing substances in pineapples, mangoes and other fruit, which allow the retention of citrus fruit and apples in the trees. All these types of technology favour good planning of inventories.

4.7 COUNTRY-SPECIFIC ANALYSIS

Based on the findings and in the interviews with different actors in the countries of the study, an analysis of strengths, weaknesses, opportunities and threats (SWOT) of the logistics system was carried out and reviewed by experts. Annex I gives the SWOT analysis for each of the countries appraised. In the analysis, it is possible to compare particularities of the countries that warrant consideration for the formulation of actions. A summarized discussion of the SWOT content follows here.

Chile

The assessment showed that one of the most relevant weaknesses in the country is the high cost of fuel, which challenges competitiveness, especially considering the potential for highly unfavourable foreign exchange rates and direct competitors taking advantage of this fact. For example, Peru, one of the fastest growing economies in the region, is increasingly competing with Chilean products in the foreign market. Other significant weaknesses are the shortage of agricultural workers, because of

demand from the mining industry that offers higher salaries, and access to ports in certain regions such as the north of the country. Available ports there cannot handle containers, forcing producers to transport their products to Valparaiso, between 400 and 750 km, increasing ground transportation costs and ultimately reducing competitiveness.

As mentioned in section 3.1, Chile has the highest logistics performance in the region. Its large volume of agricultural exports, particularly fruit and vegetables, is a major strength. Another strength is the active role of producers' and exporters' organizations that have been able to implement solutions for the benefit of the sector as a whole. As for opportunities, Chile has the opening of Asian markets (India, China, Thailand and Indonesia), which are currently sourcing products that Chile can deliver from Australia and New Zealand.

Colombia

Colombia is probably one of the countries in the study with the most possibility of improving its logistics systems, but it also has evident weaknesses. One particular weakness is that there are too many inspections. This has been inherited to a certain extent from previous decades, when illegal commerce was highly active. The prevalence of illegal commerce in the past has caused a low degree of trust in markets, which prevents agribusiness from associating and working together to increase economies of scale and gain efficiency.

Regulatory institutions have a high rotation of personnel, limiting improvements in the monitoring processes. Other significant weaknesses include high freight costs, a low cold chain capacity in comparison with other countries in the region, and insufficient availability of 3PL services specialized in food products.

These issues add to the recurrent threat of natural disasters. In fact, the country ranks high in this aspect among other countries in the region. Clearly, the geographic location and recent policies to promote the development of logistics are strengths to be reinforced. Moreover, opportunities are on the horizon, such as the ongoing establishment of trade agreements and increased professional human resources at all levels of the production-to-supply chain.

Guatemala

Guatemala has similar weaknesses to those of Colombia, including a limited cold chain capacity (which makes it difficult for producers to access appropriate refrigerated vehicles for transportation

of products), lack of qualified personnel, inefficient ports and lack of auxiliary roads. The country also faces major constraints in rural areas where roads are in poor condition and electrical and potable water coverage is limited. Some enterprises also indicated security constraints on national roads, where theft of merchandise is frequent, thus restricting overnight transport.

With regard to evident threats, Guatemala is continuously exposed to natural disasters and political instability. Agricultural trade is limited to a few major trading partners such as the United States of America, which can make the country dependent on its economic performance. Its most important strengths are good communicating roads linking ports in the two oceans, as well as major institutional support for export. Opportunities that have arisen in recent years include the growing formation of production associations, the experience of certain supply chains with sophisticated logistics systems (e.g. cardamom) and the recent establishment of a law for public-private investment alliances.

Honduras

Weaknesses in Honduras include limited infrastructure, particularly limited potable water and electrical coverage. Collection centres built in the past to improve product commercialization are failing to provide the expected results, since the energy service available is not sufficient for their operation. Additionally, the cold chain storage capacity in the country is insufficient and cannot meet the volumes managed by SMEs. There is insufficient availability of 20-foot (6-m) refrigerated containers. Efforts to store products in 40-foot (12-m) containers are challenging, because of product incompatibility and lack of coordination among suppliers. SMEs also face challenges for exporting products, which are caused by high freight costs because of low volumes and lack of certification such as GAP and GMP required by buyers.

Threats in Honduras are similar to those in Guatemala. The country has one of the most active ports (Cortés) and a good road network to access the port. Interestingly, in Honduras, increasing domestic demand is seen as a major opportunity, which is also coinciding with efforts towards development of policies to promote investment.

Panama

Panama is a hub for logistics operations, a strength that should place the country at the top of the region. However, investments are focused on the Panama Canal and the free trade zone of Colón,

with limited investments for the national market where there are major inefficiencies in the food supply chain. Supermarkets sometimes lack the appropriate infrastructure to unload refrigerated containers, so that the cold chain is interrupted during the unloading and display of products on the shelves. The main national market also lacks appropriate infrastructure such as refrigerated warehouses to handle fresh produce. Products are packed in recycled packages that have already been

used for different articles, and this may cause quality to deteriorate.

Some believe, as do the experts consulted in the workshop, that the trade agreement with the United States of America may bring benefits. However, this may not be the case for food logistics. Panama is currently completing a megaproject to expand its cold chain capacity and it is hoped that this will bring new opportunities that may, for example, be aligned with the development of the tourism sector.

Chapter 5

Results from the expert workshop

The “Instruments to Promote and Strengthen the Logistics Development of the Agrifood Sector in Latin America” regional workshop was held in Panama City from 30 to 31 August 2012. The event gathered together participants from institutions and enterprises in the produce and agroprocessing industry who reviewed the results of the country assessments, discussed information from the SWOT analyses and proposed indicators to be used as assessment tools for the logistics performance of produce enterprises, the produce sector as a whole and countries overall.

5.1 VALIDATION OF LOGISTICS COMPONENTS

Experts reviewed the five logistics components identified for the produce sector, which were described in Chapter 4. They validated the importance of the following components: infrastructure and transportation; ICT; electricity and the cold chain; and human capital. However, they suggested two additional components: post-harvest management packages and traceability; and institutional policies and frameworks.

Critical issues were identified for each of the components and indicators were suggested to measure logistics performance and orient actions at three levels: country (macro), sector (meso) and enterprises (micro). Table 26 summarizes for each of the logistics components the most critical issues and indicators recommended at each of the three levels (country, sector and enterprise).

The participants recognized that the elements proposed in the matrix cannot be implemented by all countries to the same degree, because of different levels of development and institutions. However, this first draft of a matrix may serve as an informal basis for developing tailored indicators in the different countries. Future work should be designed to develop this matrix further, with more details on the different components, potential construction of an overall “food logistics performance” score as a reference and, in particular, an implementation step

to validate the functionality of the different indicators emerging from the exercise.

Infrastructure and transportation

As described in Chapter 4, the experts emphasized that one of the main issues for logistics performance is adequate infrastructure. Critical issues identified include access to potable water, quality of national roads, appropriate transport nodes and efficient distribution centres. Indicators suggested for the country level are times required to move produce, or area covered by roads. At sector level, the discussion was about infrastructure to deliver clean water and handle produce adequately. The experts considered that the degree of certification on GMPs was a good indicator to evaluate (indirectly) the logistics component of infrastructure.

ICT

ICT is considered to be of great relevance in strengthening vertical integration in the supply chain. To monitor performance in this area, the collaborating experts suggested indicators related to access to the Internet and mobile phones, and the existence and use of relevant databases by agroenterprises.

Electricity and the cold chain

Experts confirmed the importance of access to electrical energy and appropriate cold chain capacity to ensure delivery of high-quality fruit and vegetables. The shelf-life of fresh products is significantly dependent on low temperatures, currently mainly achieved by electrical power. It was therefore recommended that national electrical coverage, number of power cuts and overall cold chain capacity be closely monitored. Rejected products also serve as an indicator as to whether the appropriate cold chain was adopted.

