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Agro-Logistics in Central America

A Supply Chain Approach

Background Paper

Economics Unit, Sustainable Development Department

Central America Country Management Unit

Latin America and the Caribbean Region

The World Bank

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LATIN AMERICA AND THE CARIBBEAN REGION

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opportunities for all

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Contents

Acronyms

COMIECO	Consejo de Ministerios de Integración Económica
LANAR	Laboratorio Nacional de Residuos, Honduras
LANASEVE	Laboratorio Nacional de Servicios Veterinarios, Costa Rica
MAG	Ministerio de Agricultura y Ganadería, Costa Rica
MAGFOR	Ministerio Agropecuario y Forestal
SAG/SENASA	Secretaria de Agricultura y Ganadería/ Servicio Nacional de Salud Animal, Honduras
SIECA	Secretaria de Integración Económica de Centroamérica
SCA	Supply Chain Analysis
SPS	Sanitary and Phytosanitary Standards
TICA	Tecnología de Información para el Control Aduanero
TIM	Tránsito Internacional de Mercancías
USDA-FSIS	United States Department of Agriculture Food Safety and Inspection Services

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Executive Summary

This chapter uses supply chain analysis (SCA) to identify transport and logistics bottlenecks that add costs, times and uncertainty to the exportation of perishable agricultural products from Central America. Macro-level analyses of logistics performance, including the Logistics Performance Index, Doing Business Reports and Enterprise Surveys of the World Bank, as well as the Global Competitiveness Index of the Global Economic Forum, often leave policy-makers unclear on exactly what poor performance *means* for exporters and producers in Central America. How does poor road quality eat away at the profit margins of my country's producers? Extensive procedures add time to export processes, but how much time? How and to what extend does this additional time hurt the competitiveness of key industries? How does this effect vary by product type? By tracking the movement of seven carefully selected exports, these supply chains complement macro-level analyses by answering these questions for some of the region's key agricultural exports.

A range of unique characteristics makes the success of perishable exports exceedingly dependent on the efficiency of the related logistics systems and the ability to connect effectively and reliably to global supply chains. Remote production zones add cost, time and variability to transport from the farm gate to the distribution, collection or processing center. Increasingly complicated international sanitary and phytosanitary standards (SPS) add institutional and procedural complexity to the supply chain. Above all, the time sensitivity of most perishable products increases the value of time and makes cold chain infrastructure and the availability of refrigerated containers essential for successful exportation.

The Methodology

The SCA methodology[1] is a survey-based tool used to pinpoint transport and logistics bottlenecks that hinder or prevent access to markets. By diagnosing individual product movements on the ground, each SCA provides a forensic view of one product moving to market. The analysis identifies where logistics inefficiencies, from the farm gate to the port of exit, increase logistics expenses, travel times, and uncertainty. Logistics bottlenecks negatively impact producer/exporter margins, in the case of exports, and consumer prices, in the case of imports, ultimately hindering competiveness. SCAs quantify and monetize the effects of bottlenecks for individual producers, showing policy-makers exactly how poor logistics performance hurts their export competitiveness.

The SCA case studies presented in this study were chosen for their relevance in Central American trade and the representativeness of their route. Destinations that require the use of a principal Atlantic port

[1] The unique methodology used to conduct the SCAs in this report was developed expressly for this purpose by the Economics Unit of the Sustainable Development Department for the Latin America and Caribbean Region of the World Bank. It has appeared in other World Bank publications, including: 1) Fernandez, R., Flores Gomez, S., Estrazulas de Sauza, F., & Vega, H. (2011). Chapter 6. Supply Chain Analyses of Exports & Imports of Agricultural Products: Case Studies of Costa Rica, Honduras and Nicaragua. In J. H. Lopez, & R. Shankar, *Getting the Most out of Free Trade Agreements in Central America* (pp. 151-181). Washington D.C.: The World Bank and 2) Arias, D., & De Franco, M. D. (2011). *Integrating Central American and International Food Markets: An Analysis of Food Price Transmission in Honduras and Nicaragua.* Washington D.C.: World Bank.

were favored because Puerto Cortés and Puerto Limón in Costa Rica traditionally handle the highest volumes of trade in the region, when Panama's ports are excluded.[2] The three Honduras supply chains (beef, dairy & organic coffee) were conducted as part of an IFC project designed to address administrative constraints that diminish the competitiveness of agricultural exports. The case studies chosen for this analysis include the following:

Exports beyond Central America

- Pineapple Exports to Europe from Costa Rica
- Frozen Ground Beef Exports from Nicaragua to the United States (Small & Large Producer)
- Fresh Beef from Honduras to the United States
- Organic Coffee from Honduras to Germany
- Snow Peas from Guatemala to the United States.

Exports within Central America

- Tomatoes from Costa Rica to Nicaragua (Small & Large Exporter)
- Dairy from Honduras to El Salvador

The time sensitivity of perishable agricultural goods means that bottlenecks in the logistics system have a clear and measurable impact the quality and quantity of goods delivered.[3] For Costa Rican tomatoes and Nicaraguan beef, a product-specific calculation for time value was made to estimate the impact of delays on overall logistics costs.

Though the SCA methodology is a micro-level analysis, supplementary research at the region level supports the conclusion that the logistics bottlenecks identified here are common for other types of perishable products and other countries within the region.

Main Conclusions

Three primary logistics bottlenecks appeared to effect the majority of the supply chains studied for this report: (i) poor rural road access and quality; (ii) border management and infrastructure weaknesses, including specific aspects of customs services; and (iii) sanitary and phytosanitary review and inspection processes, both at national laboratories and at points of exit & entry. Secondary bottlenecks that appeared to also affect many chains included the container security risks, poor port performance, city congestion, and absent or poorly implemented transport regulation.

General conclusions are as follows:

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[2] Comisión Centroamericana de Transporte Marítimo (2008).
[3] Time to trade imposes a number of additional costs on exporters which vary in character and degree according to the product. For non-perishable, time-insensitive products, delays often result in increased logistics expenses for labor, fuel, and storage, as well as fees or fines for delays or demurrage.

- **Logistics bottlenecks can more than double logistics costs for both high and low value goods.** For example, logistics costs for a large tomato producer, exporting from Costa Rica to Nicaragua, including ground transport, handling and customs service fees are estimated at around $0.15 per kilogram, while the value of time spent waiting at the Peñas Blancas border crossing (heading north) doubles the logistics costs by adding an additional $0.14 per kilogram in hidden costs through losses of this extremely perishable product. For beef exports from Nicaragua, total logistics costs also double when time value is included, from 11% to about 21% of the wholesale price in the U.S.

- **The poor quality of rural roads means high transport costs particularly for pineapple, tomato and dairy farmers, and cattle ranchers.** For the tomato export chain, the largest transport cost components correspond to the short freight segment for both small and large exporters - from the farm gate to the consolidation center in Costa Rica, and from the distribution center to the final market in Nicaragua. For Costa Rican pineapples, transport costs for the short 40 km trip from the farm gate to the packing plant may cost anywhere from $120 to $280, where as the long freight from the packing plant to Puerto Limón (220km) costs $600. Factoring in the different vehicle capacities for each transport leg, on a cost per kilo/kilometer basis, the short freight is more than 8 times higher. For cattle in Nicaragua, the small producer raises cattle in El Ayote, located 144 kilometers away from the slaughterhouse; he pays $230 for his truck, as compared to $70 for the large producer, because a third of the route is on a seasonal, unpaved, tertiary road.

- **Time delays, particularly during the first transport segment can lead to major product losses for producers.** For pineapple exports, rough rural roads and no refrigeration also leads to product losses that are 50% greater on the short freight journey than on the entire journey from the distribution center on to Rotterdam. For cattle from Nicaragua, factoring in the increased distance and cost, expected loss of bodyweight and risk of injury, a small cattle rancher faces logistics costs of $0.32 per kg of body canal weight, as opposed to $0.15 for a larger producer with a farm close to the slaughterhouse in Juigalpa (see Figure 20).

- **At the four border crossings studies for these SCAs[4], poor technical capacity, out-dated paper document processing, inconsistencies in export law, regulation and practice, as well as inadequate infrastructure converge in an environment of insecurity to create a nexus of delays and confusion.** Within the region, border crossings with Honduras produce the longest unexpected delays, with recently recorded crossing times reaching up to 2 days for the El Amatillo border with El Salvador.

- **Delays are generated by entrance congestion, slow export procedures and poor coordination of border authorities at Puerto Cortés in Honduras.** Normal experiences involve backlogs of

[4] *El Amatillo (HON-SAL), El Guasaule (NIC_HON), Las Manos(NIC_HON) and Peñas Blancas (CR-NIC).*

paperwork, duplicated procedures and additional costs and fees. There is one SENASA[5] employee to manage, stamp and sign the export permit for every container of agricultural exports.[6] Customs brokers routinely arrive with documentation for 30 to 50 containers at a time, and this signing process can take several hours, or even an entire day.[7] Uncertainty about the root cause of procedural inefficiency complicate attempts to resolve the issue without a thorough diagnostic by a neutral party.

- **High fees and long waits for laboratory analysis required for the sanitary inspection certificate have a powerful negative impact on the competitiveness of Honduras' dairy and meat exports.** For the case of beef, exporters reported a minimum of 5 days, an average of 8 days, and a maximum of 15 days to perform this process, from taking the sample to receiving the results. The costs for beef tests in Honduras are about a third higher than those of Costa Rica ($625), and 85% greater than those for Nicaragua ($540). Dairy test fees in Honduras are double those in the other two countries (Figure 24). For small lots of dairy (less than one 42,000lb container), these costs represent 36% of total costs to export.

- **Beef and Dairy exporters in Nicaragua and Honduras, as well as several public sector officials in both countries, reported the misuse of SPS measures as non-tariff barriers throughout the region.** According to one Honduran dairy exporter, every time a refrigerated container of dairy products undergoes a duplicate inspection at the El Salvador border, logistics expenses may increase by up to $900, and the time in transit from 2 to 9 days. Exporters and customs brokers report that decisions to inspect and detain cargo appear to be made arbitrairily, and question the implementation of risk management procedures.

- **Interviewees noted poor port performance and infrastructure at all three ports covered in these SCAs.** Delays leading to missed boats are passed on by the shipping companies to the exporters in late charges normally around $125 to $150 per day.

- **Together with poor infrastructure, poor or absent speed, weight and vehicle type regulation makes roads and highways very insecure for cargo, public and personal transport.** For Nicaragua's beef exports, poor transport regulation in the form of unexpected, unnecessary, and costly delays at the weigh station can add 2 additional days to the journey to port and result in fines anywhere from $16, for the first offense, to over $1,000 per container, for a frequent, repeat offender.[8] Conversely, the absence of a system of weigh stations in Honduras contributes to the deterioration of roads, ultimately increasing maintenance and rehabilitation costs.

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[5] In reality, this is an official for the *Servicio de Proteccion Agropecuaria*/Agricultural Protection Service (SEPA). SEPA is a subdivision of SENASA that handles border inspection and quarantine.

[6] This is a requirement for all containers shipped to the United States.

[7] Even without the documentation signed, the container may be loaded and travel on to its destination. However, at the port of destination, the cargo will not be allowed to leave the port until the proper documentation has been received.

[8] Reported by 3 shipping agencies interviewed and each of the 4 exporting slaughterhouses.

- **Pervasive insecurity in Central America has corresponding costs for the region's trade.** High-value meat and coffee exports must pay for a security patrol or armed guard to accompany containers in transit, particularly for vehicles traveling in or through Honduras. For small and large coffee exporters surveyed, the price of this security service ranged from $250 to $368 dollars total per trip from cooperative to port, equal to a third of overall transport costs, or half of the ground transport service costs itself, depending on the scale, production zone and warehouse location. Though insignificant as a percentage of the final price of organic coffee (.005%), the burden of security is significant for smaller coffee cooperatives, in that it increases upfront costs; cooperatives typically face a high cost of capital and little access to credit; it routinely takes 20 days to a month to receive payment after sending a coffee shipment.[9]

General Recommendations

Recommendations that require infrastructure investments include:

- Shorten the distance between farms and refrigerated storage facilities, distribution or processing centers by constructing small storage centers in rural production zones, or moving food processing and distribution centers away from capital cities and closer to production zones.
- Expand the capacity, number and reach of national laboratories.
- Build rural roads with attention to cost-effective, sustainable alternative to asphalt.

Recommendations requiring investments in soft infrastructure, institutional enhancements, or policy changes:

- Establish regular communication between transport ministries and agro-export promotion entities.
- Introduce spatial planning into plans for border modernization.
- Improve data collection on border efficiency and traffic to feed into public policy decisions.
- Preclearance of low-risk perishable products prior to completion of laboratory tests.
- Further explore the possibility of mobile platforms, to increase access to information and prices of transport, logistics and security services for agriculture.

Improvements requiring cross-institutional or regional collaboration:

- Develop a regional, shared online platform where countries are required to announce precautionary border inspection measures in response to agriculture risks, such as disease outbreaks in neighboring countries, in real time.
- Harmonize customs systems (regional) and ensure that they interface seamlessly with quarantine and sanitary inspection systems (country-level).
- Expand efforts to proactively address the use of SPS measures as non-tariff barriers to trade.

[9] In the organic coffee chain, logistics bottlenecks are not as severe a cost burden as a lack of access to credit.

Future analytical work should be conducted in collaboration with logistics operators and customs agents that have representative data on transport costs and times within the region. A series of SCAs at the country level that compare results for well-developed supply chains and potential growth exports would be further helpful in diagnosing each countries particular weaknesses. Information on competition in the trucking services sector is sparse. Also, much interest has been shown in cost-benefit analyses that quantify the effect of port inefficiencies on the region's exports and imports, particularly for Puerto Cortés. Complementary analyses that project likely shifts in trade patterns in the region could help to inform a regional port strategy, and infrastructure development of strategic interest for the region as a whole.

Introduction

The objective of this analysis is to identify the logistical bottlenecks that constrain the movement of agricultural products both within and beyond Central America. Logistics refers to the infrastructure, machinery, related services, and information systems that allow products to move from the original point of production to the final point of consumption.

The Marriage of Agriculture & Logistics

The success of agricultural trade, and in particular for perishable products, depends on the efficiency of the related logistics systems and the ability to connect effectively and reliably to global supply chains. Estimates for Latin America show that international maritime freight and road haulage components can total 20% of the F.O.B. value of goods if combined. Logistics bottlenecks often make up a large component of the barriers-to-entry that make it impossible for small and medium-sized firms to link in to global supply chains.

Perishable agricultural products have a unique set of characteristics that require specialized logistics systems; most important for this analysis are the following:

- remoteness of production zones
- time sensitivity
- required temperature control
- sanitary inspection procedures

Remote production zones mean higher costs and greater losses for the first actors along the supply chain, the farmers themselves. Farms and cattle grazing lands are often far removed from major transit corridors on secondary or tertiary roads, which are designed to handle lower traffic volumes, slower speeds, and smaller vehicles. Radial road network structure that connect secondary cities to the capital increase the segmentation of rural markets by leaving neighboring local markets disconnected without a quick and affordable road between them. As a result, some small producers may be forced into paying higher transport costs and selling for the export market, when they might have received a better price domestically. Further down the supply chain, processing plants for manufactured agricultural goods, such as cheese or ground beef, are more strategically located outside of primary cities.

The time sensitivity of perishable agricultural goods means that bottlenecks in the logistics system have a clear and measurable impact the quality and quantity of goods delivered[10]. The most commonly used methodology for measuring time costs comes from Hummels (2001), in which the author estimates an exporter's willingness-to-pay for one day of time savings is estimated at around .8% of the final price for manufactured goods. In Christ and Ferrantino (2009), the authors conclude that the value of time calculated in Hummels (2001), is an overestimate for time costs alone, but appears to accurately reflect the combined value of implicit time costs and an uncertainty penalty.

For the LCSSD Central America SCAs, the characteristics of the selected good determined the appropriate methodology for time valuation. For perishable agricultural goods (tomatoes, pineapples and snow peas), the value of time was measured according to the shelf-life of the product, confirmed by matching with reported losses in interviews. For frozen beef exports from Nicaragua, which, when frozen, have a useful life of up to one year, the Hummels (2001) time value was applied.

Most perishable products require temperature control, and often cannot be consolidated easily with other types of cargo, including other refrigerated cargo. For large-scale exportation to North America and Europe, the equipment required to maintain the cold chain, including refrigerated/reefer containers, access to electricity in parking areas, and refrigerated storage space, is provided by international shipping agencies, such as Mearsk, Crowley and Seaboard Marine, among others. In addition to their role and maritime freight service providers, these international actors have come to dominant the supply chain for international cargo, serving as shippers, freight forwarders, and third party logistics operators throughout Central America.