Human capital

Even with appropriate infrastructure, ICT and cold chain capacity, a critical issue concerns well-

trained personnel able to designate appropriate solutions and handle products according to specific requirements. To assess the performance of this component, it was recommended that, for example, the number of trained personnel, educational programmes in agribusiness logistics and available courses on the topic be monitored.

Post-harvest management packages and traceability

Packaging plays a key role in efficient transportation, storage, and preservation of fruit and vegetables. Experts suggested that it be considered a critical component to improve logistics performance in the produce sector. At country level, the actual involvement of the government in establishing

agreements for quality assurance (e.g. measurement norms) is needed. At the sector and enterprise level, indicators suggested the evaluation of existing certification mechanisms, traceability systems and standardized packaging systems.

Institutional policies and frameworks

As regards the role of governments in promoting an enabling environment, an assessment of national institutional policies and frameworks to improve logistics performances were suggested. These indicators included the number of documents required for trade (to measure ease of processes), financial operators (to measure financial services), and account systems owned by holders (to measure performance of accounting processes).

TABLE 26
Logistics components for the produce sector – issues and proposed indicators

Component	Country		Sector		Enterprises		
	Critical issue	Indicator	Critical issue	Indicator	Critical issue	Indicator	
Infrastructure and transportation	Quality of national roads	Percentage of paved roads (primary and secondary)	Product delivery and handling at collection/distribution centres	Percentage of timely deliveries to collection/distribution centres	Fulfilment of GMPs accounting for proper infrastructure (HACCP)	Percentage of enterprises certified in GMPs	
		Time required to move merchandise		Percentage of product loss at collection/distribution centres			
		Transportation costs/km	Access to potable water	Area with potable water, or population benefited			
	Quality of transport nodes	Costs to export/import containers (refrigerated)					
		Number of days to export/import containers					
	Institutional and policy framework and processes	Ease of process for customs and market access	Number of documents required to take part in formal markets	Associativity	Number of associated producers/total producers	Implementation of key logistics performance indicators	Number of enterprises using key performance indicators
Number of standard documents required among countries			Access to financial services	Number of financial operators	Number of enterprises measuring key performance indicators		
Sanitary regulations		Existence of national sanitary regulations for production and commercialization of food products			Financed capital/total capital	Accounting processes	Number of producers with accounting systems

Component	Country		Sector		Enterprises	
	Critical issue	Indicator	Critical issue	Indicator	Critical issue	Indicator
Institutional and policy framework and processes		Enforcement of food guidelines				Number of producers with accounting counselling
			Sanitary regulations	Compliance with sanitary regulations		
			Information regarding processes	Number of producers aware of required processes (i.e. for exports)		
ICT	Reliable information databases	Number of databases with information on producers and logistics operators	Access to the Internet and telephones	Percentage of coverage of communication networks in rural areas	Connectivity – alternatives for information sharing	Number of communication means used to communicate with suppliers
				Percentage of people and enterprises with access to high-speed Internet		
			Available and reliable information data on the sector	Database available for agroprocessing industry	Updated information in databases	Number of enterprises updating information databases
				Number of enterprises with access to information databases		
Human capital	Educational programmes in logistics for agribusiness	Number of programmes (professional and technical) in logistics covering agribusiness topics	Training in logistics operations	Number of trained personnel according to designated functions	Definition of roles and responsibilities within enterprises	Number of satisfied employees
		Number of students graduated in logistics programmes		Number of courses promoted by the sector on specific issues		Number of roles with a clear definition of capacities needed to perform them
						Number of people attending training promoted by enterprises
Electrical energy and cold supply chain	Access to electricity	Percentage of electrical national coverage (particularly rural areas)	Cold warehouses in rural areas	Capacity of cold warehouses in farms by productive areas	Product rejection	Percentage of client rejection by product type
		Percentage of power cuts	Refrigerated transportation systems	Number of refrigerated vehicles available by productive areas	Practices to save energy use	Number of people in enterprises aware of and practising energy-saving mechanisms
	Cold chain capacity	Cold chain capacity for product storage and transportation in terms of population	Training in cold chain management for fruit and vegetables	Number of people trained in post-harvest handling, cold storage management, refrigeration engineering		

Component	Country		Sector		Enterprises	
	Critical issue	Indicator	Critical issue	Indicator	Critical issue	Indicator
Quality assurance, post-harvesting and traceability	Regional agreement for codes, weights and measurements	Number of agreements in existence	Standard packages	Existence of standard packaging according to product type	Quality certifications	Number of enterprises implementing and certified in quality assurance mechanisms
			Traceability systems	Existence of traceability systems	Standard packages	Percentage of enterprises using standard sector packages
					Traceability systems	Percentage of enterprises with a traceability system
					Client satisfaction	Percentage of deliveries that arrive at customers on time
						Percentage of products that arrive with high quality and complete

Sources: expert discussion during regional workshop in Panama.

Note: empty cells indicate that experts did not agree on a particular indicator or did not find one for measurement at a particular level.

5.2 POLICY AND ACTION PRIORITIZATION

Governments in LAC have established different policies and institutions to promote logistics development as a means to increase country competitiveness. Annex 2 summarizes the main policies and institutions affecting logistics developments. However, it is evident that much work and targeted actions are needed in the region to support efficient logistics operations.

Using the findings of the country assessments and their own experience in the region, the experts from the different countries were asked to rank priority actions to stimulate the development of logistics systems in the region, considering not just the urgency of the matter but also the feasibility of the actions in the produce subsector. Table 27 summarizes the relevant issues that could enhance logistics development in the region and how they were categorized as short-, medium- or long-term priorities.

In the local market, issues identified as top priorities to be addressed in the short term were post-harvest management, packaging, cold chains and road infrastructure. In the medium term, the experts suggested that governments should address communication and ICT, transportation from production to distribution centres and to retailers and final consumers, and traceability systems. In the long term, they suggested working on electrical energy coverage and improving efficiency in paperwork and processes.

In the foreign market, the experts suggested that the main priority should be to improve cold chain capacity and efficiency in paperwork and processes, but also to focus on improving infrastructure in the medium term.

The experts believe that in order to improve logistics performance, particularly in the produce sector, the issues that need to be addressed in the short term concern specific challenges within the industry such as post-harvest management and packaging. They indicated that inadequate post-harvest management of products prevails in the region. Packaging plays a key role for containment, protection, preservation and marketing. It is also one of the most labour-intensive stages in the food industries. In LAC, the lack of proper packaging and inadequate handling affect the quality of products and cause inefficiencies in transportation, storage and other logistics processes that increase the costs of final products. Chile invested in post-harvest management, cold storage and packaging some decades ago and these significant actions were crucial in establishing it as the leading country in the region. Panama has also recently acknowledged these important areas. A number of issues currently encountered could be solved by more extensive knowledge on food production, handling and commercialization, as well as adequate technology. Nevertheless, some limitations can be tackled to diversify the sector, and transform it into a more competitive and sustainable system. These should be covered by the solutions suggested for medium-term actions.

TABLE 27
Action prioritization for developing logistics systems in the produce industry

Item	Actions (%)		
	Short-term	Medium-term	Long-term
Local market			
Post-harvest management	80	10	10
Packaging	70	20	nc
Transportation from production to distribution centres	30	60	10
Transportation from distribution centres to retailers	30	60	10
Electrical energy	30	30	40
Cold chain	70	30	0
Road infrastructure	60	20	20
Communications and ICT	nc	70	30
Paperwork and processes	10	40	50
Traceability systems	30	50	20
Human capital	10	nc	nc
Databases	10	nc	nc
Foreign market			
Infrastructure (air, ports, roads)	40	60	nc
Cold supply value chain	50	50	nc
Paperwork and processes	60	30	10

Sources: authors' elaboration, based on data from the regional workshop in Panama City.

Note: nc = not considered (when some experts believed the action to be unnecessary); percentage (%) = experts (out of 20) mentioning a specific item at the particular term; highlighted numbers are the highest by term (with at least half of the experts suggesting the action).

Participants discussed the difficulties that SMEs face in transporting products from rural areas to distribution centres and national ports. These are mainly caused by the poor conditions of rural roads and insufficient cold chain capacity along the entire value chain. They suggested that immediate action should be focused on these areas, while acknowledging that this will require further investment.

With regard to medium-term action, ground transportation from production to distribution centres and thence to consumers is a main issue. The experts indicated that there is lack of adequate vehicles to satisfy the needs of the agroprocessing industry, which increases costs and times of transport. It was further recognized that the main challenges impeding the implementation of appropriate ICT are related to lack of knowledge about technological solutions; excessive time and costs associated with implementation; and lack of interest from enterprises to invest in new technologies.

Increasing efficiency in paperwork and clearance processes were presented by half of the experts as key actions to be taken in the long term. However, there are more urgent issues to be addressed in the meantime. A current need for Chile to accelerate its systems was mentioned specifically since, despite good scores in a number of logistics-related indica-

tors, times for shipping food commodities abroad are one of the highest in the region.

Other specific issues not previously identified emerged from the various discussions.

Accounting processes in SMEs. Some SMEs lack proper accounting systems that make it hard to manage firms efficiently. Small firms generally lack the proper tools to determine and control basic information such as production costs. Small companies lack accounting counselling for viable budgets and planning, which results in limited key management decisions and access to credit.

Client satisfaction. The importance of accounting for final customer satisfaction concerning quality, price, availability and opportunity was discussed. This reflects whether products arrive at their final destination according to the client's requirements, meaning that logistics processes have been carried out efficiently.

Access to financial services, especially for SMEs. Small companies have difficulties in accessing appropriate financial services to invest in infrastructure and assets to improve their logistics processes

Chapter 6

Further ideas and efforts to promote logistics development

In addition to the number of observations and opportunities identified from appraisal of the five countries studied, the authors felt it important to identify best practices that could be disseminated or upscaled for greater impact in LAC in the near future. This chapter describes some of these best practices as well as giving a summary of insights from Caribbean experts in produce supply chains.

6.1 FOOD SAFETY IN TRANSPORTATION

Safe transportation of food products and perishable food items in particular involves several industry-specific deterrents against spoilage, contamination and tampering. Guidelines such as the agreement for transporting perishable foodstuffs (see Box 5), which are used in most European countries, and the

BOX 5

Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be used for such Carriage

ATP is a multilateral agreement between states for overland cross-border transportation of food products. It was prepared by the Inland Transport Committee of the United Nations Economic Commission for Europe (UNECE) and was presented in Geneva in 1970. ATP ensures that vehicles used for transporting food products meet agreed international standards. The agreement mainly details the following points:

- standards for temperature of vehicles for road, rail and maritime transportation;
- food products to be transported under the ATP agreement and minimum temperature required for each type of product;
- tests to be performed on equipment to ensure they meet specified standards;
- system for certification of equipment;
- competent authorities within countries that have signed ATP are required to recognize certificates (VOSA, 2012).

Currently, 41 countries have signed ATP. Its purpose is to facilitate trade and to ensure food safety through verification of compliance of the means of

transport. Non-processed fruit and vegetables, and food products transported by air are not included at present in the scope of the agreement.

The question of extending ATP to perishable food products has been raised. Application of ATP to these products would be driven by the need for safe food products. The shelf-life of fruit and vegetables is influenced by temperature both from the quality aspect as well as that of microbial proliferation. It would be beneficial to extend the application of ATP to such goods, in order to take advantage of the certification of the refrigerated vehicles regarding their ability to maintain appropriate temperatures. The additional costs resulting from the extension of ATP would be minor compared with present total costs with regard to increase in quality and reduction in product rejection (Panozzo and Cortella, 2008). The latest version of the *ATP Handbook* in 2012 includes guidelines for raw vegetables that have been diced, sliced or otherwise reduced in size, but excluding those that have only been washed, peeled or simply cut in half, prepared raw vegetables and concentrated fruit juice. It still does not include fresh fruit and vegetables.

Sanitary Food Transportation Act in the United States of America (see Box 6) are two examples of efforts to standardize logistics related to transportation. However, LAC lags behind in developing standardized guidelines that are acceptable for all countries in the region to transport food products, and fruit and vegetables in particular. Further actions need to focus on adopting international standards or finding ways to adapt them to specific regional requirements. This is urgent, since ensuring food safety during transportation has become of paramount importance for countries aiming at export markets. Food safety-related factors are currently regarded as one of the main reasons for the rejection of food products in markets demanding high-quality products such as the United States of America (Fonseca and Njie, 2014). The food transportation act is one of the many efforts to exert more control over this aspect.

6.2 MODELS TO IMPROVE SUPPLY CHAIN MANAGEMENT AT ENTERPRISE LEVEL

Some initiatives for developing models to enhance efficient logistics management have been undertaken. These are the Supply Chain Operations Reference (SCOR) model for supply chain management and the logistics DNA to assess the logistics performance of companies.

SCOR model to improve supply chain management

The Supply Chain Council (SCC) developed SCOR to provide a framework for linking business process, metrics, best practices and technology features into a unified structure to support commu-

BOX 6

Sanitary Food Transportation Act

The Food and Drug Administration (FDA) of the United States of America is implementing the Sanitary Food Transportation Act of 2005. It constitutes the first step in federal regulations to govern sanitary practices by shippers, carriers by motor vehicle or rail, receivers and others engaged in the transportation of food products for humans and animals. FDA has identified 15 areas of concern with a major focus on temperature control, sanitation, training and communication along the food supply chain to protect products from food safety hazards during transport (FDA, 2010).

Source: FDA, 2010.

nication among supply chain partners and improve the effectiveness of supply chain management and related supply chain improvement activities. The model helps to manage business challenges through a standardized language, metrics and common business practices to improve performance. It can be used in different areas including supply optimization and re-engineering, standardization, benchmarking and process outsourcing.¹⁴

Logistics “diagnostic analysis” to assess the level of logistics development of an enterprise

During the expert workshop, different stakeholders mentioned that a tool was needed to measure logistics performance at enterprise level to assess which areas required special attention. A participant at the workshop in Panama presented DNA LogístiK, which is a joint initiative of the private sector and the Secretariat of Economy in Mexico to create a free tool to analyse the supply chain. It enables the identification of priority areas to ensure operational capacities, assesses the maturity of processes and determines which systems generate additional value (Dnalogístik, 2013).

DNA LogístiK evaluates the relevance of different processes in the logistics function of the supply chain. Through a questionnaire, participants reveal information, and software assesses the level of complexity in logistics processes including provisioning, production, storage, transportation, international trade and sales points. It assesses different processes in each of the areas and suggests systems that will add value to the supply chain according to their relevance.

It also enables a comparison of results with different companies using the tool. In fact, identification of bottlenecks for specific industries is based on a type of benchmark analysis (with the previously inserted information). Currently, there are close to 2 000 records in the tool from enterprises in Mexico (80 percent), Colombia (12 percent), Peru and Ecuador. However, it is important to take care when looking at results. Since DNA LogístiK is a free tool, anyone can access it, so there is no control over the reliability of data inserted and information may not reflect the real situation of enterprises.

The tool constitutes an interesting approach towards standardized models to assess how enterprises are managing their logistics processes and

¹⁴ www.supply-chain.org/scor.

supply chain. However, it was developed mainly for manufacturing companies and does not take into account the specificities of food products. In order to be more useful for companies in the agrifood sector, the “diagnosis tool” needs to deal more with relevant issues in the sector such as land surface, number of items produced, type of irrigation, number of processes before delivery and requirement of refrigerated transportation. Yet it could represent a starting-point for further work that takes the requirements of the produce industry into account.

6.3 FREE TRADE ZONES TO PROMOTE LOGISTICS EFFICIENCIES

In developing countries across LAC, Asia, and Africa, different types of spatial development initiatives have been supported to gain efficiencies in the supply chain of agricultural products. A spatial development initiative focuses on industrial development in certain areas near the coast, to maximize transport efficiencies and make the region more competitive globally. This is most commonly undertaken in the form of special economic zones (SEZs).