For intraregional trade of perishable goods, cold chain infrastructure and equipment is much more complicated. Private companies must own their own reefers or contract out to domestic trucking companies; reports abound of drivers that turn off the electricity in the unit in order to conserve fuel. Smaller exporters are often constrained by high transport costs and shortage of refrigerated containers, particularly during fruit harvest seasons. For the first leg of the journey to market, from the farm gate to the processing or distribution center, the absence of affordable and accessible cold chain infrastructure and services prohibits market participation for many small farmers, some of whom report simply giving away spoiled goods.

An integral part of agricultural trade, sanitary and phytosanitary standards (SPS) are designed to guarantee the safety of all imported products for domestic consumption, as well as the safety and compliance of all exports with the standards and norms of the destination market. At one stage in the supply chain, exporters of perishable agricultural products send a sample of a current production lot to a national laboratory, where microbiological and chemical residual tests are performed. Results showing the sample free of harmful contaminants are required in order to issue the sanitary export permit. Depending on the reliability of the product, and changing reports of infestations and animal illnesses,

[10] Time to trade imposes a number of additional costs on exporters which vary in character and degree according to the product. For non-perishable, time-insensitive products, delays often result in increased logistics expenses for labor, fuel, and storage, as well as fees or fines for delays or demurrage.

importing countries may exercise their right to re-inspect these products upon arrival at the point of entry.

SPS systems are necessarily complex, involving coordination with customs agencies and other inspection and regulatory agents operating at borders and ports. They are also increasingly challenging, as compliance with international norms complicates exportation from countries that lack the same level of control and capacity to collect and manage information. Many countries in Central America, and particularly Honduras and Guatemala are known for some of the following symptoms of poorly managed SPS systems:

- high laboratory costs
- long wait times to receive laboratory results
- frequent re-inspection of exports at port of entry
- frequent rejection of product at port of entry, due to detection of contaminants

Ultimately, inefficiencies and failures of SPS systems increase costs and times for exportation, and reduce the reliability and competitiveness of agricultural exports.

Supply Chain Analysis

The SCA methodology[11] is a survey-based tool used to pinpoint transport and logistics bottlenecks that hinder or prevent access to markets. The analysis follows a selected product from the farm gate to its destination, identifying where logistics inefficiencies increase logistics expenses, travel times, and uncertainty. Logistics bottlenecks negatively impact producer/exporter margins, in the case of exports, and consumer prices, in the case of imports, ultimately hindering competiveness. SCAs quantify and monetize the effects of identified bottlenecks for individual producers, showing policy-makers a snap shot of how poor logistics performance directly impacts upon one product.

On the public side, the results have proven to be of interest to ministries of agriculture, trade or commerce, planning, transport and public works, customs officials as well as road, port and rail agencies. On the private side, the results are of direct interest to producers, exporter associations, transport service providers, and chambers of commerce.

Logistics bottlenecks revealed in this SCA may include:

- insufficient capacity or stock of road, rail and/or port infrastructure;
- poor management, operations or maintenance of that infrastructure;

[11] The unique methodology used to conduct the SCAs in this report was developed expressly for this purpose by the Economics Unit of the Sustainable Development Department for the Latin America and Caribbean Region of the World Bank. It has appeared in other World Bank publications, including: 1) Fernandez, R., Flores Gomez, S., Estrazulas de Sauza, F., & Vega, H. (2011). Report 6. Supply Chain Analyses of Exports & Imports of Agricultural Products: Case Studies of Costa Rica, Honduras and Nicaragua. In J. H. Lopez, & R. Shankar, *Getting the Most out of Free Trade Agreements in Central America* (pp. 151-181). Washington D.C.: The World Bank and 2) Arias, D., & De Franco, M. D. (2011). *Integrating Central American and International Food Markets: An Analysis of Food Price Transmission in Honduras and Nicaragua.* Washington D.C.: World Bank.

- non-competitive freight handling, trucking, shipping and warehousing services; and
- border congestion along with customs, phytosanitary and security clearance costs and delays.

For a more detailed description of the SCA methodologies, including examples of surveys, please see the methodological note in Annex III.

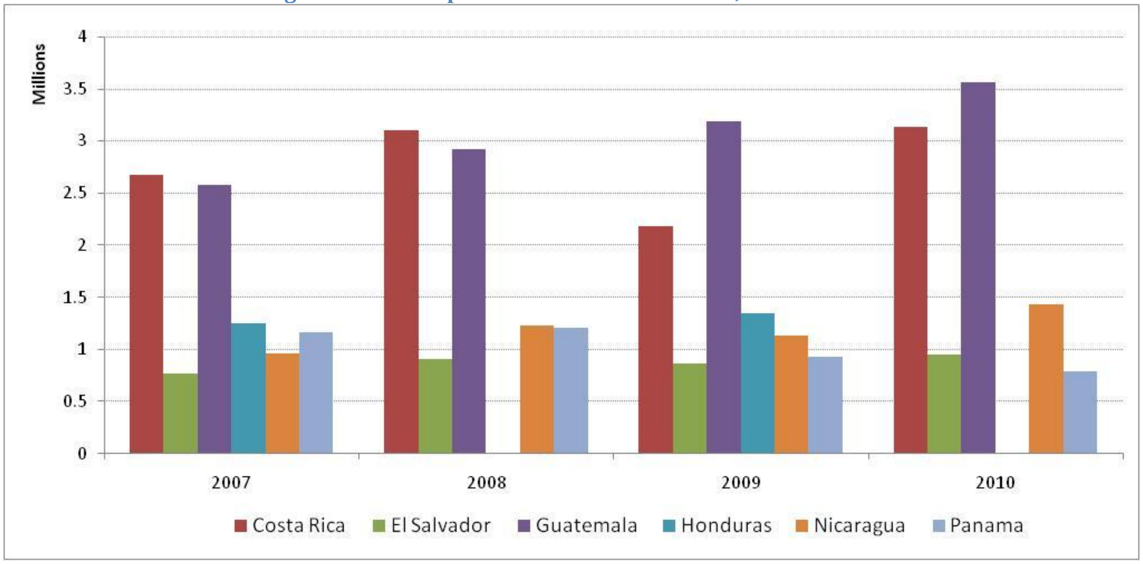
Within a great and diverse body of analytical tools related to the movement of goods, this methodology is a product-level assessment with a singular focus on infrastructure and logistics. Wider-ranging studies, such as Trade and Transport Facilitation Assessments (TTFAs), are conducted at the country level and consider the institutions and corresponding regulations that govern the movement of goods; they often include SCAs as one component of a more holistic assessment (see: World Bank, 2010). Sectoral diagnoses of, for example, domestic trucking services or the shipping industry, can identify a range of inefficiencies related to a particular step along the chain. Freight-flow simulations, among other types of spatial modeling exercises can identify bottlenecks in the movement of cargo, but are unable to quantify the cost-impact on producers or address the unique challenges that these bottlenecks pose to different types of cargo. Because the SCA is a micro-level tool, complementary analyses are necessary to show the degree to which product-specific points of friction are structural and symptomatic.

This SCA methodology must not be confused with a value chain analysis, which is also product-based, but attempts to identify inefficiencies in the production of a good, from the usage of inputs to product positioning in the final retail market. Value chain analyses offer a more general perspective of a particular industry or agricultural sector, and may complement supply chains, but ultimately do not provide the same kind of detailed analysis of constraints to product movement that are integral to an SCA. Other supply chain methodologies differ in their focus on price transmission, the role of intermediaries, or customs services and documentation, which often pay a great deal of attention to the movement of information through the chain (see: Kunaka, 2010; Zuñiga-Arias, 2007).

The Exportation of Agricultural Products in Central America

In recent years, Central America has been exporting from $9.3 to $9.8 billion dollars worth of food exports. Guatemala is currently the largest food exporter, accounting for over a third of 2010 exports ($3.6 billion) followed by Costa Rica ($3.1 billion). Each of the other four countries typically exports about $1 billion worth of food each year.

Figure 1. Food Exports from Central America, 2007 to 2010

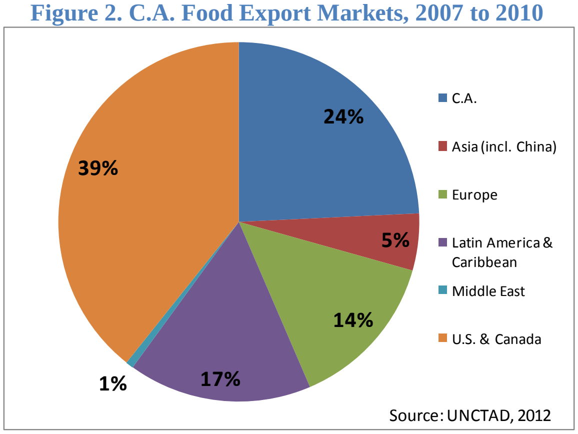


Note: No data was available in this database for Honduras in 2008 & 2010.

Source: UNCTAD (2012)

The U.S. and Canada remain dominant markets for Central America's food exports, accounting for almost 40% of all exports over the period 2007 to 2010. Other important export regions include Europe, with approximately 14%, South America & the Caribbean, with 27%, and intraregional markets, with 24% (see Figure 2). North America and Europe are primary markets for the region's known large-scale production and exportation of bananas, and Costa Rican pineapples, where as other markets demand small volumes of a greater diversity of products.

Figure 2. C.A. Food Export Markets, 2007 to 2010



For the purposes of these SCAs, emphasis has been placed on exports of perishable agricultural products, defined as all animal and vegetable food products that require careful temperature regulation, and have a shelf-life of less than 30 days. For these time-sensitive goods, sophisticated and efficient logistics systems are vital for market success, which makes them the ideal protagonists for a micro-level analysis of logistics systems. There are four main categories of products that fit this description: 1) meats, including beef, poultry, pork, fish, and other seafood; 2) dairy, including milk, cheese, and eggs; 3) fresh vegetables, including carrots, beets, broccoli, snow peas, etc.; and 4) fruits, including bananas, melons, papaya, and lemons, among others.[12] Flowers have also been included in the database used for this study; though inedible, they confront similar logistics challenges due to their delicacy and short use-life.

Within the category of food exports, Costa Rica and Guatemala are the largest regional exporters of perishable goods, exporting $1.1 million and $757 million respectively in 2009, with bananas accounting for approximately half of that total in both cases. In fact, in a typical year, bananas may account for more than 40% of total perishable exports from Central America. Banana production is dominated by large firms with established global supply chains, and so will not be a focus of this particular study.

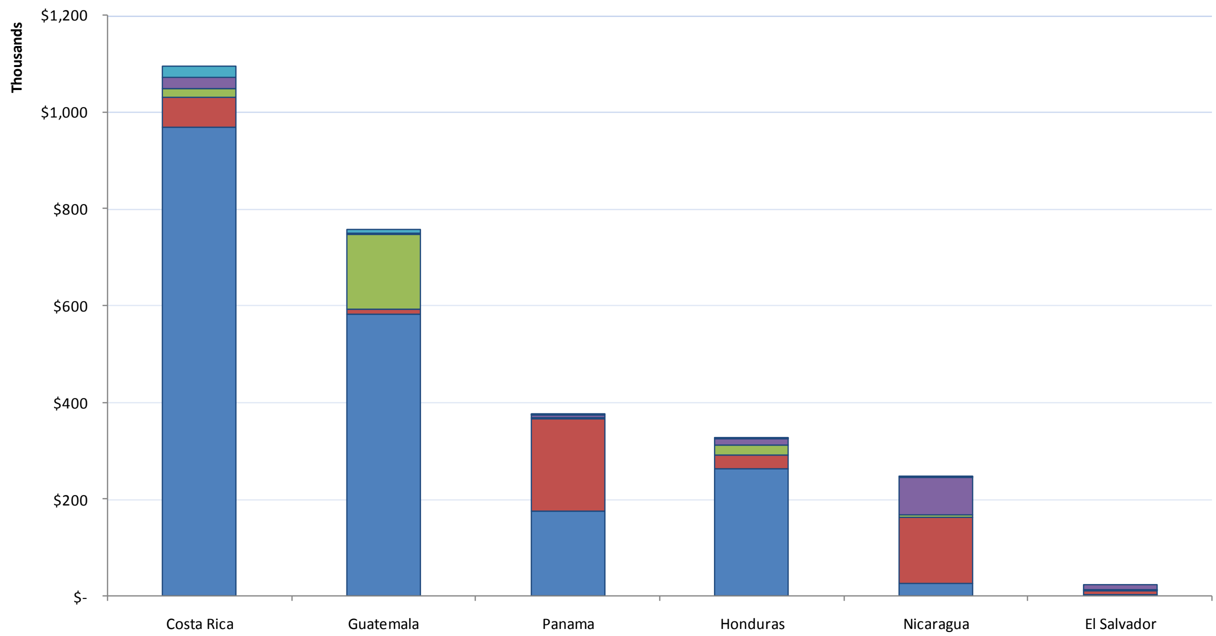
The countries vary in terms of dominant perishable products for export. Costa Rica and Guatemala also dominate exportation of other types of fresh fruits, primary to the U.S. and Europe. In 2009, Costa Rica's second largest perishable exports were pineapples ($438 million) and melons ($75 million). In addition to other kinds of fresh fruit, Guatemala also exports a large amount of vegetables, including snow peas, brocolli and bell peppers. Nicaragua is the regional leader when it comes to meat and dairy exports; in 2007, the country exported over $150 million dollars worth of fresh beef and cheese. In a given year, meat and dairy products combined may account for up to 90% of all Nicaragua's perishable exports by value. Meat, fish & dairy exports accounted for 52% of Panama's perishable exports in 2009, due to large export volumes of fresh salmon and other fish – worth over $115 million in 2009.

Nicaragua dominates intraregional trade of perishable foods, accounting for over 48% of the total, while Guatemala & Costa Rica each account for around 20%. All other countries have traded between $44 and $48 million over the period 2007 to 2010. El Salvador, due to its limited land area, is the primary recipient of the region's perishable agricultural exports, accounting for almost 60% over the period 2007 to 2010.

Countries tend to specialize in exporting to one regional partner. For example, trade from Nicaragua to El Salvador accounts for one third of all intraregional perishable agricultural exports, and 68% of Nicaragua's total. Guatemala and El Salvador appear to have a strong trade partnership, with over 85% of the two countries' perishable goods trade taking place between them. Only Costa Rica distributes its products fairly evenly throughout the region, sending between 14% and 33% of all products to each country, with Guatemala and El Salvador as the most popular destinations.

[12] For the purposes of this descriptive section, all frozen and processed products have been eliminated from the dataset. Only exports of fresh, whole goods or packaged fresh goods that require refrigerated transport are included.

Figure 3. 2010 Perishable Exports, by Category



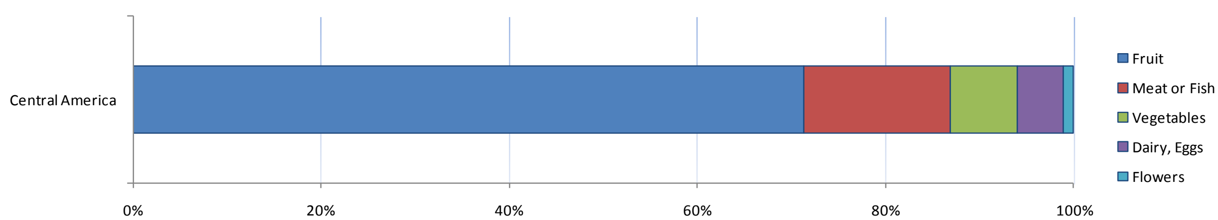
Value of 2009 Perishable Agricultural Exports, by Country and Category

in 1000s USD

	Fruit	Meat or Fish	Vegetables	Dairy, Eggs	Flowers	Grand Total
Costa Rica	$ 968,721.67	$ 62,114.00	$ 16,867.29	$ 24,271.49	$ 21,502.49	$ 1,093,476.94
Guatemala	$ 581,125.66	$ 9,912.63	$ 156,798.47	$ 2,350.92	$ 7,446.13	$ 757,633.81
Panama	$ 175,413.18	$ 189,480.19	$ 3,319.01	$ 7,684.93	$ 22.76	$ 375,920.06
Honduras	$ 261,940.30	$ 28,472.51	$ 20,976.12	$ 15,608.37	$ 43.71	$ 327,041.01
Nicaragua	$ 25,019.64	$ 138,489.54	$ 5,099.84	$ 78,672.11	$ 20.04	$ 247,301.17
El Salvador	$ 3,187.96	$ 8,467.26	$ 598.82	$ 9,753.38		$ 22,007.42
Central America	$ 2,015,408.41	$ 436,936.13	$ 203,659.55	$ 138,341.21	$ 29,035.12	$ 2,823,380.40

Note: 2009 is the most recent year for which data is available for Honduras.