An SEZ is a demarcated geographic area within a country’s national boundaries where the rules of business concerning international trade and customs, taxation and regulatory environment are different from those that prevail in the national territory. In this sense, it is an area where economic laws are more liberal than a country’s typical laws. Asia and Latin America are forerunners in setting up SEZs, which focus on exports and trade facilitation. Production and processing activities of agricultural products are also carried out in agricultural economic zones. Some examples are ZOFRATAC-NA in Peru for the production and commercialization of fish, vegetable oils and sugar; La Plata Free Trade Zone in Argentina; and the zone for extension and logistics support (ZEAL) in Chile, which integrates logistics services for perishable goods (Bhatt, 2013). Agricultural free trade zones can be useful tools in promoting logistics development for the agrifood industry.

6.4 PARTNERSHIPS TO INCREASE HUMAN CAPITAL AND KNOWLEDGE INFORMATION

Different countries have established institutions through partnerships among governments, private companies and educational institutions in order to promote logistics knowledge and development. These institutions carry out research in different logistics areas, run educational programmes for individuals or companies interested in acquiring

certain skills, and provide useful information for logistics operators, companies and the government to facilitate logistics operations. Some examples are the Georgia Tech Panama Logistics Innovation and Research Center (Box 7), the Institute of Food Technology (ITAL) in Brazil (Box 8) and the Center for Latin American Logistics Innovation (CLI) in Colombia (Box 9). Other universities in Latin America have researchers trained in post-harvest factors and processing of food but their background and experience are not necessarily linked to the managerial aspects of logistics.

BOX 7

Georgia Tech Panama Logistics Innovation and Research Center

The Georgia Tech Panama Logistics Innovation and Research Center was created under an agreement with Panama’s National Secretariat of Science, Technology and Innovation. It is a unique research and education centre focused on logistics and trade with three core areas: applied research, education and competitiveness. Its strategic objective is to improve the logistics performance of the country and to support in developing appropriate trade capabilities (www.gatech.pa). This partnership designed and implemented the Panama Logistics Web portal, which gives information to enable shippers and logistics service providers to optimize the value given by Panama’s logistics platform. However, the centre has done little with regard to perishable food products.

Source: www.gatech.pa/es/

BOX 8

Institute of Food Technology in Brazil

The Institute of Food Technology (ITAL) is a national organization that conducts research, provides technical assistance, innovates and disseminates knowledge in the areas of transformation, conservation and safety of food and beverages. ITAL works in developing technologies to increase the shelf-life of products and take advantage of the wastes generated while processing. It offers companies consulting services, training and testing of specific products (www.ital.sp.gov.br). However, logistics as a subject is not addressed.

Source: www.ital.sp.gov.br/

BOX 9

Center for Latin American Logistics Innovation in Colombia

CLI was founded in 2008, with a partnership between LOGYCA and the Center for Transportation and Logistics of the Massachusetts Institute of Technology (MIT-CTL). CLI is the LAC member for the MIT Global SCALE Network, which is an international partnership of logistics centres to promote logistics performance through innovation in research and education. CLI offers diverse educational programmes related to logistics subjects. It also carries out research in logistics, transport and supply chain management in LAC. One of its main studies is benchmarking LAC logistics performance, which provides indicators to measure logistics development in different countries. It also studies strategies for managing efficient distribution channels in the retail small fragmented market, characteristics of efficient logistics platforms, and proposals to have an integrated information platform for transport and distribution (www.cli-logyca.org).

Source: www.cli-logyca.org

6.5 FURTHER SUGGESTIONS FROM THE CARIBBEAN

The Symposium on Postharvest Logistic Systems for Horticultural Commodities in Latin America and the Caribbean held in Port of Spain, Trinidad and Tobago on 2 July 2013, as part of the Third International Conference on Postharvest and Quality Management of Horticultural Products of Interest for Tropical Regions revealed a number of logistics issues and proposals for improvement. Selected information that consolidates the facts already given for inland Latin America, and particularly for the five countries appraised, is discussed below.

A case study was reported in Trinidad and Tobago (Felix, Seepersad and Iton, 2010) where failures in logistics to process fresh-cut produce destined for supermarkets were identified. There were several post-harvest and logistics factors that were critical in the deterioration of products and their shelf-life and subsequent monetary losses. These included:

- overpacking of crates for fruit and vegetables;
- time lag between preparation of fresh cuts and delivery;

- refrigerated trucks used only for foreign raw produce (apples);
- some fresh cuts manufactured outside delivered by air-conditioned vehicles;
- water added to produce before delivery to the processing plant;
- non-optimal methods during processing of fresh cuts – in particular, moisture removal was not implemented.

In short, the main issues observed in this case may be grouped together as application of inappropriate post-harvest handling practices, which could be solved with adequate training. This confirms what the experts in the Panama workshop suggested, i.e. that training in post-harvest technology should be made one of the priorities, with the expectation that it will provide major benefits for relatively low investments.

The overall analysis of the produce situation in Jamaica addressed by Prof. Noure Benkeblia emphasized several logistics issues that affect the shelf-life of both fresh and processed fruit and vegetables. Some limitations and critical issues identified were:

- that almost 50 percent of agroprocessors are located in the Kingston Metropolitan Region and utilize fresh produce obtained from other areas of the country, thus increasing costs and losses through inefficiencies in sourcing and transportation;
- an inconsistent supply of good-quality agricultural raw materials, as well as inefficiencies in supplying goods in a timely manner, in part due to the non-associated numbers of small producers in the country, resulting in heavy dependence on imported inputs because of low or no availability locally;
- limited information on appropriate post-harvest and processing technologies, which explains the difficulties in compliance with export quality;
- lack of HACCP/quality/standards information, to the extent that no more than ten factories are compliant with HACCP;
- lack of packaging technologies and equipment;
- high costs of electricity and the need to find alternative energy systems.

Ackee, a highly consumed fruit in Jamaica, was highlighted as a good example of a subsector that is growing “inclusively” in Jamaica. It is widely grown and processed in rural areas where other employment opportunities are limited. It directly

impacts 13 communities across the island with approximately 5 000 people directly employed and 10 000 indirectly employed. Production was affected for several years because of regulations in international markets that were particularly concerned about the potential presence of hypoglycin, a toxin, when fruits are harvested immaturely. However, the sector has now established better controls to avoid the presence of this toxin in ackee products. Logistics for the fruit are improving and set an example for other industries. The advantage of ackee is that essentially there are no other competitors in the market for immigrant Jamaicans in the United States of America and the United Kingdom.

An analysis of international extension service models on post-harvest logistics, and subsequent proposals for the Caribbean countries were delivered by Prof. Wayne Ganpat. The analysis concluded that the most successful countries are highly organized nationwide, and have more than a single provider of services in all areas, as opposed to centralization of services through the Ministry of Agriculture. It was emphasized that, in the Caribbean, extension services have been mainly for farmers and their work in the field, but little has been done on commercial orientation of farmers and on value-added techniques. Part of the problem is that there are no post-harvest, food logistics and market experts. It was considered important to lessen sole reliance on public extension services but rather stimulate the creation of autonomous entities that could also provide the services. The role of farmer organizations was seen as crucial for the emergence of diverse post-harvest/logistics extension services. Once again, this analysis evidenced the need for prioritizing adequate training systems. It is clear that governments will need to search for feasible solutions that may incorporate academia, ministries and private enterprises, perhaps as part of a network in several countries, as in the case with other institutions (e.g. the University of the West Indies).

Mr Rhett Chee Ping gave a review of the most important issues faced by shipping companies when handling fruit and vegetables. He emphasized inefficiencies in the processes. For example, containers may often be transported empty, which substantially increases costs. The containers are deployed to the destination of the commodity, but little effort is made to reduce costs. Moreover, Trinidad and Tobago and other neighbouring countries have extremely poor port infrastructure to maintain produce in acceptable conditions during transit and inspection.

Attendants and participants in the symposium had the opportunity to provide further insights and suggestions to improve logistics in the region:

- An approach needs to be established to coordinate the creation of a post-harvest/logistics agency in subregions (e.g. the Caribbean). In the past, a centre for research and outreach on food science and technology in Central America existed, with the main office in Guatemala. However, funding was discontinued.
- Training is needed on lean supply chains to prevent high costs being passed from one actor/point to another in the supply chain. In other words, a holistic approach is needed from producers and post-harvest handlers to consumers, which once again requires an entity/agency to stimulate the process.
- The Caribbean already has some good examples where logistics systems perform well. Besides ackee in Jamaica, there are several examples of efficient logistics in the Dominican Republic that include oriental vegetables, avocados, mangoes, peppers and tomatoes (all as a result of targeting export markets and in many cases using air transport). Moreover, the cocoa experience in Trinidad and Tobago was indicated as one that could be replicated as a model. It is a good example of integrated logistics along the entire chain (production to delivery) with a plus value that local varieties are now being commercialized with solid value addition. The effort is linked to the Cocoa Research Centre, which provides research and transfer technology from germplasm to post-harvest technology and value addition aspects. Commodities of concern for the Caribbean (breadfruit, sorrel and cassava) and other products targeting market niches (e.g. organics) could benefit particularly from good experiences already present in the region.
- It is believed that a key point when looking into improving logistics systems in the produce industry is to bind “input logistics” or pre-harvest logistics to post-harvest logistics as routes, for products seem to be similar and processes may thus be eased.
- Legislation, policies and subsequent interventions to regulate logistics and post-harvest practices are considered as some reasons for the lack of improvement in produce handling in the region over the last three decades, with a few exceptions such as Trinidad and Tobago, which has implemented important actions for prevention of produce loss in particular

supply chains. However, it is recognized that promoting logistics is complicated since it involves many areas of development and interested parties, to varying degrees in different countries.

- In establishing a national or subregional strategy to disseminate knowledge, there is a need to consider the lessons learned from industrialized

countries. The South-to-South approach in this area is not the only solution. The promotion of one- and two-year post-secondary school training, as occurs in many port cities in the United States of America (in these cases led by community colleges), could be one component of the overall approach.

Chapter 7

Recommendations and plans of action

The Inter-American Development Bank (IDB) suggests that, according to level of economic development, countries should focus their strategies on different areas. Low-middle-income countries' main weaknesses are related to basic infrastructure, economic reforms, appropriate service provision (such as ports) and commerce facilitation. Middle-high-income countries have more complex challenges, in addition to those previously indicated, including appropriate policies and organizations focused on improving the logistics performance of SMEs (IDB, 2010).

Governments in LAC have implemented policies and invested in infrastructure to increase their competitiveness. To keep moving forward, it will be advisable for governments to continue to work together with the private sector to bring more attention to increasing the efficiency of logistics processes throughout the food supply chain.

This chapter presents key recommendations for the public and private sector for each of the main components that affect the logistics performance in the agrifood sector and, more specifically, the fruit and vegetable subsector.

Infrastructure and transportation

Recommendations

- Improve the design and hiring processes for infrastructure investments, giving relevance to models with private participation.
- Consider not only public transportation infrastructure (such as roads, airports and ports), but also the infrastructure at logistics nodes such as wholesale and retail markets and distribution and collection centres.
- Train and promote professional workers in the transportation services with the purpose of guaranteeing quality and timely delivery of products at each step of the logistics chain.
- Optimize and modernize intermodal infrastructure and complementary services such as warehouses in collection and distribution centres.

- Develop models to reduce the impacts of fuel, freight and vehicle maintenance costs.
- Reduce transit times and time for loading/unloading merchandise.
- Promote the use of appropriate transport vehicles according to the type of products.

Public action

- Improve management of roads, particularly the maintenance of main roads.
- Emphasize the development of paved secondary and tertiary roads.
- Achieve the above recommendations realistically – design incentives to promote private investments to strengthen infrastructure since budgets appear to be a limitation in most countries.
- Strengthen incentives to standardize and promote investment in refrigerated transportation.
- Promote specific subject training for key actors through state organizations.
- Establish a regulatory framework more adapted to the needs of the logistics chain.
- Evaluate alternatives to reduce tariffs for refrigerated truck parts.
- Establish more regulated parameters for transporting perishable food products.
- Provide security for free transit on roads.
- Update and approve weight and dimension of trucks with other countries.
- Design and implement incentives to invest in the sector.
- Promote the implementation of the SAFE Framework of Standards of the World Customs Organization (WCO) to secure and facilitate global trade.

Private action

- Develop associations that can finance the maintenance of secondary and tertiary roads.
- Quantify and inform losses generated by inadequate product transportation so that proper measures may be taken.

- Train operators in basic logistics and transportation concepts.
- Hire qualified personnel in administration of logistics and distribution chains.
- Offer adequate and fuel-efficient vehicles to transport products.
- Develop loading/unloading schedules.
- Improve logistics services by associative strategies, which could have an impact in reducing costs through economies of scale.
- Identify most adequate transportation means according to product characteristics.
- Train transportation operators and improve their working conditions.

ICT and communications

Recommendations

- Promote the development of information databases that can be easily accessed by SMEs.
- Increase Internet coverage in rural areas.
- Improve processes to access information on the different actors in the food system.
- Establish a forum with common interests on different components of logistics.
- Use available technologies such as mobile telephones to develop useful mechanisms for logistics processes.
- Enhance the systemization of operations.
- Unify systems across the national territory and promote regional compatibility.

Public action

- Coordinate information supply across different entities.
- Increase access to Internet centres and include training.
- Establish standard tools and processes for training in databases.
- Increase the availability of information for private companies.
- Provide Internet and telephone access in rural areas.
- Provide integral information systems and promote their use.
- Evaluate the potential for implementing Electronic Data Interchange (EDI) to exchange data structurally according to predefined formats within applications of different organizations.

Private action

- Strengthen associations to generate relevant and periodic information.
- Promote information supply.

- Set clear indicators at enterprise level that account for logistics performance.
- Set up training in the use of online services (forums, market offers, etc.).
- Advise on the use of available information services and how to update them.
- Develop information products using text messaging (sms) and build lists electronically to disseminate information.

Electricity and the cold chain

Recommendations

- It is fundamental that the cold supply chain is not managed as an extra process in the production and distribution of products but as a strategic area that will allow increasing efficiency and offer high-quality products to clients, as well as reducing costs. In order to do this, it is necessary to have an adequate supply of refrigerated transport vehicles.

Public action

- Increase electrical coverage in rural areas to guarantee the cold chain throughout the entire processes.
- Undertake an inventory of national cold chain capacity to establish the current situation to make it easier to establish a road map of where to go next.
- Generate and provide information according to user's requirements.
- Establish clear regulations for the use of cold supply chains with regard to safety issues.
- Design incentives to promote private investments to provide services and infrastructure for the operations of the cold supply chain.
- Promote the use of agreements for the transportation of food products such as ATP, which is accepted in Europe and the United States of America.

Private action

- Explore new markets (e.g. food products that are currently not handled in refrigerated conditions but could benefit from refrigeration) to offer cold supply chain services.
- Associate with international unions to seek advice in the management of cold supply chains.
- Seek information in other industrial sectors that could be applied to the fruit and vegetable sector.
- Seek appropriate technologies according to the region's characteristics.

Human capital

Recommendations

- Design training and formation plans in logistics areas to strengthen workers' capabilities.
- Increase knowledge of food logistics in 3PL.
- Design and implement standard processes in ports to prevent individual workers from executing tasks according to their own interpretation.
- Promote public-academic partnerships to support knowledge dissemination and innovation in logistics.
- Place incentives to develop programmes targeted specifically for logistics in the agrifood sector.