Composition of Perishable Agricultural Exports from Central America, by Category



Source: UNCTAD, 2012

Case Studies

The SCA case studies presented in this study were chosen for their relevance in Central American trade and the representativeness of their route. Exports such as Costa Rican pineapples and Nicaraguan beef are straightforward elections based on these criteria. Destinations that require the use of a principal Atlantic port were favored because Cortés and Limón traditionally handle the highest volumes of trade in the region, when Panama's ports are excluded. Additional attention was paid to choosing a body of chains that would cover several principal trade routes throughout Central America, in order to be able to draw some conclusions for the region as a whole. The three Honduras supply chains (beef, dairy & organic coffee) were conducted as part of an IFC project designed to address administrative constraints that diminish the competitiveness of agricultural exports; a different methodology was used: costs to export are calculated per container, rather than kilogram, and do not include costs associated with the first transport segment – from the farm gate to the processing plant. The case studies chosen for this analysis include the following:

Exports beyond Central America

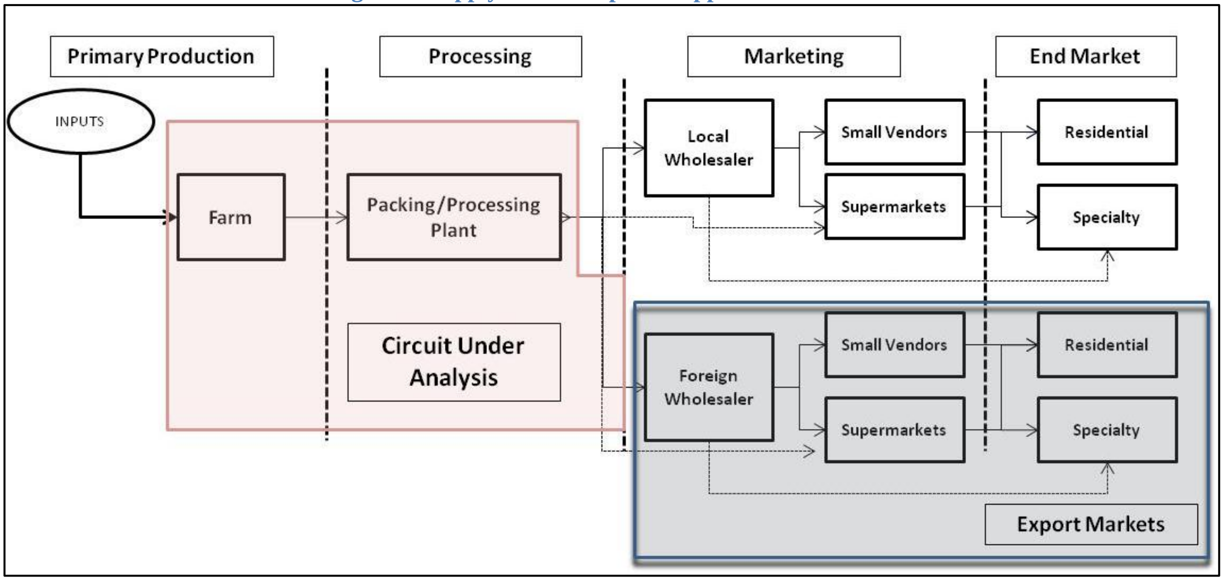
- Pineapple Exports to Europe from Costa Rica
- Frozen Ground Beef Exports from Nicaragua to the U.S.(Small & Large Producer)
- Fresh Beef from Honduras to the United States
- Organic Coffee from Honduras to Germany
- Snow Peas from Guatemala to the United States.

Exports within Central America

- Tomatoes from Costa Rica to Nicaragua (Small & Large Exporter)
- Dairy from Honduras to El Salvador

Supporting SCAs include the following: (i) pineapple exports from Panama to Europe; (ii) wheat, rice and corn imports into Honduras & Nicaragua; (iii) pineapple exports from Costa Rica to St. Lucia.

Figure 4. Supply Chain Map: Pineapples from Costa Rica



The routes chosen represent a "typical" route that reflects one of several studies; because productive zones are dispersed throughout the region, the route shown here by no means should be taken to be the "only" route, nor representative of all the exporters interviewed for each product.

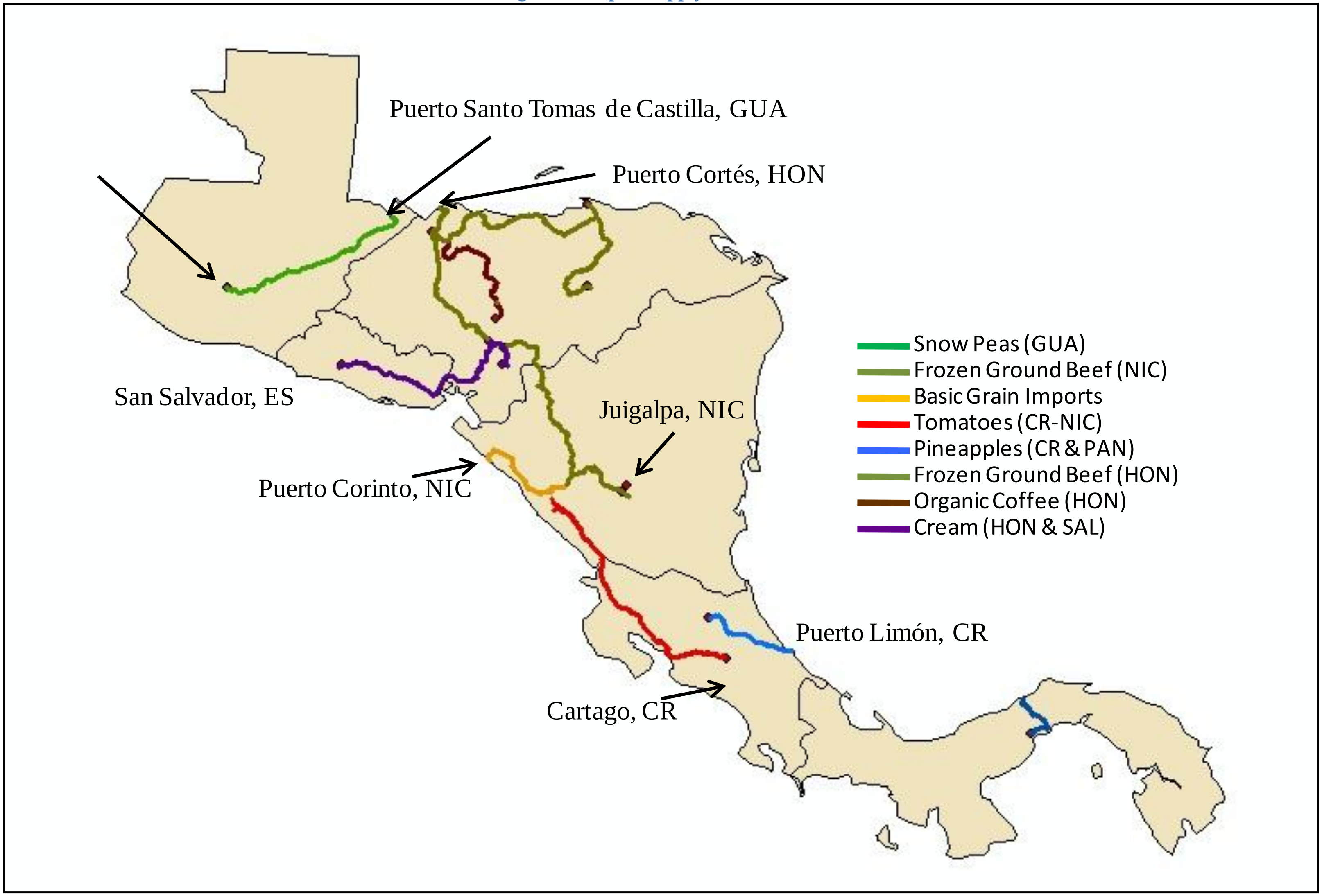
Snow Peas from Guatemala to the United States

Snow peas are Guatemala's third largest fresh fruit or vegetable export product behind bananas and melons. The country exported an estimated 38,000 metric tons in 2009. Unlike other traditional Guatemalan exports, such as sugar and bananas, snow peas are typically produced by small and medium-sized enterprises (SMEs), rather than large estates. In spite of several difficulties complying with Sanitary and Phytosanitary Standards (SPS), Guatemalan exports of snow peas have risen over the past decade from an annual average of 16,000 metric tons over the period 1997 to 2000, to over 25,000 metric tons from 2003 to 2006. Each year, the United States typically receives about 80% of total exports.

This supply chain starts in Chimaltenango, Guatemala's largest snow pea production zone, responsible for almost 70% of total production in the country.[13] From the field, snow peas first travel to a storage and packing facility, where they are handled, conditioned and packaged for export. At this stage, samples are sent to the national laboratory for a phytosanitary inspection permit. In a refrigerated container truck, 40,000 pounds of snow peas in 10 lb bags travel 456 kilometers from the storage facility to Puerto Santo Tomás de Castilla – a journey which takes approximately 6 hours and 20 minutes. The exporter has its own refrigerated facility at the port, where the cargo waits to be cleared through customs before continuing on to its final destination.

[13] From Raquel's presentation.

Figure 5. Map of Supply Chain Routes



Pineapple from Costa Rica to Europe

Costa Rica is the world's largest exporter of fresh pineapple, exporting over 1.6 million tons in 2010. This pineapple export supply chain estimated logistics expenses for pineapple exports originating in the northern or central parts of Costa Rica.[14] Pineapples leave the production zone in 20-foot containers carrying 9,000 kilograms each in large bins. For the central producer, losses during the short freight are minimal. However, those pineapples that arrive from the northern production regions often travel up to 60 kilometers, some on unpaved roads, and can suffer large product losses; one small producer estimated losses at around 14% of a total shipment to the processing plant. Losses are also greater for small producers that rent transport services; larger businesses own their own trucks and have more control over the handling of the product during shipment. After the pineapples are packaged into approximately 1,500 boxes of 12 kilograms each, they are loaded into a 40-foot container that travels an estimated 220 kilometers from Cartago, centrally located near San Jose, to Puerto Limon. International shipping lines charge exporters a lump fee move the cargo from the processing plant to the port of destination in Rotterdam[15], and hire local transport companies to carry the pineapples directly to their refrigerated storage facilities located near Puerto Limón.

Frozen Ground Beef from Nicaragua

In 2010, US$300 million in beef was exported from Nicaragua, making it the country's second largest agricultural export by value, at more than 16% of all exports for that year. Trade statistics show that cattle industry products, including beef, cattle on the hoof, cheese and milk, accounted for 10% of all agricultural exports by weight and 25% by value for both 2009 and 2010.[16]

Among agricultural exports, meat products have a high level of intra-product price dispersion not registered in vegetables and fruit products. There are over 22 different products that come from any animal, from select cuts, like Eye Round and Flank Steak, to byproducts, like fertilizers. A range of products from one animal may reach several final consumers in countries as diverse as Russia, Taiwan, Venezuela, El Salvador, and the United States.

From 2007 to 2010, Venezuela grew from a nonexistent market for Nicaraguan beef to the most important, capturing more than 30% of the total volume of processed beef exports in 2010. This change reflects an economy-wide adjustment in export markets; the share of total exports sent to Venezuela went from 0.5% to 13% over the same period.

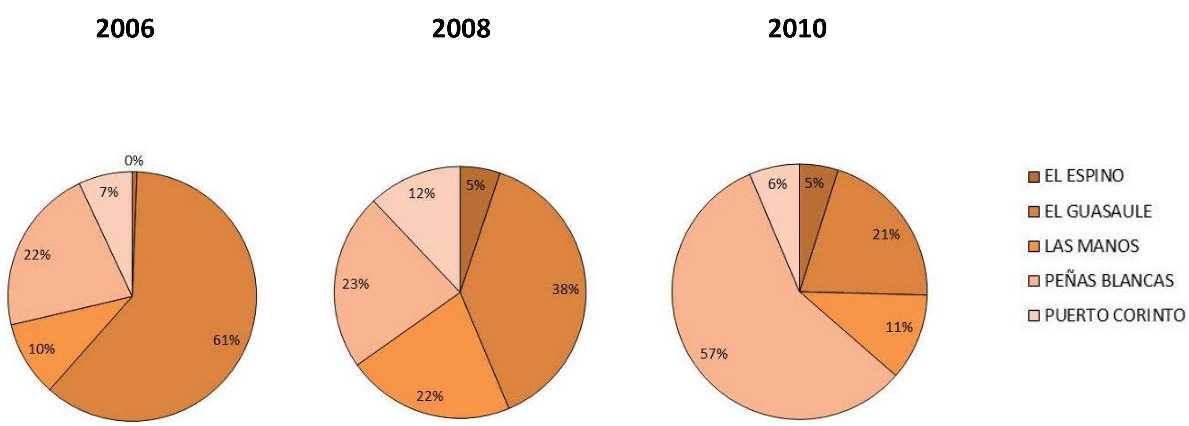
The United States has been the most consistent destination for high-volumes of frozen ground beef exports for the past six years. When CAFTA-DR was ratified in 2006, beef exports to the United States rose from 145 to almost 113,000 metric tons each year; total beef exports by value to the United States totaled more than US$81 million in 2010. Other fairly consistent markets for Nicaraguan beef, and particularly refrigerated select cuts, include Puerto Rico and El Salvador, which together accounted for

[14] Logistics costs from the farm gate to the processing plant are averaged for 6 different production zones: 3 in the nothern region near Mount Poas, and 3 near Boca Arenal in the central region.
[15] Terms of Trade for this example is Ex-Works.
[16] August to January Statistics from CETREX

22% of beef exports by value in 2010 ($70 million). Taiwan, Japan, Mexico and Russia are also small, but growing markets.

Figure 6. Product Route: Beef from Nicaragua

Figure 7. Beef Exports, Weight by Border Crossing of Exit, 2006, 2008 and 2010



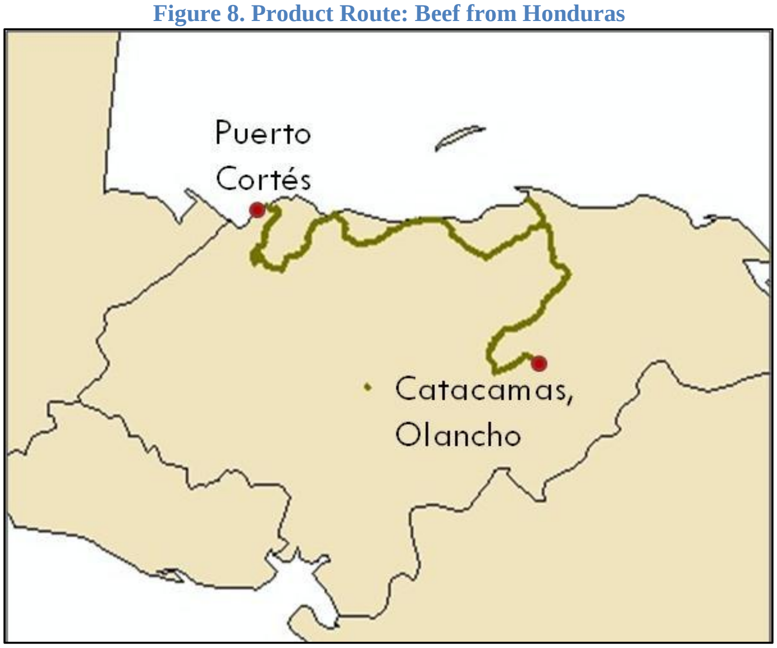
Source: CETREX

This beef supply chain estimates logistics expenses for a typical small producer, as well as a large producer. For the small producer, 18 animals travel 144 kilometers from El Ayote to Juigalpa; a third of the route is on a seasonal, unpaved, tertiary road. The large cattle farmer is located within 35 kilometers of the slaughterhouse on a paved road, and sends the recommended 16 animals at a time. After processing at the slaughterhouse, 42,000 pounds of frozen ground beef are packed into 700 boxes 60 pound cardboard boxes and loaded into a reefer container on a T3-S3 truck. This container travels 400 kilometers at speeds between 60 to 80 kilometers per hour[17] on primary roads to Las Manos, the border town between Nicaragua and Honduras. At Las Manos, it can take anywhere from 3 to 6 hours to cross the border, though delays are less frequent and serious than those at Peñas Blancas, the border crossing point between Nicaragua and Costa Rica, en route to Puerto Limón. After crossing into Honduras, the truck travels a distance of 427 kilometers, covered in about 6 hours, to reach Puerto Cortés. At Puerto Cortés, the container has three free days of warehousing before it is loaded for its maritime journey.

Fresh Beef from Honduras

In 2010, Honduras exported 2,403 metric tons of refrigerated and frozen beef, most of which was frozen ground beef (referred to as "industrial cuts") traveling to the United States. The most popular markets for beef from Honduras are the United States and El Salvador, as well as Puerto Rico; other markets include Spain, China, Mexico, and Vietnam.

Figure 8. Product Route: Beef from Honduras



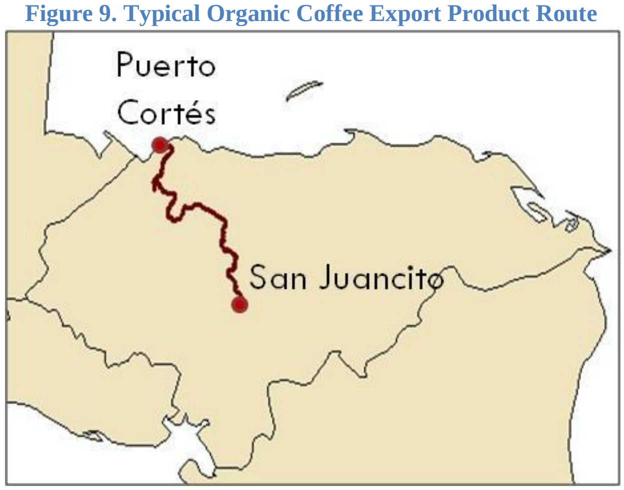
Typically, one of thousands of cattle ranchers in Honduras loads 15 or 16 animals into a truck for a journey of approximately 100km (5-6 hours) to the processing plant for slaughter. After processing, some beef is packaged in 60lb boxes, frozen and stored in a refrigerated warehouse, which is where our supply chain begins. After taking 3 to 4 hours to load, a standard 20 foot container travels 469 km in approximately 9 hours, carrying 18,200 kilograms of frozen ground beef from Catacamas, a city in the department of Olancho, located in the southeast of Honduras, to Puerto Cortés for export to the United States.

[17] Basic comparisons of travel times and distances raise suspicion that these reported speeds represent maximum cruising speeds, rather than average speeds. Truckers may feel that reporting higher speeds makes them appear more efficient.

Organic Coffee from Honduras to Germany

With exports of over 200,000 metric tons in 2010, Honduras may have recently surpassed Guatemala as the largest coffee exporting country in Central America. Organic[18] coffee is exported through specialized warehouses, the largest of which reported exports of 11,385 metric tons of organic coffee in 2011. Primary markets for organic coffee include Denmark, Germany and the U.K., and, to a much lesser extent, the United States.

Figure 9. Typical Organic Coffee Export Product Route



Fresh picked coffee berries are wet-milled, dried and travel to the cooperative, which is where this supply chain analysis starts tracking logistics costs. For this typical route, 295 quintals, each with 45.45 kgs of *cafe pergamino* travel 276 kilometers in a 14-foot truck from El Paraiso to San Pedro Sula. Because of the mountainous terrain and poor road quality, the cooperative can only send a small truck that can easily maneuver on curvy roads. In San Pedro Sula, the coffee is sold to one of the 12 large exporting houses which hulls and repackages the beans into sacks, each with one quintal of approximately 69 kilograms of *café oro*. Coffee is shipped to its final destination in a 20-foot container, which can hold between 250 and 300 quintals. The cooperative estimates the entire transaction, from the moment of sale to the receipt of payment takes 20 days.

Tomatoes from Costa Rica to Nicaragua

The country pair was chosen so as to capture movements between the region's highest and lowest performers on the World Bank's Logistics Performance Index. Tomatoes were chosen because: (i) their

[18] Additional costs related to the specialized production of organic coffee are generally incurred in the certification stages, months and even years before the supply chain begins. This SCA did not research whether logistics costs are higher for organic coffee vis á vis conventional coffee. A lack of working capital and, in some cases, limited access to market do motivate farmers to sell their coffee to intermediaries at the farm gate, rather than through an organic cooperative, because of the immediate benefit of cash-in-hand. This is not entirely a logistics issue, so further mention has been omitted from this report.

unusual sensitivity to time and susceptibility to damage make them greatly dependent on efficient logistics movements; (ii) both large and small shippers could be evaluated along the supply chain; and (iii) among vegetables, tomatoes represent the most important export to Nicaragua in terms of value.

Due to their short shelf life, calculations for time value factor heavily into logistics costs for the tomato. Interviewees reported that a tomato's lifetime is equal to 5 days or 120 hours, from the time it is picked at the farm gate until it perishes at the shelf. Knowing that a shipment of tomatoes waits 3 hours on average at the Costa Rican side of the border, these three hours represent 2.5% of the tomato's total lifetime. Assuming that this loss in the tomato's lifetime is directly proportional to the loss in product sales upon arrival at the final retail point, multiplying this number by the final price of the tomato- note different final prices for the small and the large exporters- can provide a proxy for time costs at the border in monetary terms[19].

In the trade of fresh tomatoes from Costa Rica to Nicaragua, Figure 10 and Figure 11 provide a general picture of the different steps involved in transporting one kg of tomatoes from Costa Rica to Nicaragua for both a small exporter and a large exporter. The small exporter receives the fresh product in 18 kg plastic boxes from a small producer located in Cartago, located about 36 km from San José, who transports it to the exporter's distribution center located just 4 km away from the farm gate in a small, non-refrigerated truck. Once at the distribution center, the product is transferred to 23 kg cardboard boxes[20] and loaded into a 40 foot container, which then starts traveling towards Peñas Blancas, the border town between Costa Rica and Nicaragua located at about 319 km from the distribution center. The truck travels up the Panamerican Highway at a speed of 60 to 80 kilometers per hour and takes approximately 7 hours non-stop. Once at the border, the shipment must pass through Costa Rican and Nicaraguan customs and travels 3 to 4 hours from the border until it arrives at the Mercado Oriental, where the product is sold to both big wholesalers and retailers.

Overall, the large exporter's chain has a similar structure to that of the small exporter. The large exporter purchases product all year round from a large independent producer who controls market prices due to its overwhelming share in the country's tomato production. The large producer then transports the product in a 20 foot truck with a capacity of up to 700 boxes of 13 kg each to the large exporter's distribution center, located approximately 60 km away. Once at the distribution center, the boxes are then loaded into a 45 foot container that can carry up to approximately 1,200 boxes. After the container is fully loaded, the truck travels towards Peñas Blancas, crosses the border, and arrives at the distribution center in Managua, located at 149 kilometers from the border. Finally, the product is then consolidated with other goods at the distribution center and transported in 8 MT refrigerated trucks that can carry up to 6,800 kg to different supermarket points in Managua[21].

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[20] The exporter transfers the product to cardboard boxes since transporting the product in plastic boxes would imply having to process the former as a temporary export, implying additional costs (approximately US$14.50 per trip per container and an extra US$61.80 for a "carta de política").

[21] Results from interviews suggest that larger exporters with lower logistics costs usually sell to supermarket chains while smaller and more expensive exporters sell to popular markets.

Figure 10. Estimated Route for Tomatos from Costa Rica

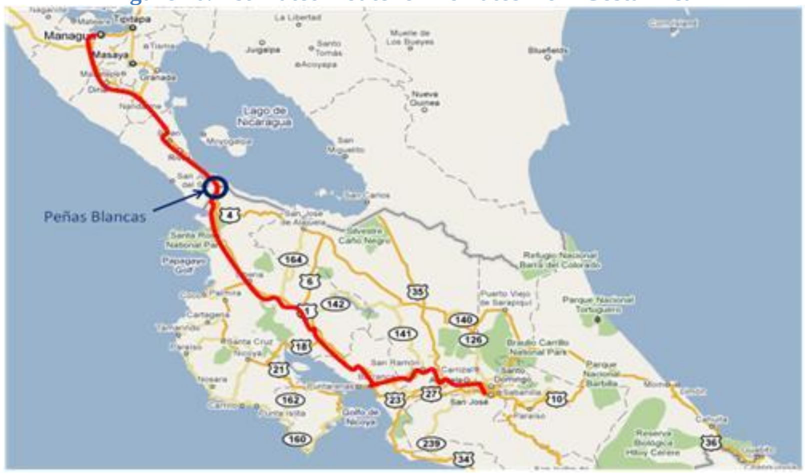
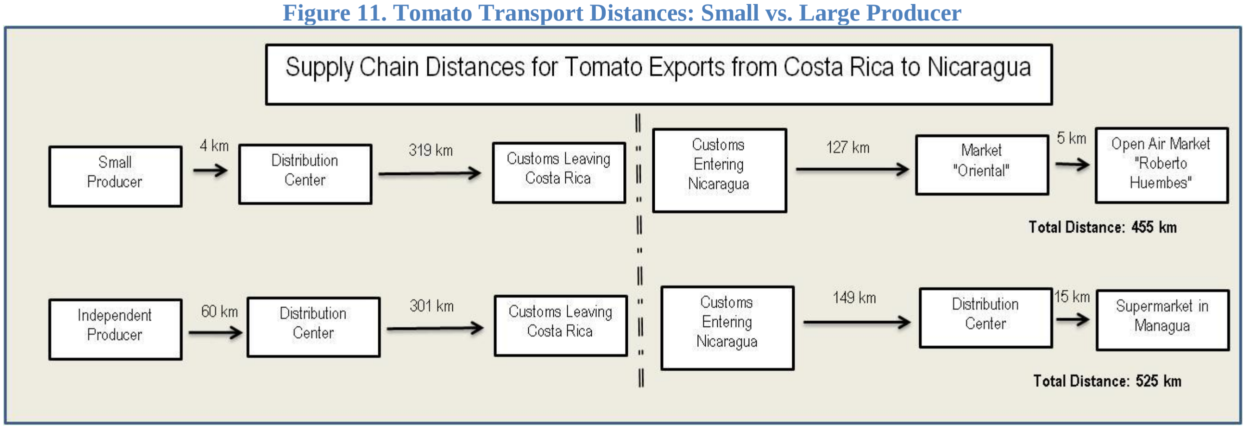


Figure 11. Tomato Transport Distances: Small vs. Large Producer

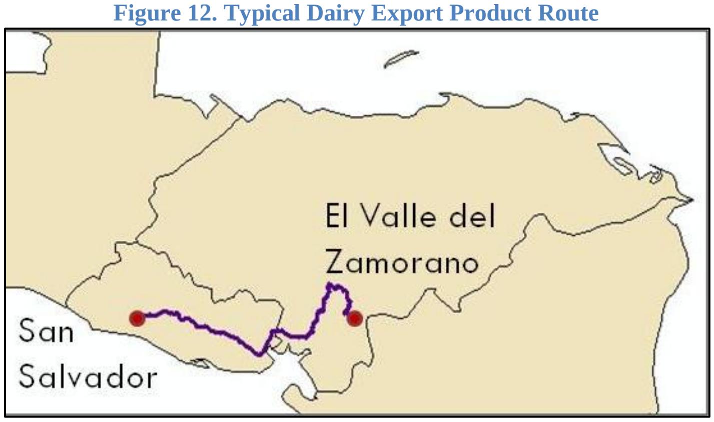


Dairy from Honduras to El Salvador

Behind sugar, cows' milk is the second largest agricultural product of Honduras, with more than 700,000 tons produced in 2009. Though much as with the beef sector, Nicaragua still is the regional leader in terms of export volumes, Honduras exports modest quantities throughout Central America and to the United States; in recent years, registered export volumes have wavered close to 8,000 tons, with corresponding values approximating $20 million dollars. Primary export markets are El Salvador and the United States; for El Salvador, most processing plants send *crema quesillo* or a type of thick custard cream commonly used in Central American cooking. Of an almost 7.6 thousand tons of dairy products exported in 2011, almost half of them were milk and cream products, most likely destined for El Salvador; cheese, most likely destined for the Latino market in the United States, made up an additional 40%. Government officials, producers, and exporters alike estimate the illegal trade of dairy products, and particularly artisanal cheese, to El Salvador to be as great as or greater than the official flow.

For this supply chain, cows' milk originates in the Zamorano Valley, located about 60 km south west of Tegucigalpa. In many cases, small dairy farmers[22] carry their milk daily to a local collection center, where it can be maintained at an adequate temperature in a refrigerated tank, while waiting for transport to the processing plant. The processing plant charges a small fee per liter (5% of the sale price) to collect milk and transport it in a refrigerated vehicle to their facilities in Tegucigalpa, which is where our supply chain begins. At the processing plant, it takes 3 hours to load a refrigerated containers with approximately 40,000 lbs of crema quesillo (in 1.7 liter bottles inside of 50 lbs boxes); the containers travel about 300km in 5 ½ hours towards the El Amatillo border crossing with El Salvador. Anywhere from 3 to 5 hours are spent waiting in line and processing paperwork there; afterwards, the container travels another 205km on to a warehouse near San Salvador, where it is repackaged into 1, ½ and ¼ liter bags for final sale.

Figure 12. Typical Dairy Export Product Route



Logistics Bottlenecks

Overview of Results

According to the analyses performed here, logistics costs as a percentage of the delivered price can range anywhere from 52%, in the case of Guatemala's snow pea exports to 11% for higher value exports, in the case of beef exports from Nicaragua. For one of the most established and integrated supply chains in Central America, the pineapple supply chain in Costa Rica still has estimated logistics costs at around 45% of the CIF price in Holland. In the case of tomatoes, the advantages of scale, in terms of the final market and a more integrated supply chain can cut logistics costs in half. For those countries that export out of their own Atlantic port, ground transport costs are between $0.04 and $0.06 per kilogram. Because Nicaragua must travel to Honduras or Costa Rica to export on the Atlantic side, transport costs are around double in normal conditions at $0.12 per kilogram.

[22] Larger farms often have their own refrigeration tanks.

Figure 13. Logistics Costs & Select Components for 6 SCAs[23]

Logistics Costs for 6 Supply Chains												
	Snow Peas (GUA)		Pineapples (CR)		Beef (NIC)				Tomatoes (CR)			
					Best Case		Worst Case		Large		Small	
Type of Expense	**Expense/Kg**	**%**	**Expense/Kg**	**%**	**Expense/Kg**	**%**	**Expense/Kg**	**%**	**Expense/Kg**	**%**	**Expense/Kg**	**%**
Farm Gate Price	$ 0.21	40%	$ 0.29	34%	$ 2.76	76%	$ 2.76	76%	$ 0.44	24%	$ 0.47	31%
Total Land Transport	$ 0.04	8%	$ 0.06	7%	$ 0.12	3%	$ 0.25	7%	$ 0.10	5%	$ 0.26	17%
Maritime Freight	$ 0.14	27%	$ 0.19	22%	$ 0.19	5%	$ 0.19	5%	$ -	0%	$ -	0%
Losses	$ 0.02	4%	$ 0.05	6%	$ 0.12	3%	$ 0.24	7%	$ -	0%	$ 0.05	3%
Other Logistics Costs	$ 0.07	13%	$ 0.09	10%	$ 0.16	4%	$ 0.69	19%	$ 0.19	10%	$ 0.22	15%
Total Logistics Costs	**$ 0.27**	**52%**	**$ 0.39**	**45%**	**$ 0.59**	**16%**	**$ 1.37**	**38%**	**$ 0.29**	**16%**	**$ 0.53**	**35%**
CIF Price in Miami	$ 0.52	100%	$ 0.86	100%	$ 3.65	100%	$ 3.65	100%	$ 1.83	100%	$ 1.50	100%

Logistics bottlenecks that cause unexpected delays and extend transit times can more than double logistics costs for both high and low value goods. For example, logistics costs for a large tomato exporter in Costa Rica, including ground transport, handling and customs service fees are estimated at around $0.15 per kilogram, while the value of time spent waiting at the Peñas Blancas border crossing, on a typical day under typical circumstances almost doubles the logistics costs by adding an additional $0.14 per kilogram in hidden costs through losses of this extremely perishable product[24]. For beef exports from Nicaragua, total logistics costs also double from the best case to the worst case scenario, from 11% to about 21% of the wholesale price in the U.S.