Public action

- Design and implement policies to enhance formation in logistics areas, trying to motivate the creation of professional and technical faculties (logistics in the specific food sector) in these areas to feed both the public (extension service) and the private sector.
- Build human capacities related to certification/verification of sanitary and phytosanitary measures.

Private action

- Design and implement training modules for employees at all levels.
- Define strategic functions in companies to identify human capital requirements of people who need to be hired.
- Develop and deliver specific practical training modules for the needs of perishable food products.

Institutions, policy framework and processes

Recommendations

- Enable policies across a strategic competitiveness plan with a focal point on logistics and distribution of food products, or a set of policies that impact integrated means logistics development.
- Strengthen associations among private service providers (e.g. ICT alliances and transportation businesses) to the logistics systems as a means to improve logistics processes.
- Facilitate establishment of third party agencies and supporting services to accelerate processes to comply with certification and good practices programmes.
- Establish clear and direct policies with regard to product inspection that ensure product safety without impeding trade.

- Establish clear policies and procedures to obtain better coordination among customs, ports and inspecting agencies so that tasks are not repeated and more efficiency is gained.

Public action

- Provide financial, normative and technical instruments that enhance investments and improvements in logistics systems.
- Simplify trade requirements and documents to facilitate trade and reduce costs.
- Ensure the compatibility of systems among countries to facilitate regional integration and trade.
- Implement the single window to standardize documents and information at a single point for imports and exports.
- Modernize institutional structures to obtain a suitable and flexible system.
- Harmonize sanitary and technical rules to ensure food safety.
- Modernize and simplify customs procedures.
- Set clear roles and responsibilities for organizations across the supply chain so that they can be held accountable.

Private action

- Motivate enterprises in the agroprocessing sector to associate and develop mechanisms to increase the efficiency of logistics activities.

Post-harvest management, packaging and traceability

Recommendations

- Use market segmentation to establish appropriate packages for each type of product according to its characteristics.
- Use packages that help save food (which otherwise would be spoiled by inappropriate handling), and consequently maintain competitive prices.
- Build national networks to manage post-harvest issues. Discuss, investigate and promote adequate techniques.
- Establish adequate traceability systems from harvest to delivery to final consumer.
- Measure time and movements and identify checkpoints along the route.
- Evaluate the possibility of implementing digital technology, such as product-tracking tools and digital records that can help to facilitate processes, especially those regarding inspection. For fast-moving consumer goods, small digital graphics can be inserted in the packages for product tracking. One example is STAMPS

(Secure Tracking and Authentication through Matrix Printing and Scanning), which is impossible to copy and can be scanned through an image captured by a mobile phone (World Economic Forum, 2012b), making it easy for product inspection and traceability.

Public action

- Create training programmes in post-harvest management for professionals in specialized food areas.
- Work in collaboration with the private sector to develop technical rules for package regulation.
- Promote the conformation of post-harvest networks.
- Design mechanisms and controls to ensure the fulfilment of products and good-quality standards.
- Promote the application of traceability systems.

- Design and implement educational campaigns for consumers.
- Promote traceability practices for SMEs.

Private action

- Link professional associations to establish professional directories.
- Analyse package requirements in order to design appropriate packages.
- Implement sustainable and automatic traceability systems.
- Increase awareness of the need for traceability throughout the food supply value chain to guarantee product safety.
- Adapt processes and instruments required for certifications.
- Identify critical points in the supply chain.
- Establish responsible records.
- Develop traceability technology appropriate for agricultural products.

Chapter 8

Final remarks

The results of this analysis constitute an important step forward in the study of logistics for the produce sector in LAC, but represent only an initial step. More work is needed at the country level to identify the logistics map of the destination market (local, foreign), types of consumers and types of products (fresh or processed) in order to gain extensive knowledge of associated costs for each of the value chains. The authors consider it to be of paramount importance to continue elaborating feasible indicators that will serve to measure enterprise and food systems logistics performance efficiently and identify bottlenecks that generate excess costs in both the business and the overall food supply chain.

The countries analysed reveal major logistics deficiencies that undermine competitiveness and hence reduce the possibilities of taking advantage of the increasing commercial trade agreements. National strategic plans need to be designed to tackle the challenges in food logistics with a holistic approach, for both the national and foreign market. The local market needs to be analysed in order to provide better access to high-quality food for the population at an affordable price. The foreign market needs to be addressed because competition with stronger actors makes it imperative to have efficient logistics operations that result in reduced costs and higher commercialization of production. For many, improvements in logistics systems exclusively concern export markets, yet national demand is the most common market for most of the produce industries and this needs to be addressed with special attention. Providing food for the growing urban population will also be a major concern if logistics systems are not improved at a fast pace over the next few years.

According to LPI, the countries analysed are ranked in intermediary levels among worldwide economies. There are large internal imbalances in the various aspects considered. Using this base as an indicator, with its six components, it is clear how customs efficiency and infrastructure are the two main components that need to be improved. The importance of this component for efficient logistics

operations in the fruit and vegetable subsector was ratified in stakeholders' consultations and validated by experts during the regional workshop.

Another factor affecting efficiencies in logistics is the price of fuel, which is not entirely dependent on national policies but is also influenced by international trade markets. This is a further incentive for countries to increase efficiency in aspects of the logistics chain under their control. For example, Chile has the highest fuel costs among the countries included in this report, yet it has the highest logistics performance. One factor that has contributed to Chile's high performance is the development of alliances among associations that have enabled a cohesive working manner, as well as promoting long-term integral governmental policies that seek to support enterprises.

Countries need to invest in appropriate infrastructure and procedures to increase the flow of regional trade that is currently marginal. Supermarkets and food franchises have helped to modernize logistics services by establishing higher-quality product requirements.

With regard to export markets, Colombia, Honduras and Guatemala experience high costs in exporting a container, which makes them fall behind global standards. These costs result from several factors, such as lack of infrastructure, high fuel costs and inadequate human capacity. Moreover, electricity costs in LAC countries result in high prices for cold storage. This is particularly important for perishable food that needs to be stored immediately after harvest. As indicated in the critical points analysis, appropriate issues need to be addressed by the government, sector or enterprises.

Governments should enact policies to support enterprise operations. It is important to involve the private sector in designing these policies so that solutions correspond to their needs.

This report emphasized the main components affecting logistics performance in the fruit and vegetable subsector in LAC, and outlined recommendations for improvement. However, the food logistics analysis

also revealed the need to discuss and find solutions for further issues for which currently there is insufficient information, such as the following questions.

- How can effectiveness of logistics management within an enterprise be assessed?
- When is it more appropriate to outsource logistics operations to 3PLs or 4PLs for packaging, storage and transportation?

- What has been the role of supermarkets and other institutional buyers in the food value chain, and how can they contribute further to its development?

These and other questions require further analysis and study in order to develop efficient logistics systems for the food sector in LAC.