Figure 14. Logistics Expenses for Honduras Supply Chains compared to Doing Business

Logistics Expenses	Doing Business	Beef	Dairy	Organic Coffee
Documents Preparation	$ 0.01	$ 0.00	$ 0.01	$ 0.02
Inspection	$ -	$ 0.05	$ 0.03	$ 0.01
Customs Clearance and technical control	$ 0.01	$ 0.01	$ 0.01	$ 0.01
Ports and Terminal Handling	$ 0.00	$ 0.01	$ -	$ 0.01
Inland Transport & Handling	$ 0.04	$ 0.04	$ 0.04	$ 0.05
Total	**$ 0.07**	**$ 0.11**	**$ 0.08**	**$ 0.10**
**Assumption of 18,200 kg per container.*				

The Honduras supply chains do not include the first transport leg from the farm gate to the processing plant, nor do they include marine freight. Ground transport costs per kilogram are similar to others in the region at $0.04 and $0.05 per kilogram. Inspection costs are quite high for beef and dairy. As compared to the Doing Business cost estimations, which represent a container of manufactured goods, unique documentation and inspection procedures for agricultural products can add an additional $0.03 to $0.05 per kilogram to the total logistics costs (see Figure 14).

Overview of Logistics Bottlenecks

[23] For the tomato chain, the value of time spent waiting at the Peñas Blancas border crossing has been omitted in this table. Were it to be included here, it would figure in the "Losses" category, adding $.14(large) and $.12(small) to total logistics costs, making total costs 24% and 43% of the final price for the large and small exporter respectively.

[24] In Figure 12, the $0.14 estimate for time at the border is included as a component of Other Logistics Costs, which include handling ($0.02), customs ($0.03), in addition to time.

Three primary logistics bottlenecks appeared to effect the majority of the supply chains studied for this report: (i) poor rural road access and quality; (ii) border management and infrastructure weaknesses, including specific aspects of customs services; and (iii) sanitary and phytosanitary review and inspection processes, both at national laboratories and at points of exit & entry. Secondary bottlenecks that appeared to also affect many chains included slow transit speeds, absent or poorly implemented transport regulation, including the use of weigh stations, and the increasingly high cost for security guards and patrols needed for high-value cargo. Research and interviews with national customs officials, agriculture and trade ministries suggest that, though they were not identified through a national or sector-level study, these bottlenecks are quite representative of bottlenecks that effect perishable agricultural logistics within the region.

Figure 15. Summary Table of Logistics Bottlenecks Reported in C.A. Supply Chains

Logistics Bottlenecks Reported Central America Agro-Logistics SCAs	Beef (HON)	Beef (NIC)	Dairy (HON)	Snow Peas (GUA)	Pineapples (C.R.)	Organic Coffee (HON)
Primary						
Rural Roads: Access & Quality	X	X	X		X	X
Border Management and Infrastructure		X	X			
Sanitary and Phytosanitary Review and Inspection Processes	X		X	X		
Secondary						
Port Infrastructure & Management	X	X			X	
Transport Regulation & Weight Stations	X	X	X			
Cargo Security for High-Value Goods	X	X				X
Mentioned, but Requiring Further Research						
Slow Travel Speeds	X	X	X	X	X	X
Waiting Time to Unload at Processing Center		X				
Congestion on Primary Roads Passing through Urban Areas		X				
Empty Backhaul		X				

Bottlenecks that are currently addressed with deeply-ingrained coping mechanisms are complicated to identify, and even more complicated to measure. Coping mechanisms developed to handle logistics bottlenecks often become routine practice, leaving stakeholders to think of them as customary or traditional and complicating efforts to identify the root of the constraint. For example, inefficiencies at a particular port may lead exporters to go to export through a different port, or clamor for the construction of a new port; expensive infrastructure investments may seem ultimately more feasible than addressing a problem that originates with, for example, unionized workers, low-skill levels of technical staff, or intraregional non-tariff trade barriers. Without an integrated risk management strategy, border agencies, such as customs, immigration, and SPS inspection officials cope with the absence of a risk management system with inspection rates of 60 to 100%.

These supply chains cannot capture the aggregate effect of logistics bottlenecks that make entry into the market prohibitive for smaller producers. An analysis of logistics at the sector level could potentially identify at exactly what point logistics costs prevent market entry for producers of a certain size, facing a certain set of production costs.

Figure 16. Identifying Silent Bottlenecks

Interviewees will not report so-called "silent bottlenecks", which have a small and predictable effect on individual products, but a large effect at the aggregate level; these hindrances to trade are more difficult to identify without a regional/global benchmark or comparative perspective, and can only be roughly estimated. For example, the absence of a bridge could be preventing several small producers from entering the market, expanding their operations, or producing new crops; at the industry level, it may add hours to travel times and increase maintenance costs for all agricultural products traveling that route; at the national level, the absence of that same bridge may impact overall competitiveness and influence private investment decisions. Silent bottlenecks include the following:

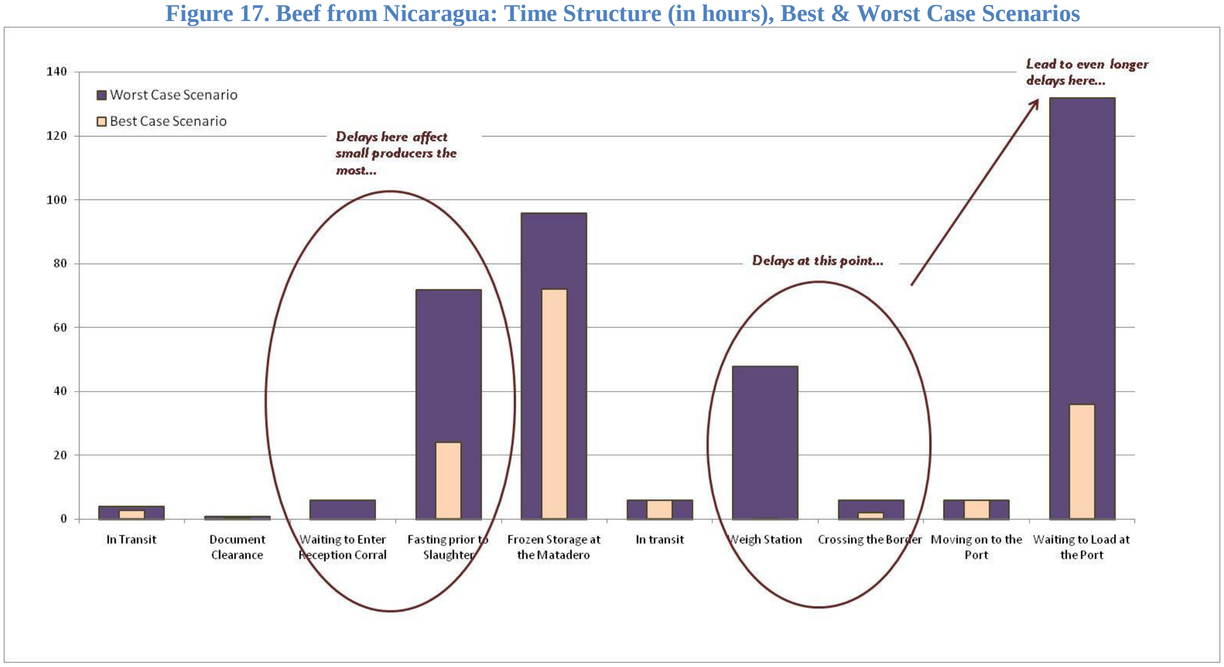
- Actual transit speeds are slower than road design speeds. (Constant)
- Comparatively high costs for ground transport services. (Constant)
- The absence of a bypass around an urban area. (Missing Infrastructure)
- Indirect route preference due to poor quality of more direct roads, absence of bridges, etc. (Missing Infrastructure)

In order to accurately identify constant bottlenecks and estimate their impact, it is essential to diligently gather information on costs, speeds, times, distances, and identify traveled routes for each segment of the chain. In fact, the primary value-added of the analytical team is to complement local knowledge by lending context and regional perspective to the logistics for the SCA. To measure missing infrastructure barriers, multi-year investments in transport infrastructure could plan for an impact evaluation that can actually measure the increase in trade of individual products on a case-by-case basis.

Perhaps even more important than the higher costs and longer times required to export products is the unpredictability that these logistics bottlenecks introduce into supply chains, which is the primary concern of importers (McLinden et al., 2011). In some cases, this additional risk of product loss, delay and uncertainty of arrival time is absorbed in part by higher overall costs for transport services. In other cases, the aggregate effect of increased uncertainty has a negative impact on the competitiveness on all goods from the exporting country or region. In other words, like with any other exchange, unreliability directly impacts on the buyer's perception of the quality and value of the product, and can give the seller a bad reputation.

SCAs take a snapshot of product movement, and so are unfit tools to show how export times vary within a given period. Still, reported best and worst case scenarios approximate the degree to which logistics constraints can effect export times. For example, exporting 1 kg of hamburger meat from Nicaragua to the U.S. normally takes an estimated 13 days. However, back-ups and delays along the way increase the likelihood of future delays, and can ultimately lead to a worst case scenario, in which total export time from farm gate to port of destination is an estimated 23 days (see Figure 17). One of four exporting slaughterhouses in Nicaragua reported unnecessary expenses related to logistics delays leading to lost profits in the neighborhood of $20,000 a month.

Figure 17. Beef from Nicaragua: Time Structure (in hours), Best & Worst Case Scenarios

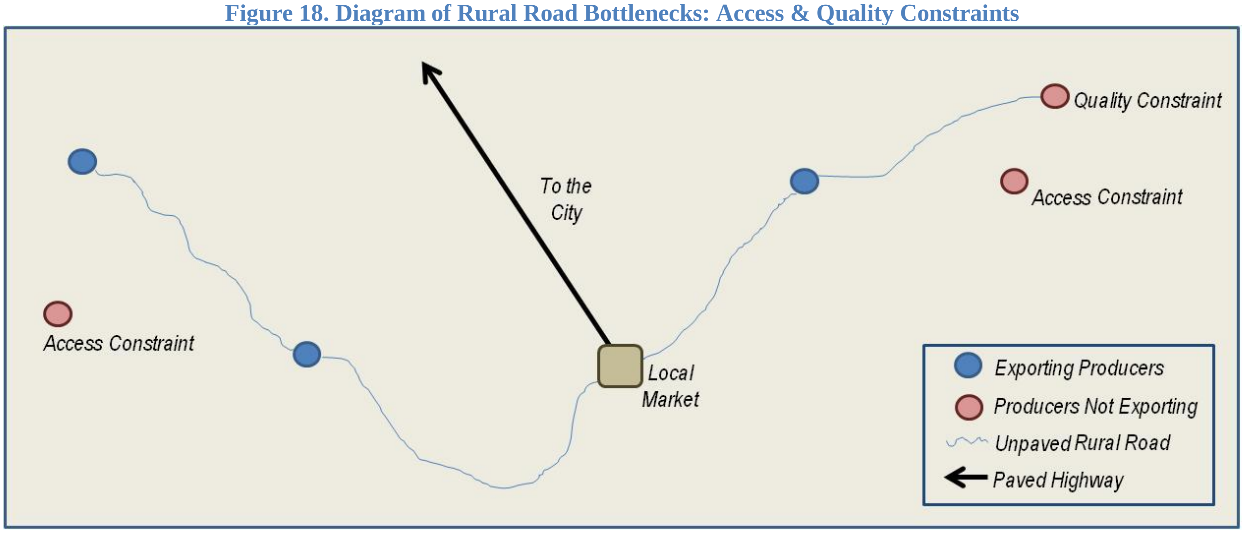


Primary Logistics Bottlenecks

Rural Roads: Access and Quality

Poor access and quality of rural roads can affect the exportation of perishable agricultural products in different ways (see Figure 18). When the constraint is related to access, producers either face large losses moving their product to market on foot or using animals, or simply never develop their production beyond household subsistence levels; for these producers, anticipated logistics expenses may be prohibitive, and serve as a barrier to entry. Access constraints may keep many small producers out of the market, and are nearly impossible to capture with a supply chain analysis. In the second case, producers have access to a rural road, but the quality is so poor that transporting their goods is too expensive and time consuming to be profitable. These producers may not enter the market, or may sell a much smaller quantity of their goods, only at the highest point in the harvest season, when they can accumulate enough volume to make it worthwhile. SCAs can be effective tools for measuring rural road quality constraints.

Figure 18. Diagram of Rural Road Bottlenecks: Access & Quality Constraints



For the tomato export chain, the largest transport cost components, measured by $US/kg/km for both small and large exporters pertain to transport from the farm gate to the consolidation center as well as to domestic transport costs once the product arrives in Managua. Transport from the farm gate to the distribution center represents 0.0028 US$/kg/km and transport from distribution center to the open air market represents 0.0060 US$/kg/km. Likewise, for the large exporter, the largest cost components within shipping are transport from the farm gate to the distribution center at 0.0003 US$/kg per km and transport from distribution center to the supermarket at 0.0010 US$/kg per km. The relative weight of these two legs within shipping as compared to the other two legs can be due to the fact that trucks must pass through secondary roads crossings in congested city centers at reduced speeds of 20 to 40 km/hr, as opposed to 80 km/hr on the Pan-American Highway. Uneven pavement can lead to breakage, and congestion can cause delays that directly impact upon product quality.

Figure 19. Transport Costs for Small and Large Tomato Exporters, by Transport Leg

Small Exporter	US$/kg	Distance (km)	Weight (kgs)	Ratio US$/KG per KM
Farm Gate to Distribution Center	0.01	4	2,250	0.0028
Distribution Center to Border	0.14	318	5,750	0.0004
Border to Distribution Center (NIC)	0.08	127	5,750	0.0006
Mercado Oriental to the Local Market (NIC)	0.03	5	166	0.006
Large Exporter	**US$/kg**	**Distance (km)**	**Weight**	**Ratio US$/KG per KM**
Farm Gate to Distribution Center	0.02	60	9,100	0.0003
Distribution Center to Border	0.05	301	15,600	0.0002
Border to Distribution Center (NIC)	0.03	149	15,600	0.0002
Distribution Center to Super Market	0.02	15	4,000	0.001

Source: Raquel Fernandez (2010)

According to survey reports from the Costa Rica Pineapple Chain, transport costs for the short 40 km trip from the farm gate to the packing plant may cost anywhere from $120 to $280, where as the long freight from the packing plant to Puerto Limon (220km) costs $600. Factoring in the different vehicle capacities for each transport leg, on a cost per kilo/kilometer basis, the short freight is more than 8 times higher. Rough rural roads and no refrigeration also lead to product losses that are 50% greater on the short freight journey than on the entire journey from the distribution center on to Rotterdam.

The smallest and least powerful actors along the supply chain, the producers themselves, are those that most bear the brunt of costs and losses associated with poor rural infrastructure. Though prices are reasonable in the highly competitive cattle transport market in Chinandega, a central department and cattle production zone in Nicaragua, informal arrangements introduce a great deal of risk into these transactions, especially in cases of animal injury or death. Longer journeys on unstable roads increase the risk of injury, stress, and loss of life for cattle. Bulls typically lose anywhere from 7 to 10% of their bodyweight in this journey to the slaughterhouse, which leads to decrease in overall canal weight, as well as in the quality of the beef. Stress and weight loss from transport can subtract $60 in an estimated $590 in income per animal that farmers typically receive. Poor road quality and seasonality also introduces greater risk of injury for smaller producers that are farther removed from primary roads. Long travel times between the ranch and the processing plant can set in motion a domino effect of delays and stress factors that can more than double the logistics burden for a rancher (see Figure 20).

Figure 20. Beef in Nicaragua: From the Farm Gate to Slaughterhouse

Logistics Expenses from the Farm Gate to the Slaughterhouse Nicaraguan Beef Export Chain		
Large Producer		**Small Producer**
35 paved km	Distance to Slaughterhouse	144 km, most unpaved
$4/animal	Transport Expenses	$14/animal
Low	Probability of Injury	High
>2.5%	Loss of Carcass Weight in Transit	<5%
About 30 hours	Total Time from Departure to Slaughter	Up to 3.5 days
US$2.84	Farmer's Received Price per kg of Meat on the Canal	US$2.76
US$0.15	**Total Logistics Burden per kg**	**US$0.32**

Source: Author's Own Calculations from Survey Responses

For the first transport segment, long travel distances, poor road quality, and long reception times can more than triple transport expenses and add 2.5 extra days to the period of fasting before slaughter – directly impacting upon cattle weight and producer margins. For this supply chain, the large producer sells more than 100 cattle a year. His farm is located in close proximity to a paved road and the slaughterhouse, which keeps the time, expense, and probability of injury both low and predictable. The small producer raises cattle in El Ayote, located 144 kilometers away from Juigalpa (the capital of Chinandega); he pays $230 for his truck, as compared to $70 for the BCS producer, because a third of the route is on a seasonal, unpaved, tertiary road. To cut costs, this producer is more likely to overload the truck with 18, rather than 16 animals, thus increasing the risk of injury and death, as well as a decrease in meat quality due to stress. The small producer has less control over when he arrives at the reception corral, and often waits by the road to unload the animals. These animals then, in turn, may fast for up to 3 days before the slaughter.

For cattle in Honduras, before the cattle reaches the slaughterhouse, it may travel anywhere from 120 to 440 kilometers to the slaughterhouse, depending on the production zone. Truckers that regularly transport cattle quoted prices ranging from $160 to $480 per cattle truck. Using price, weight and yield estimations provided by the country's two largest slaughterhouses, these costs work out to anywhere from 2% to 5% of the estimated farm gate producer earnings for a kilogram of beef (see Figure 21). A larger vehicle, carrying up to 4 times the regular load of cattle (64 animals) makes transport per animal cheaper; still, the advantage of scale does not cancel out the disadvantage of distance – the quoted prices per kilogram of transport services are lower for the departments of Atlántida and Yoro, which are much closer to the slaughterhouse in San Pedro Sula than those of Olancho and Colón. Cattle transporters note that, in addition to poor rural connectivity, the poor quality of paved roads that are not main transit corridors effects transport times, cattle weight loss, stress and risk of injury. In particular, the route La Cieba – Jutiapa –Saba, a heavily traveled route between primary production zones and San Pedro Sula, is noted to be in extremely poor condition.

Figure 21. Truckers' Estimates to Transport Cattle from the Ranch to the Slaughterhouse

Origin	Cost	Time (hrs)	Distance (km)	Speed (km/hr)	Cost ($/km)	Cost (per animal)	Cost (per kg*)
Atlantida	$ 162.16	2.5	120	48	$ 1.35	$ 10.14	$ 0.05
Atlantida	$ 189.19	4	120	30	$ 1.58	$ 11.82	$ 0.05
Yoro	$ 229.73	4.5	135	30	$ 1.70	$ 14.36	$ 0.07
Atlantida	$ 243.24		200		$ 1.22	$ 15.20	$ 0.07
Olancho (Large)**	$ 1,081.08	12	400	33	$ 2.70	$ 16.89	$ 0.08
Atlandia	$ 324.32		300		$ 1.08	$ 20.27	$ 0.09
Colon	$ 459.46	12	425	35	$ 1.08	$ 28.72	$ 0.13
Trujillo	$ 459.46	10.5	435	41	$ 1.06	$ 28.72	$ 0.13
Olancho	$ 486.49	12	400	33	$ 1.22	$ 30.41	$ 0.14

**Assumed 16 animals, each yeilding 216 kilos of beef (estimate does not account for variations in weight loss, canal yields or price variation for different cuts.*

*** Large Trucks can hold 64 animals*

Exchange rate used is 18.5 Lempiras/1 USD.

Snow Peas

Although the quality of rural roads in Guatemala is comparable to that of neighboring countries, it was not identified as a major constraint for snow peas exports for three primary reasons. First, transport is normally arranged by the farmers at a very low cost of less than $0.02 per kg. Second, the Ministry of Agriculture, Cattle and Food (MAGA) has partially funded a collection and distribution warehouse for storage of vegetable products for export in close proximity to the production zone. Third, constraints relating to the shortage of working capital and mistrust of buyers and intermediaries were found to far overshadow logistics concerns for this supply chain.

The most relevant transport bottleneck for this SCA is related to city congestion and occurs during the long freight leg, from the distribution center to the port. All goods traveling to Atlantic ports from the western production zones of Guatemala must pass through Guatemala City. Traffic is heavy, regulation of cargo movement in the city is exceptionally poor, and there is no bypass. For Guatemalan vegetable exports, transport bottlenecks are primarily related to mountainous terrain, poorly maintained primary roads, absent safety regulation and city congestion.

Border Management and Infrastructure

Overview

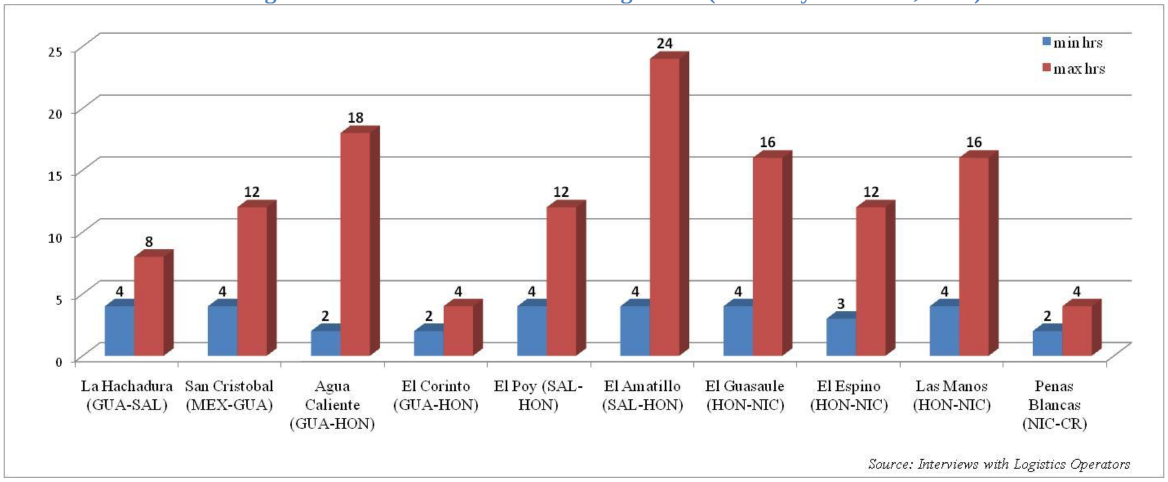
Border crossings are inherently complex, involving constant interplay between physical infrastructure, logistics services needs, and safety procedures. A range of actors, including drivers, customs brokers, health inspectors, police officers and parking lot operators, have both competing and complementary responsibilities that require concerted coordination in order for goods and passengers to travel quickly and safely across country lines. At many of the Central American borders studied for these SCAs, poor technical capacity and inadequate infrastructure converge in an environment of insecurity to create a nexus of delays and confusion.

Border delays mean additional costs for exporters including fuel costs to maintain containers refrigerated, waiting time costs for truck drivers, and costs associated with inventory management, delayed distribution, and reduced shelf time of the product.

Border crossings vary in terms of their infrastructure, technical capacity of customs and other officials, and subsequently crossing times. Interviews conducted for these SCAs revealed constraints at four border crossings: El Amatillo, El Guasaule, Las Manos and Peñas Blancas. Truck drivers, shipping agencies, customs officials and exporters in Nicaragua reported significant problems related to the Peñas Blancas border crossing, especially during the high-season for fruit exports. Nicaraguan truck drivers reported some delays related to dairy and meat inspection at the El Amatillo border between

Honduras and El Salvador.[25] Interviews with logistics operators in Honduras revealed maximum wait times of 12 or more hours at several Honduras border crossings (see Figure 22).

Figure 22. Estimated Border Crossing Times (February to March, 2012) [26]



Delays at the border can be attributed to a long list of service and infrastructure factors, including the following:

- Lack of technical skills and corruption of customs agents and personnel.
- Poor or nonexistent risk management systems, leading to duplicate inspections or 80 to 100% cargo inspection rates.
- Limited coordination of multiple border protection agencies.
- Underuse or erratic functioning of electronic information management systems.
- Poor spatial layout, making it difficult to direct trucks into different lanes, depending on risk.

Inefficient document processing systems in Central America are a common factor in border delays. Honduras depends on all-paper document processing systems that slow the process for each and every container movement, complicate attempts to build records of frequent exporters/importers, and do not allow customs officials to distinguish low-risk from high-risk traders – an essential building block for effective risk management. Officials at CENTREX, the Center for Export Procedures in Managua, Nicaragua related the unsuccessful adoption of a national single window for customs procedures to an unwillingness of customs officials on the ground to learn the new system.

[25] Though it is not included here as a supply chain study, the SCA for Nicaraguan beef exports also collected substantial information on exports to El Salvador.

[26] An estimated 10 trucks per week. Estimates provided by Raúl López of Apex Logistics in Honduras. The result for Peñas Blancas is contradicted by our interviews, but may be related to recent improvements in the electronic document processing system.

Exporters report general dissatisfaction with Costa Rica's digital customs system, Tecnología de Información para el Control Aduanero (TICA); TICA was designed at a time when commercial volumes were about a fifth of current volumes, which leads to frequent collapses. What is permitted by law may not be permitted by the electronic system; disaccord creates confusion and requires double-checking, which increase total border processing times. Because the system was designed by Uruguayan engineers, the country lacks the technical capacity to make changes or add modules to the system as they become necessary(Barquero, 2012).

For the region, Figure 23 shows the findings from a survey of sixty-seven users of customs systems in the region were interviewed regarding their perceptions of logistics processes and customs administration (Castro, 2009).

Figure 23. Perceptions of Customs Challenges in Central America, 2009

Country	Systems and Procedures	Technical Personnel	Customs Infrastructure
Costa Rica	Connectivity problems. TICA software collapses.	Customs personnel lack proper knowledge regarding assignation of tariff lines.	Lack of adequate space for revisions.
El Salvador	Not a major problem.	Poor technical skills of customs personnel.	Limited parking space for trucks.
Guatemala	Burdensome amount of documents. Too many windows to carry out different procedures.	Low professionalization of customs personnel. Lack of flexibility. Corruption.	Lack of adequate infrastructure at the border, including narrow bridges, limited space for parking of trucks, and limited access points.
Honduras	Uncertainty regarding time to be spent at customs. Arbitrariness of customs schedule, such that exporters and importers must wait up to a day in customs.	Informality of customs personnel.	Lack of infrastructure to handle perishable goods.
Nicaragua	Centralization of procedures. Procedures must be carried out in Managua.	Informality of customs personnel.	*Information not provided by the authors.

Source:(Castro, 2009)

Supply Chain Results

Delays and costs related to border crossings & customs procedures increased transport times and logistics costs for four of the case studies: snow peas from Guatemala to the U.S.; tomatoes from Nicaragua to Costa rica; beef from Honduras to the U.S.; and dairy from Honduras to El Salvador. Grain import chains also support the findings from these SCAs by showing how Nicaragua importers cope with border delays in Honduras.

Delays at the border are the primary logistics challenge in the export of tomatoes from Costa Rica to Nicaragua. Field data indicates that the time spent on the Costa Rican side of the border averages 3 hours on the Costa Rican side for both large and small exporters assuming that shipments must undergo customs, phytosanitary, and narcotics inspections. On the Nicaraguan side of the border, waiting time equals 5 hours along the same dimensions. It should be noted, however, that these waiting times refer to an average day, as there are certain times of the year, such as Easter, when congestion at the border can add up to two days.

For perishable products, and specifically for tomatoes, which have a maximum life span of 5 days from the time they leave the farm gate until they expire on the shelf, a 2-day waiting time period translates into a total of only 1 day at the shelf vs. 3 days under average conditions. To illustrate the impact of delays during highly congested periods in the cost of a kg of tomatoes, the cost difference between the regularly congested period and the highly congested period was calculated assuming that the cargo must wait one whole day at customs (9.5 hours on the Costa Rican side and 14.5 hours on the Nicaraguan side). The results reveal that congestion delays at the border translate into 0.22 $US/kg more for the large exporter and 0.20 $US/kg for the small exporter.

For beef exports from Honduras to the U.S., several factors related to border management in Puerto Cortés lead to backlogs of paperwork, duplicated procedures and additional costs and fees. Customs officials are only present to process documentation from Monday through Friday, 8am to 5 pm, while Puerto Cortés operates 24 hours a day, 7 days a week. Logistics operators report congestion upon entry to the port on Friday afternoons and to leave the port on Monday mornings, related to the inability to process documents. Customs officials offer a different perspective, claiming that the bottleneck develops when poorly trained port operators leave work early, or are unable to move containers efficiently. Uncertainty about the root cause of procedural inefficiency complicate attempts to resolve the issue without a thorough diagnostic by a neutral party.

Duplication of information collection by customs and sanitary inspection officials, coupled with an all-paper process add to the complications associated with exporting from Puerto Cortés. Customs brokers handling agricultural exports from Honduras must present the Certificate of Sanitary Inspection for review to a SENASA official. There is one SENASA employee to manage, stamp and sign the export permit for every container of agricultural exports[27]. Customs brokers routinely arrive with documentation for 30 to 50 containers at a time, and this signing process can take several hours, or even an entire day[28]. This unnecessary constraint increases the likelihood that exporters will miss their boats, incur fees for late arrival, and potentially receive a lower final price for their product. It also increases customs broker fees.

Results for SCAs covering the importation of corn, wheat and rice into Honduras and Nicaragua supported the findings of these analyses. In theory, the shortest, most direct route for grain imports to arrive in Nicaragua beings with entry into Puerto Cortés, ground transport through Honduras to the El Guasaule border crossing, and continuing on to Managua. In practice, importers prefer a longer maritime route to the uncertainties and complications presented by entry through Honduras. Smaller

[27] This is a requirement for all containers shipped to the United States.
[28] Even without the documentation signed, the container may be loaded and travel on to its destination. However, at the port of destination, the cargo will not be allowed to leave the port until the proper documentation has been received.

importers feel they are treated unfairly at the port, their cargo unnecessarily delayed. Customs brokers cannot get things done in a timely manner from Managua. The current low volumes of product imported through Cortés on its way to Nicaragua do not provide sufficiently strong incentives for them to open subsidiary offices there.

Additional constraints arise when grain imports reach the El Guasaule border. Shipping companies report that documention is late to arrive, preventing importers from initiating the import authorization procedures with MAGFOR[29] and the DGA[30]. Upon receipt of the Bill of Lading, the procedure takes about five working days. A longer and more extensive list of documents is required in order to clear customs in El Guasaule, as opposed to Puerto Corinto, suggesting that Nicaragua's customs systems are not being implemented in a homogeneous and standardized way.

Sanitary and Phytosanitary Review and Inspection Processes

In order to be released for export, all agricultural products face sanitary and phytosanitary measures, making the efficiency of the SPS system as important as that of customs procedures. Though the government animal health authority may designate and authorize a private firm to administer laboratory analyses, the operation and administration of these systems is ultimately a public sector function upon which exporters depend. SPS measures effect the studied chains in two distinct ways. First, poor administration and operation of national laboratories can raise costs and times to export, and lead to product rejection. Honduras is the country that most suffers with this condition. Second, for intraregional exports, the right to inspect, review, sample, and reject cargo upon arrival can be used as a non-tariff barrier to importation.

Inefficiencies in SPS Procedures

For the dairy and beef export chains in Honduras, exporters reported frustration with the administration and operation of the national laboratory. As a result of poor laboratory performance, the required microbiological and chemical residue tests may be comparatively expensive, take a long time, and often do not correctly capture potential contaminants that can lead to rejection of containers at the port of destination.

Responding to the surveys administered for these SCAs, beef and dairy exporters in Honduras noted long wait times to receive the results from analyses performed at the National Laboratory for Residual Analysis (LANAR). Microbiological and residual analysis must be performed on a sample of every lot of meat destined for export. The results must be handed in to the Center for Export Documentation (CENTREX) in order to obtain the export permit. For the case of beef, exporters reported a minimum of 5 days, an average of 8 days, and a maximum of 15 days to perform this process, from taking the sample to receiving the results. Exporters also note that the physical location, space and infrastructure for LANAR and the CENTREX buildings makes the process even more burdensome.

[29] Ministerio de Agricultura y Forestería
[30] Dirección General de Aduanas

Failed inspections and rejected products at the port of destination are clear evidence of poor national laboratory performance. According to official audit reports from the United States Department of Agriculture's Food Safety and Inspection Service (USDA-FSIS), Honduras' poor performance on a 2003 audit necessitated an enforcement audit in 2003. Inspectors identified deficiencies in the documentation of preventative measures, the implementation of HACCP & SSOP[31] procedures, sampling techniques, temperatures for deboning rooms, and several others.