Bibliography

- Berdegú, J.A., Reardon, T.A., Balsevich, F. & Flores, L.** 2004. *Supermarkets and agrifood systems in Latin America: an overview*. Michigan State University, United States of America, Regoverning Markets and International Livestock Institute. September.
- Bhatt, A.** 2013. *Special economic zones in developing countries: promoting agribusiness development*. Rome, Food and Agriculture Organization of the United Nations. (draft)
- Biere, A.** 2001. *Agribusiness logistics: an emerging field in agribusiness education*. Sydney, Australia, International Food and Agribusiness Management Association, Agribusiness Forum and Symposium.
- Bloomberg.** 2013. RBOB Gasoline Price on 26 March 2013. <http://www.bloomberg.com/energy/>
- CEPAL, FAO & IICA.** 2013. *Perspectivas de la agricultura y del desarrollo rural en las Américas: una mirada hacia América Latina y el Caribe 2014*.
- CSCMP.** 2013. Council of Supply Chain Management Professionals. <http://cscmp.org>
- DNALogistiK.** 2013. <http://www.dnalogistik.com>
- Durán Lima, J. & Lo Turco, A.** 2010. El comercio intrarregional en América Latina: patrón de especialización y potencial exportador. In *Los impactos de la crisis internacional en América Latina: ¿Hay margen para el diseño de políticas regionales?* Serie Red Mercosur, 18(3): 91–142.
- ECLAC.** 2013. *Perfiles nacionales*. http://estadisticas.cepal.org/cepalstat/WEB_CEPALSTAT/perfilesNacionales.
- FAO.** 2007. *The State of Food and Agriculture – Paying farmers for environmental services*. FAO Agricultural Series 38. Rome.
- FDA.** 2010. <http://www.fda.gov/Food/NewsEvents/ConstituentUpdates/ucm210186.htm>.
- Felix, N., Seepersad, G. & Iton, A.** 2010. Competitiveness Assessment of the USA – Miami Market for Trinidad and Tobago Habaneros. Caribbean Food Crops Society. 46 Annual meeting. Boca Chica, Dominican Republic.
- Fendipetróleo.** 2013. <http://www.fendipetroleo.com>
- Fernandez, R., Flórez Gómez, S., Estrázulas de Souza, F. & Vega, H.** 2011. Supply Chain Analyses of Exports and Imports of Agricultural Products: Case Studies of Costa Rica, Honduras and Nicaragua. World Bank.
- Fonseca, J.M. & Njie, D.N.** 2014. Addressing food losses due to non-compliance with quality and safety requirements in export markets: the case of fruits and vegetables from Latin America and the Caribbean region. *Acta Hort.*, 1016: 179–186.
- Fonseca, J.M. & Vergara, N.** 2014. Logistics systems need to scale up reduction of produce losses in the Latin America and Caribbean Region. *Acta Hort.*, 1047: 173–180.
- GS1.** 2012. *Tracing grapes from Chilean field to U.S. grocery*. Industry pilot study. New Jersey, United States of America, Global Language of Business.
- Inter-American Development Bank.** 2010. *Freight logistics in Latin America and the Caribbean: an agenda to improve performance*, by J.A. Barbero. IDB Technical Notes IDB-TN-103.
- Inter-American Development Bank.** 2011a. *Logistics as a Driver for Competitiveness in Latin America and the Caribbean*, by L. Guasch. Discussion Paper IDB-DP-193.
- Inter-American Development Bank.** 2011b. *Logistics as a competitiveness factor for small and medium enterprises in Latin America and the Caribbean*, by C. Kirby & N. Brosa. Americas Competitiveness Forum V, San Domingo, Dominican Republic, 5–7 October. 24 pp.
- Jaramaillo, J.M. & Gonzalez, C.** 2012. *Documento de revisión y análisis de la cadena logística del sector agroindustrial agroalimentario en América Latina*. (internal document)
- Kuwayama, M.** 2005. *Latin American South-South integration and cooperation: from a regional public goods perspective*. Serie comercio internacional 50. Economic Commission for Latin America and the Caribbean (ECLAC).

- Loma-Ossorio, E. de, Castillo, R. & Rio, M. 2000. *Estudio de la industria agroalimentaria en Guatemala*. Costa Rica, AECI-IICA.
- Lundqvist, J., De Fraiture, C. & Molden, D. 2008. *Saving water: from field to fork. Curbing losses and wastage in the food chain*. SIWI Policy Brief. Stockholm International Water Institute.
- McKinnon, A., Cullinane, S., Browne, M. & Whiteing, A. 2010. *Green logistics. Improving the environmental sustainability of logistics*. Kogan Page.
- Ministerio de Transporte. 2011. Transporte en Cifras Colombia.
- Montoya, A., Montoya, I. & Castellanos, O. 2010. *Situación de la competitividad de las Pyme en Colombia: elementos actuales y retos*. *Agronomía Colombiana* 28(1), 107-117.
- Myerson, P. 2012. *Lean supply chain and logistics management*. McGraw-Hill Professional.
- OECD. 2001. *Measuring productivity. OECD Manual. Measurement of aggregate and industry-level productivity growth*. Paris, Organisation for Economic Co-operation and Development.
- OECD, UN-ECLAC & CAF. 2013. *Latin American Economic Outlook 2014. Logistics and competitiveness for development*, pp. 125-157.
- Panozzo, G. & Cortella, G. 2008. Standards for transport of perishable goods are still adequate? Connections between standards and technologies in perishable foodstuffs transport. *Trends in Food Science and Technology*, 19(8): 432-440.
- Pérez, G. 2012. Port container traffic in Latin America and the Caribbean 2011. Economic Commission for Latin America and the Caribbean (ECLAC). *FAL Bulletin Issue*, 307(3).
- Pullman, M. & Zhaohui, W. 2011. *Food supply chain management. Economics, social and environmental perspectives*, pp. 193-200. Routledge.
- Rantasila, K. & Ojalá, L. 2012. *Measurement of national-level logistics costs and performance*. International Transport Forum, OECD. Discussion Paper 2012(4): 35.
- Reardon, T., Berdegué, J.A. & Farrington, J. 2002. *Supermarkets and farming in Latin America: pointing directions for elsewhere*. London, Overseas Development Institute. Natural Resource Perspectives 81. December.
- Rodríguez, M. & Repetto, M. 2013. *Análisis de la cadena logística del sector agroindustrial agroalimentario en América Latina y El Caribe*. FAO regional report.
- Rong, A., Akkerman, R. & Grunow, M. 2009. An optimization approach for managing fresh food quality throughout the supply chain. *International J. Production Economics*, 131(1): 421-429.
- Schwartz, J., Guasch, J., Wilmsmeier, G. & Stokenberga, A. 2009. *Logistics, transport and food prices in LAC: policy guidance for improving efficiency and reducing costs*. World Bank Sustainable Development Occasional Papers Series, 2. August.
- Torrealba, F. 1999. *La inversión en el sector agroindustrial chileno*. Economic Commission for Latin America and the Caribbean (ECLAC).
- Trail, W. 2006. The rapid rise of supermarkets? *Development Policy Review*, 24(2): 163-174.
- UNDP. 2011. *Human Development Report 2011. Sustainability and equity: a better future for all*. United Nations Development Programme.
- UNESE. 2015. *Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be Used for such Carriage*. ATP Handbook. United Nations Economic Commission for Europe (UNESE).
- Van der Vorst, J., Beulens, A. & Van Beek, P. 2005. Innovations in logistics and ICT in food supply chain networks. In W.M.F. Jongen & M.T.G. Meulenberg, eds. *Innovation in agrifood systems: product quality and consumer acceptance*, 10: 245-292. Wageningen, the Netherlands, Wageningen Academic Publishers.
- VOSA. 2012. *A guide to ATP – the international carriage of perishable foodstuffs*. Vehicle and Operator Services Agency (now Driver and Vehicle Standards Agency [DVSA]). United Kingdom.
- World Bank. 2006. *Road freight transport industry in low and middle income countries*, by J. Hine. Washington, DC. (mimeo)
- World Bank. 2007. *Infrastructure in Latin America & the Caribbean. Recent developments and key challenges*, by M. Fay & M. Morrison.
- World Bank. 2012a. *What are the facts about rising food prices and their effect on the region?*
- World Bank. 2012b. *Connecting to compete 2014: trade logistics in the global economy. The Logistics Performance Index and its indicators*. Washington, DC.
- World Bank. 2013a. Data. <http://data.worldbank.org>

- World Bank.** 2013b. *Doing business 2013: smarter regulations for small and medium-size enterprises*. Washington, DC.
- World Economic Forum.** 2012a. *The Global Competitiveness Report 2012–2013*.
- World Economic Forum.** 2012b. *The Global Enabling Trade Report. Reducing supply chain barriers*, eds R. Lawrence, M. Drzeniek & S. Doherty.
- World Economic Forum.** 2013. *The Africa Competitiveness Report 2013*.
- World Trade Organization.** 2013. <http://www.wto.org>