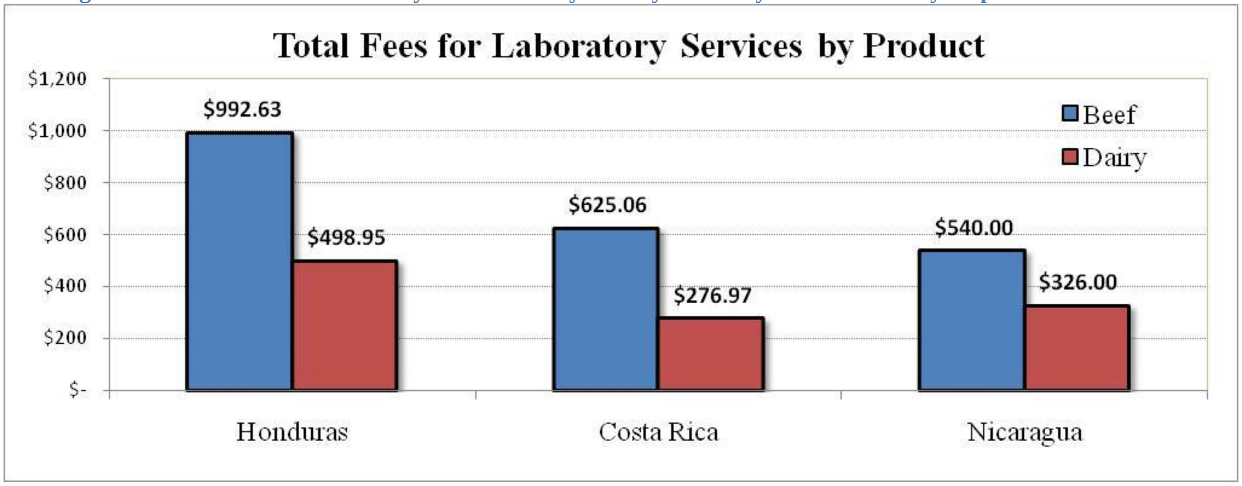
More recently, the USDA/FSIS 2010 audit report stresses concern over inspection, documentation and implementation of procedures in the meat sanitation system, and noted the delisting of the only eligible exporting plant in March of 2010, due to two E. coli O157:H7 violations. Northwestern Meats, Inc. a firm located in Miami, Florida recalled 6,240 pounds of frozen boneless beef products from Honduras after routine sampling by the FSIS rejected other containers from the same lot, upon discovery of traces of Ivermectin, a common anti-parasite medication. Honduras' national laboratory, LANAR requires a test for Ivermectin in order to receive the sanitary export permit, which was authorized in the case. A similar incident occurred in October of 2008, when routine testing of frozen beef trim products uncovered possible contamination with E. coli O157:H7 bacteria. Audit reports from Nicaragua mention minor deficiencies, overall focused on poor record keeping at slaughterhouses.

The tests required vary by type of product; fees for laboratory services vary by country, according to the availability of laboratory services. The official price list for these services shows a total cost of around $992 to perform the analyses for beef exports, and around $499 for dairy. For small lots of dairy (less than one 42,000lb container), these costs represent 36% of total costs. For coffee, both SENASA and IHCAFE take samples in order to perform analysis for mycotoxins; the analysis is performed in a IHCAFE laboratory based in San Pedro Sula and costs an estimated $157.

Comparable laboratory fees were collected for the two other large beef and dairy exporting countries in the region, Nicaragua and Costa Rica. The costs for beef tests in Honduras are about a third higher than those of Costa Rica ($625), and 85% greater than those for Nicaragua ($540). In the case of dairy, the corresponding amounts are around half of the Honduran total for both countries (Figure 24). The difference in costs is not uniform. Some tests are less expensive in Honduras than in the other two countries. Tests for heavy metals (iron, copper, cadmium and lead) are considerably more expensive in Honduras, as are tests for Escherichia coli O157:H7.

[31] Hazard Area & Critical Control Points, Sanitation Standard Operating Procedures.

Figure 24. Total Cost of Laboratory Fees necessary for Phytosanitary and Zoosanitary Inspection Certificate[32]



In both Costa Rica and Nicaragua, the relevant government agency is responsible for the administration and operation of national laboratories that perform these tests, where as in Honduras, the *Organismo Internacional Regional de Sanidad Agropecuaria* (OIRSA) is in charge. For a list of the comparative lab tests, please see Annex I.

SPS Measures as Non-Tariff Trade Barriers

From the interviews emerged a general consensus that Central American governments try to protect domestic industries from regional competitors through the sudden or unjustifiable imposition of unnecessary technical regulations, or the prolongation of inspection procedures. Research suggests that these studies have profoundly negative impacts on intraregional trade volumes, particularly for common exports within the region, such as beef and dairy (Díaz, 2006). Exporters reported that intraregional agricultural exports are arbitrarily expected to adhere to phyto- and zoosanitary standards that are unreasonable and in excess of what is required to export to the United States. This unnecessarily increases the cost of compliance for exporters, and may complicate firm-level strategies to plan for tightening international trade standards, and particularly new demands for traceability for major beef and dairy importers. These SCAs in Central America find that extended border wait times, expenses and product losses are primarily a problem for beef and dairy imports into El Salvador from Nicaragua and Honduras, and for beef exports from Nicaragua to Guatemala.

Members of the WTO must sign the SPS Agreement and the Technical Barriers to Trade Agreement that are designed to prevent the use of sanitary measures as non-tariff trade barriers. Principals of these

[32] These totals represent all microbiological and chemical residual tests performed in the national laboratories of each country. Information is the most recent available. For Costa Rica, information and costs were provided by officials from the *Laboratorio Nacional de Servicios Veterinarios* (LANASEVE) at http://www.senasa.go.cr/senasa/sitio/index.php/secciones/view/6. For Nicaragua, information came from the *Direccion General de Proteccion y Sanidad Agropecuaria* (DGPSA) and is not publicly available.

agreements include transparency, nondiscrimination, proportionality, equivalence, science based measures and regionalization (van der Meer & Ignacio, 2011).

Within Central America, the Council of Regional Trade Ministers (COMIECO) receives and handles allegations of discrimination for trade within Central America. Of twenty cases presented to COMIECO from 2003 to 2012, seven of them were related to dairy exports, and five to beef. Nicaragua registered the highest number of reported cases, most likely related to its role as the regional bread basket. El Salvador was the most frequent respondent. As evidenced by the complete failure of Honduras to officially report its allegations against El Salvador for measures to impede dairy imports, the list of reported cases does not necessarily reflect the totality of intraregional trade disputes. The majority of reported disputes are related to SPS measures for the products studied in this report.

Figure 25. Table of Intraregional Trade Controversies, 2003 to 2011

		Respondent					
		Guatemala	**El Salvador**	**Honduras**	**Nicaragua**	**Costa Rica**	**Total**
Complaintant	**Guatemala**		3	1		1	5
	El Salvador	1			1	1	3
	Honduras						
	Nicaragua	2	4	3			9
	Costa Rica	2		1			3
	Total	5	7	5	1	2	

Source: SIECA

Though Honduras has never made an official complaint through the SIECA mechanism, the country's exporters were the most outspoken about the effect that discriminatory imposition of SPS measures have on their costs and times. Every time a refrigerated dairy container undergoes a duplicate inspection at the El Salvador border, logistics expenses may increase by up to $900, and the time in transit from 2 to 9 days. For the dairy sector, one exporter reported that phytosanitary inspection duplication at the Amatillo border with El Salvador repeatedly added 7 days and $400 in additional expenses to the logistics costs to export a container. In addition, dairy exporters and customs brokers report charges of approximately $400 to $500[33] per lot to take a sample, transport it to the laboratory in San Salvador, and perform the relevant sanitary exams; this estimated cost increase does not factor in increased fees for the customs broker or losses that may result from exposure to open air while samples are taken.

Findings from the tomato export SCA suggest that minor adjustments to SPS procedures minimize the time cost of documentation and inspections on tomato exports from Costa Rica to Nicaragua. Tomatoes must undergo phytosanitary revisions both at the Costa Rican and the Nicaraguan sides of the Peñas Blancas border crossing. As explained by interviewees, on the Costa Rican side, the Ministry of Agriculture and Livestock (MAG) obtains a sample for each of the products being shipped and clears the cargo. The laboratory sample collected by the Nicaraguan Agricultural and Forestry Ministry (MAGFOR) no longer needs to travel to Managua for processing; at least for tomatoes, these products are analyzed

[33] Note that these estimates come from exporters, and do not reflect official price lists. The team is presently working to confirm the accuracy of these numbers.

in a nearby laboratory in Rivas. Unlike dairy imports into El Salvador, tomato shipments do not have to wait for the laboratory results and can continue on to market. As in the United States, products with laboratory results showing contaminants can be recalled; MAGFOR sends personnel to track down the shipment and to prevent importers from selling the products in the local market.

Results from SCAs for grain imports into Nicaragua suggest a great heterogeneity in how SPS measures are implemented by border crossing or port of entry. Importers of grain into Nicaragua report troubles with the SPS procedures at the El Guasaule border crossing. Upon arrival at El Guasaule, the grain samples have to be shipped to Managua to be inspected at the Universidad Centro-Americana. The costs of having the product sitting at El Guasaule averages U$110 per day per container.

At Puerto Cortés, SENASA/SEPA officials in charge of sanitary inspections[34] often do not accept US certifications and requires re-inspection and fumigation. Fumigation can take place on board the vessel, at the port or at the mills, and represents substantial additional costs, delays and operational uncertainties. These additional costs include, for example, the purchase of the fumigant (U$11.25/MT), delay in the unloading process or the time that the vessel must remain at the port, and unpredictability in the timing of shipments, which may result in increased storage costs for the mills.[35]

For organic coffee from Honduras, the required SPS inspection was not identified as a constraint. Exporters estimated only 2 to 3 days awaiting results for this inspection. Coffee exporters that do not have warehouse facilities based in San Pedro Sula are at a slight disadvantage; they must wait until a container arrives at the port in order for SENASA and IHCAFE to perform the required phytosanitary inspections for the export permit. The fee is the same, but the process can take up to 3 days.

Other Significant Logistics Bottlenecks

Port Infrastructure and Management

Bottlenecks at the maritime port level were explored through the wheat, rice, and corn supply chain analyses being imported into Puerto Corinto on the Atlantic Coast of Nicaragua and into Puerto Cortes on the Pacific Coast of Honduras. Puerto Corinto, located 160 km from Managua, handles all grain imports into Nicaragua. It handled a total of approximately 1,919 metric tons of cargo in 2008. Puerto Cortes, on the other hand, is the most important port in Honduras and the fourth busiest port in Central America in volume terms preceded by those of Balboa and Manzanillo in Panama and Limon-Moin in Costa Rica.

[34] The Animal Health Service Division of the Secretariat of Agricultural and Ranching (SAG-SENASA) has delegated OIRSA (Organización Internacional Regional de Sanidad Agropecuaria), a regional body to administer and operate the national laboratories, set costs, and manage inspection regulations. In Nicaragua, Costa Rica and El Salvador, OIRSA does not have the same responsibilities.

[35] Importers may choose to buy in advance to be able to fulfill demand fluctuations

Figure 26. Central American Ports by Total Volume Handled (metric tons), 2008

Country	Port Name	Ocean	2008 (M-ton)
Panama	Panama Port Co. Balboa	PACIFIC	15,726
Panama	Manzanillo	ATLANTIC	10,320
Costa Rica	Limon - Moin	ATLANTIC	10,104
Honduras	Puerto Cortes	ATLANTIC	8,527
Guatemala	Quetzal	PACIFIC	6,979
Panama	Charco Azul	PACIFIC	6,315
Guatemala	Santo Tomas de Castilla	ATLANTIC	4,679
El Salvador	Acajutla	PACIFIC	4,436
Panama	Evergreen/CCT	ATLANTIC	4,230
Costa Rica	Caldera	PACIFIC	3,465
Panama	Panama Port Co. Cristobal	ATLANTIC	3,045
Panama	Chiriqui Grande	ATLANTIC	2,723
Panama	T. Petrolera (Bahia Las Minas)	ATLANTIC	2,647
Guatemala	San Jose	PACIFIC	2,118
Guatemala	Barrios	ATLANTIC	2,085
Nicaragua	Corinto	PACIFIC	1,919
Panama	T DECAL	PACIFIC	948
Honduras	San Lorenzo	PACIFIC	917

Source: Comisión Centroamericana de Transporte Marítimo

The critical factors affecting maritime transport costs are the type of vessel and the distance (i.e., travel times). Puerto Cortés is located in the Atlantic Ocean only 3 days away from the port of New Orleans. Puerto Corinto, on the other hand, is located in the Nicaraguan Pacific coast. Thus, Nicaraguan importers are forced to transport the grain through the Panama Canal. This journey can take up to 12 days and is generally more expensive depending on supply and demand conditions. Since grains are not highly perishable goods, extra days in transit do not add up to significantly higher costs, but as the levels of trade continue to increase in the future, the potential to efficiency gains due to economies of scale and shorter transit times exists.

Puerto Cortés

Shipping agencies report that a May 2009 earthquake severe damaged the port infrastructure, including an original refrigerated inspection room. Perishable imports, as well as soon exports, are inspected on an open-air patio, where they are exposed to often extreme temperatures; this exposure to open air diminishes the quality and shortens the shelf-life of incoming produce. Without a public facility available for a fee, importation of perishable cargo is limited to those importers with the appropriate facilities, which can be a barrier to entry for smaller firms without access to start-up capital or credit to invest in these facilities and certify them for perishable cargo reception.

Customs officials have suggested that agricultural inspections be conducted at the Customs Sub-Administration, CORANORTE, located approximately 20 kilometers away from the port exit. In addition to private security, video surveillance, 7,500 square meters of storage, communications technology, this private customs and warehouse facility houses officials from DEI to inspect and clear non-agricultural cargo, and has made investments in an electric generator. Customs agents and port managers note the increasing demand for these services, prompted by complaints of long delays leaving Puerto Cortés.

Presently, the government has not authorized CORANORTE to perform sanitary inspections and clear agricultural products through customs.

Shipping agencies report a general sentiment that the port is in disrepair; they are weary of Dock 3, as well as the quality and number of gantry cranes. For smaller cranes for movements in and around the port, most private shipping agencies have been able to supplement logistics with their own equipment, but still must pay port fees for movements. The increase in costs for port-usage is transferred on to exporters and importers by the shipping agencies in the form of higher overall prices for services.

Puerto Limón

For ground shipment of Costa Rican pineapples, exporters point out that frequent strikes of port workers, in addition to overall inefficiencies in terminal management and operations increase their costs and often cause extended delays, most notably during high season. Uncertainty and high-frequency of inconveniences along the chain provoke the shipping agencies to set a higher base price for ground shipping services, and charge extra for unusual delays. For each additional day of storage in the port[36], shippers charge exporters a fee of approximately $125 to $150 a day.

Transport Regulation & Weigh Stations

Although transport regulations such as weight restrictions, overloading, and truck quality and safety may increase transport costs, the lack of regulations and/ or enforcement creates costs such as damaged goods and increased vehicle operating costs. Together with poor infrastructure, uncontrolled speeds, cargo weights and vehicle types make roads and highways very insecure for cargo, public and personal transport. Manifestations of poor transport regulation are well documented in *El Ojo del Lector* (The Eye of the Reader), an interactive section of Guatemala's national newspaper Prensa Libre, where readers are allowed to upload photos of overloaded trucks, vehicle assault, poor road maintenance, landslide risks, and many other dangerous situations[37]. The costs of an unregulated trucking industry are indirect and take time to manifest themselves, but they are significant.

Beef supply chains in Honduras and Nicaragua illustrate the importance of transport regulation, with particular focus on weight controls. While in Honduras, the absence of weigh stations increases transit times, vehicle maintenance costs, and roadway insecurity, in Nicaragua, weigh stations are opportunities for attendants to collect bribes and slow the transport of goods.