Annex 1

SWOT analysis

Strengths	Weaknesses	Opportunities	Threats
Chile			
<ul style="list-style-type: none"> • Large volume of exports • Support for product promotion • Trade associations • Economies of scale • Level of infrastructure 	<ul style="list-style-type: none"> • Little labour availability • Increasing production costs for agricultural products • Availability and cost of electricity • Roads, transport and access to ports in some regions • High fuel costs 	<ul style="list-style-type: none"> • Asian markets (India, China, Thailand, Indonesia) 	<ul style="list-style-type: none"> • Foreign exchange rate • Competitors (Peru)
Colombia			
<ul style="list-style-type: none"> • Geographic location • Public interest to improve processes • Policies to promote logistics development 	<ul style="list-style-type: none"> • Inefficient processes caused by many inspections • Insufficient road infrastructure • Lack of institutional coordination • Limited cold chain • Limited traceability • High freight costs • Unqualified personnel • High rotation of personnel in control institutions • Lack of performance measurement • Lack of standardized processes 	<ul style="list-style-type: none"> • Free trade agreements • Professionalization of human resources • Technological capacities and use of ICT • Incentives for private investments 	<ul style="list-style-type: none"> • Climate factor (natural disasters) • New operators in the cold chain by free trade agreements • Insufficient logistics capacity • High fuel and electricity costs • Lack of public leadership to improve transportation
Guatemala			
<ul style="list-style-type: none"> • Quality and traceability • Offer of specialized services • Institutional support (AGEXPORT) • Ports in two oceans and communication roads • Ease of procedures with sanitary authorities 	<ul style="list-style-type: none"> • Insufficient cold value chain • Lack of qualified personnel • Inefficiencies at ports • Lack of capacities of customs personnel • Lack of auxiliary roads • Insufficient access to financial services • Port infrastructure (lack of X-rays) • Electrical and potable water coverage 	<ul style="list-style-type: none"> • Revival of associative groups • Logistics services for cardamom • Law for public-private investment alliances 	<ul style="list-style-type: none"> • High transportation costs • Natural disasters that affect infrastructure • Thefts on national roads • High dependence on trade with the United States of America
Honduras			
<ul style="list-style-type: none"> • Road network close to Cortés Port • International airports (four) • New automatized inspection methods 	<ul style="list-style-type: none"> • Electrical and potable water coverage • Little use of the Internet • Sector's informality • Little development in cold chain • Risk of adverse entrepreneurs • Lack of qualified personnel in companies • Insufficient access to financial services • Food smuggling 	<ul style="list-style-type: none"> • OIRSA¹⁵ agreement • Enlargement of Cortés Port • Development of dry channel • Increasing domestic demand • Policy to promote national/foreign investment 	<ul style="list-style-type: none"> • Natural disasters • Lack of control in vehicle weight • Relocation of <i>maquilas</i> (manufacturing operations) – less access to maritime transportation • Political instability

¹⁵ OIRSA is the international organization for the sanitary aspects of regional agriculture and livestock.

Strengths	Weaknesses	Opportunities	Threats
Panama			
<ul style="list-style-type: none"> • International logistics centre • Strategic alliance with Georgia Tech • Foreign investment • Cold supply chain project • Efficient port infrastructure 	<ul style="list-style-type: none"> • Lack of promotion for developing logistics processes for SMEs • Logistics and infrastructure policies • Minimum traceability • Low rural electrical coverage 	<ul style="list-style-type: none"> • Explore new markets • Tourism services 	<ul style="list-style-type: none"> • Trade agreement with the United States of America

Sources: Rodríguez & Repetto, 2013.

Annex 2

Main policies and institutions affecting logistics development

The analysis of regulation practices in LAC shows some glaring discrepancies among countries, especially regarding the time when action has been taken. Countries such as Chile initiated the establishment of effective policies several decades ago, while other countries have made significant changes only in the last decade. Chile has implemented coherent policies over the course of 40 years to facilitate the development of the agrifood processing industry. These policies promote private investments to improve and sustain the national infrastructure to facilitate logistics processes. One example is the establishment of SAG, which guarantees the safety conditions of exported food and the tax policy that promotes agrifood processing industry exports.

Honduras has recently implemented a national programme to promote investments, which seeks to attract foreign investments to facilitate the national infrastructure for improved logistics.

Colombia has developed a large number of policies to promote logistics development over the last few years. However, the entrepreneurs interviewed for this report perceive a lack of coordination among institutions that interferes with efficient implementation of these policies.

Guatemala has also implemented policies to promote foreign investments and alliances to develop economic infrastructure. It established the Agricultural and Environmental Integral Protection Programme (PIPPA). PIPPA carries out sanitary and phytosanitary inspection of food products that are recognized by USDA and FDA.

Panama is implementing a national cold chain programme to create an appropriate logistics system to manage products from origin to distribution and commercialization points. The objective is to reduce losses, and guarantee safety and quality of products at reduced costs (www.cadenadefrio.gob.pa).

In the Caribbean, the Dominican Republic and Jamaica have also begun drawing up logistics policies, giving logistic goals prominence in the national development plan (OECD, 2001). In some cases, the target is good governance, enabling private investment. Important factors contributing to poor logistics performance are excess corruption, failing governance and weak security, all present in the region as a whole. While solicitation of informal payment in LAC was above 30 percent at all times, in OECD countries it was about 5 percent (OECD, 2001).

As indicated, some important policies have been implemented only recently, so it is still too soon to determine whether they have been efficient in promoting logistics development. Moreover, it is important for countries to set appropriate indicators to measure the impact of targeted policies and institutions and redirect efforts to areas that will have a greater impact. The establishment of indicators for future evaluations are either not being considered or have not been clearly indicated to the public.

Country	Policies and institutions
Chile	<ul style="list-style-type: none"> • Regulatory phytosanitary policies • Policies to promote and support exports • Tax policies (recover sales tax for exporters) • Policy to support agricultural development • Policy for financial access • Policy to promote infrastructure • ProChile to promote Chile's exports • Production Promotion Corporation (CORFO) to promote the production of strategic products • <i>Plan Frutícola</i> – plan to grant credits for fruit production

Country	Policies and institutions
Colombia	<ul style="list-style-type: none"> • National Productivity and Competitiveness Policy (CONPES 3527, 2008) • National Logistics Policy (CONPES 3547, 2008) • Port Expansion Plan (CONPES 3611, 2009) • National Policy on Public Road Freight Transport (CONPES 3489, 2007) • Private initiative for infrastructure (Decree 4533, 2008) • Guidelines for merchandise control (CONPES 3469, 2007) • Guidelines for merchandise control and security at foreign trade transfer nodes (CONPES 3528, 2008) • Human Capital Formation System (CONPES 3674, 2010) • Productive Transformation Programme (CONPES 3678, 2010) • Transport and Trade Facilitation Committee • National Competitiveness Council • Presidential High Council for Public and Private Management • Presidential High Council for Competitiveness and Productivity • Private Council on Competitiveness
Honduras	<ul style="list-style-type: none"> • Central American Agricultural Policy 2008–2017 • National Programme for Competitiveness • National Programme for Investment Promotion • Federation of Agricultural Exporters (FPX)
Guatemala	<ul style="list-style-type: none"> • Export Promotion and Maquila Law (Decree 29–89) • Government agreement to develop small businesses • Alliance for Economic Infrastructure Development • National Competitiveness Programme (PRONACOM) • Agricultural and Environmental Integral Protection Programme (PIPPA)
Panama	<ul style="list-style-type: none"> • Logistics Cabinet (May 2012) • National Logistics Council • Georgia Tech Panama Logistics Innovation and Research Center • National cold chain programme

Sources: authors' elaboration, based on country assessments.



Logistics in the horticulture supply chain in Latin America and the Caribbean

Regional report based on five country assessments and findings from regional workshops

Today, logistics systems and management are considered key for the growth of the perishable food sector, and particularly for those supply chains that involve smallholders. However, there is limited information on the state of logistics systems for food products in most non-industrialized countries. The present report seeks to help fill this gap by providing information on logistics in the produce subsector of five countries in the Latin America and Caribbean (LAC) region.