For Nicaragua's beef exports, unexpected, unnecessary, and costly delays at the weight station can add 2 additional days to the journey to port and result in fines anywhere from $16, for the first offense, to over $1,000 per container, for a frequent, repeat offender[38]. The poor quality of technical equipment and attendees were both mentioned as factors contributing to these fines. For overloaded containers, standard procedure is to unload the excess portion of cargo, pay a fine by making a deposit to a Ministry

[36] Past the three days that are allowed, free of charge, by the *Empresa Nacional Portuaria* (ENP).
[37]http://www.prensalibre.com/multimedia/el_ojo_del_lector/Ojo_de_Lector-Prensa_Libre-Guatemala-Amatitlan_5_688781117.html
[38] Reported by 3 shipping agencies interviewed and each of the 4 exporting slaughterhouses.

of Transport and Infrastructure (MTI) account at a local bank, and then continue en route. Containers filled with frozen ground beef, however, cannot be opened. In this case, truckers are offered the option of paying a bribe to be reported as unbalanced, rather than overweight. The trucks then must travel to MAGFOR in Managua, where they present the infraction, pay a fine[39] and receive permission to circulate. Many openly reported paying bribes to avoid excessive weight station delays, especially on Fridays, because MAGFOR is not open on the weekend to issue permission to circulate. An additional two days in transit to port may mean the container arrives tardy to port, misses its boat, and must pay extra days for electricity and storage, and re-booking the container for its maritime journey; shipping agencies pass these costs on to the slaughterhouse in the form of a fine estimated at $125 per day.

In Honduras, the lack of weight stations – a component of poor transport regulation – is related to overall poor performance in the transport infrastructure sector. Investment in infrastructure has been fairly ineffective in Honduras, due in large part to poor transport sector planning at the national level. Frequent severe storms during the rainy season down bridges and destroy major roads. Ongoing failure to maintain roads over several years has left Honduras with a road network that largely needs to be rehabilitated. For example, at two points on a major road between the Zamorano Valley and Tegucigalpa, a geographical fault line cuts like a wrinkle in the earth through the road. Instead of rebuilding, workers regularly add gravel and dirt to the road and pack it down for passing vehicles (see Figure 27). This road is a primary road, traveled not only by domestic trucks, but also by several trucks *en route* to Puerto Cortes from Nicaragua.

Figure 27. Geographical Fault under a Road in Honduras

Source: Author's Own

[39] The fines here are insignificant as a share of the cargo transported.

Cargo Security for Ground Transport

Pervasive insecurity in Central America has corresponding costs for the region's trade. A 2006 survey of Central American firms found that security costs and losses due to crime accounted for an average of 3.7% of overall firm sales for Central America, as compared to the LAC regional average of 2.8% (World Bank, 2011). The risk of cargo and container theft, as well as driver assault, is generally considered greatest in the so-called Northern Triangle, composed of El Salvador, Honduras and Guatemala. Long waits at border crossings or city congestion make container trucks easy targets for armed criminal bands. Figures from 2009 and 2010 in Guatemala suggest that around 60 containers may be stolen in a bad month (Lara S., 2009; Larios, 2012). According to the country's police force, 10 container trucks are robbed or stolen every day in Honduran territory (Guerrero, 2012). Last year, Nicaraguan trucking cooperatives reported thirty Nicaraguan transporters forced into bankruptcy due to stolen equipment (Guerrero, 2012).

Though manufactured products are the most popular targets, due to the ease of resale, high-value agricultural products, including coffee, beef and dairy are also at-risk and require a security patrol to accompany containers in transit. Exporters and transporters that loose cargo face losses, not just of product, but also of truck chasses, containers and trailer; this risk may translate into higher overall transport costs within the region. In addition to increases costs for security, the risk of theft and assault deters cargo from traveling through Puerto Cortés.

Prices of security services vary depending on the scale of production. Large exporters make shipments of multiple containers, sending 20 ft. containers of *café oro* directly to the port; these exporters only need purchase one security patrol for each shipment. By contrast, one typical small cooperative interviewed for this study sends one 14 ft. container at a time to a warehouse in San Pedro Sula, where it is then consolidated into a larger container and transported to Puerto Cortes; for this coffee to reach the port, security services must be contracted for both legs of ground transport, which increases overall costs. For both small and large exporters surveyed, the price of this security service ranged from $250 to $368 dollars total per trip from cooperative to port; each trip may include a caravan of several containers. Transport service charges ranged from approximately $530 to $730 dollars per trip. If we assume that 3 exporters interviewed send only one container at a time, costs for security services average out at about a third of overall transport costs, or half of the ground transport service costs itself. Figure 13 shows reported expenses per container.

Figure 28. Organic Coffee, Reported Transport and Security Expenses per Container

Organic Coffee	#1		#2**		#3**	
Kilometers to Puerto Cortés	276		200		300	
Ground Transport: Cooperative to Puerto Cortés*	$ 578.40	61%	$ 536.00	67%	$ 736.84	67%
Security: Cooperative to Puerto Cortés	$ 368.40	39%	$ 263.16	33%	$ 368.42	33%
Total	$ 946.80		$ 799.16		$1,105.26	

**Includes 2 ground transport legs: 1) Cooperative to San Pedro Sula 14 ft. container with 294 quintales 2) S.P.S. to Puerto Cortés in a 20 ft. container with 420 100lb quintals. To compare costs, a per quintal cost for the 1st leg was estimated and then applied to a total of 420, rather than 294. This method is close but imperfect, because coffee weight changes after drying.*

***Assuming one 20 ft. container shipment with 420 100lb quintals.*

Recommendations

Though the recommendations themselves may be regional or national in reach, they have been chosen for their likely impact upon the studied perishable exports. Products such as pineapple from Costa Rica and beef from Nicaragua were chosen as "ambassadors" for perishable exports in Central America. Though the SCA methodology is a micro-level analysis, supplementary research at the region level supports the conclusion that the logistics bottlenecks identified here are common for other types of perishable products and other countries within the region.

Agro-logistics is a topic normally considered as a subset of agriculture, or a subset of trade facilitation and logistics. For that reason, most of the recommendations included below are likely to require a collaborative effort involving the public sector, multilateral donor agencies, the private sector and some nongovernmental organizations focused on addressing a range of issues including, but not limited to agro-logistics. Most are also likely to have positive spill-over effects, either for exportation procedures in general, or for an entire agricultural industry.

Rural Roads and Access

Establish regular communication between transport ministries and agro-export promotion entities. With limited fiscal resources, and dispersed rural populations, investments in rural roads rarely yield impressive social or growth returns. Decisions about rural roads are often made blindly while substantial local knowledge of needs and constraints to product movement exists. Setting in place channels of communication between the Ministry of Transport and export-promotion agencies, producer associations, and private agricultural enterprises would allow the public sector to, wherever possible, prioritize investments in rural roads that may improve market access for the greatest number of producers, in potential production zones for targeted agricultural exports. Regular meetings, information exchanges, or cross-agency studies could help to better direct investments in rural roads and identify cost-saving solutions. Some countries in Latin America are piloting transparent and participatory planning strategies for rural roads that bring together national ministries, local governments, and social groups in a collaborative dialogue.

Build rural roads with attention to cost-effective, sustainable alternative to asphalt. Strategic investment in rural roads can have a high economic impact in terms of employment generation, lower transport costs, and easier access to market. One example of this is the $82 million Third Road Rehabilitation and Maintenance Project co-financed by IDA and the Government of Nicaragua, in which 204 km of road was paved using hexagonal cement blocks, lauded as a "cost-effective, environmentally-sound alternative to asphalt"[40]. Over 23,000 direct jobs and 8,126 indirect jobs were created as a result of this project, which shortened transport times for agricultural products traveling from rural production zones.

Shorten the distance between farms and refrigerated storage facilities, distribution or processing centers by constructing small storage centers in rural production zones, or moving food processing and distribution centers away from capital cities and closer to production zones. Long distances to markets magnify the product losses suffered by rural farmers without dependable access to electricity or proper refrigerated storage facilities. Market solutions that bring farmers together into cooperatives to share refrigerated facilities can minimize losses en route to the distribution center. One good example of this is Honduras' system of more than 50 milk collection centers, each with refrigerated storage tanks, electricity generator, water and sanitation systems and reception patio, strategically located in rural production zones in Honduras. In the Zamorano Valley, a regional milk tester for the country's largest dairy exporter, LACTHOSA, visits the cooperative's milk collection center each morning to test milk for contaminants before it is loaded into a general refrigerated storage tanks. Dairy farmers, who transport milk by bicycle, horse, or truck, may also purchase animal feed and medicines at these strategic centers. By some estimates, the system of collection centers may have doubled the price farmers receive for their milk.

Explore the possibility of mobile platforms for agriculture. Over the past decade, applications of mobile technology have been emerging to offer small farmers a variety of services, allowing them to easily access information about the cost and distance to inputs and services, calendars to assist with seeding, planting and harvesting, and general price information. Kenya has been a pioneer in this area, with the DrumNet ICT-platform launched in 2004 that allows supply chain actors to conduct transactions primarily using SMS-technology[41], and the I-Cow[42] project that allows farmers to access information on best practices, proximity of supplies and services, and store breeding and milking records. The success of these programs tends to vary by region, industry and purpose.

In Central America, cellular technology is very affordable, with even the poorest homes often having access to at least one mobile phone. Still, little information is available on ICT-projects for agricultural production in the region. Though the typical purpose of the applications is quite broad, numerous

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[40] http://web.worldbank.org/WBSITE/EXTERNAL/EXTABOUTUS/IDA/0,,print:Y~isCURL:Y~contentMDK:22301689~menuPK:4754051~pagePK:51236175~piPK:437394~theSitePK:73154,00.html

[41] http://www.prideafrica.com

[42] http://www.icow.co.ke/

possibilities exist to improve small farmers' information on logistics costs and service availability using these technologies.

Border Management & Infrastructure

Improve data collection on border efficiency and traffic. In most cases, decision making for border management should be based on substantial quantitative evidence exposing the unique needs and challenges of individual border crossings. Anecdotal reports from local experience, coupled with logistics surveys and studies conducted by international organizations do not provide enough detailed evidence to correctly inform decision-making. Consistent, standardized border monitoring and data collection would allow national customs services to make truly informed decisions. Until this data is available, misdiagnosis of border management challenges will remain common.

Harmonize customs systems and ensure that they interface seamlessly with quarantine and sanitary inspection systems. Fortunately, progress is being made in this area. In February of 2011, SIECA released a report on the Central American Customs Union, detailing recent developments, including the revision and publication of a Unified Manual for customs Procedures, the development of a Code of conduct for Customs Service Officials and Staff, and the implementation of a risk assessment system in Nicaragua, El Salvador and Costa Rica, as well as three customs posts in Honduras. Individual countries, like Honduras, are working hard to establish an electronic platform for a single customs window.

Far more difficult than building the collaborative establishment of the legal and regulatory framework has been its implementation and the incorporation of sanitary inspection procedures. Beyond regional meetings of customs authorities is building the technical capacity of customs, border police, sanitary officials and port operators to understand the roles and responsibilities of other agents. Building a strong corps of well-trained customs officials that value trust and collaboration with other border authorities is essential for the success of institutional reforms, system and infrastructure investments, and has been fairly neglected in previous and present reform and modernization efforts[43].

Much enthusiasm and concerted motivation to organize by the region's governments on this matter has met with limited success. For example, the Procedimiento Mesoamericano para el Transito Internacional de Mercancias (TIM)[44] is designed to decrease time spent for customs procedures at Central American border crossings, ports and airports through the implementation of electronic information systems (and sharing), standardized customs procedures, among other actions. The first phase pilot project, implemented at 3 border crossings (El Guasaule, El Amatillo & Pedro de Alvarado-La Hachadura), reported to reduce document processing times from over an hour to under 8 minutes[45]. Currently the TIM system is in partial use at a number of border crossings throughout the region. However, the reported reduction in travel times does not correspond with information collected from logistics operators in SCA interviews, nor have countries demonstrated willingness or ability to produce

[43] Former SIECA Secretary General, Yolanda de Gavida has commented and written extensively on recent developments in the harmonization of customs systems and the use of SPS measures as non-tariff barriers.

[44] Part of the Mesoamerican Project (PM); the TIM project is a collaborative effort of national governments with financial support from the Inter-American Development Bank (IDB) and the Central American Bank for Economic Integration (BCIE).

[45] These times are just for document processing, and do not include the time that vehicles spend waiting in line.

and share data on exports and imports gathered through online information systems. Without this official information, it is impossible to verify the success of present measures to improve border management and competitiveness. Costa Rica's TICA system, the most noteworthy and effective in the region, is not powerful enough to handle current volumes of trade, nor is it easy to update.

Introduce spatial planning into plans for border modernization. The mixed success of project designed to increase document processing times is due in part to a misunderstanding of exactly what is slows container traffic. Waiting lines of several kilometers are not uncommon at Central American border crossings, and are often the result of one container, selected for inspection, having to make an awkward movement from the one passing lane to a separate inspection lot. Border modernization decisions should be based not just on quantitative data, but also on a careful analysis of how containers move in and around the border, and what steps can be taken to improve those movements.

Sanitary & Phytosanitary Measures

In the short run, preclearance of perishable products prior to completion of laboratory tests. Most Central America countries have only one certified national laboratory to perform microbiological and chemical residue tests for agricultural products. Repeat testing that can add days and considerable expense to exportation are often unnecessary products of mistrust between countries and lack of technical capacity, rather than an honest and true assessment of product risk. Without expanding the capacity and reach of the laboratory systems, agricultural imports that have been tested in the country of origin and are not currently related to any disease outbreaks can be pre-cleared. This is standard practice for agricultural imports to the United States from Central America, beef and dairy products are re-tested upon entry into the U.S., but cleared to pass beyond the border. Where test results come back positive, the product is recalled.

Expand the capacity, number and reach of national laboratories. Fiscal and technical capacity constraints complicate this in the short run. Central American countries should further consider the certification of private laboratories to perform microbiological tests, and look for international assistance to expand the capacity and performance of existing laboratories and technicians.

Proactively address the use of SPS measures as non-tariff barriers to trade. Sudden blockades of certain products are more often than not related to political whim, volatile fluctuations in favor between nations, general mistrust, and attempts to protect domestic industries. Addressing them requires a sea-change in intraregional relations that will be long in the making. In particular, Honduras should exercise its right to report alleged misuse of regulatory measures at the border through the mechanism established through COMIECO.

Develop a regional, shared online platform where countries are required to announce blockades and retention of agricultural products in real time. When countries impose a sudden ban on importation of certain products as a food safety measure, they can minimize the damage on the region's exporters by immediately announcing it on a shared website. If exporters consistently posted cases of container retention at the border to an online forum, regional governing bodies would have records to identify the most troublesome products and border crossings, as well as to support or refute allegations of misuse of SPS measures.

Suggestions for Future Research

Future analytical work should be conducted in collaboration with logistics operators and customs agents that have representative data on transport costs and times within the region. A series of SCAs at the country level that compare results for well-developed supply chains and potential growth exports would be further helpful in diagnosing each countries particular weaknesses. Information on competition in the trucking services sector is sparse. Also, interviewees have requested a cost-benefit analysis that quantifies the effect of port inefficiencies on the region's exports and imports, particularly for Puerto Cortéz. Complementary analyses that project likely shifts in trade patterns in the region could help to inform a regional port strategy, and infrastructure development of strategic interest for the region as a whole.

Bibliography

Aigbe, G. O., Ogandele, F. O., & Aliu, I. R. (2012). *"Road Facility Availability and Maintenance in Lagos State, Nigeria.* British Journal of Arts and Social Sciences, Vol. 4 No. 2.

Alimentos. Criterios Microbiologicos para la inocuidad de alimentos. (2008). *Reglamento Tecnico Centroamericano* .

Arias, D., & De Franco, M. D. (2011). *Integrating Central American and International Food Markets: An Analysis of Food Price Transmission in Honduras and Nicaragua.* Washington D.C.: World Bank.

Barquero, M. (2012, May 2). *Sistema digital aduanero TICA aún debe resolver fisuras.* Retrieved May 2, 2012, from La Nación Economía: http://www.nacion.com/2012-02-15/Economia/sistema-digital-aduanero-tica-aun-debe-resolver-fisuras.aspx

Castro, M. (2009). *Diagnostico y propuestas para el mejoramiento de los procesos de logistica y aduana en la region de Centroamerica y Panama: Version Preliminar.* Santiago de Chile: Comisión Económica para América Latina y el Caribe (CEPAL).

Chaherli, N. (2012, January 25). Agricultural Trade Regional Study 2012: Latin America and the Caribbean (Presentation of Preliminary Results). Washington D.C. : World Bank.

Christ, N., & Ferrantino, M. J. (October, 2009). *Land Transport for Exports: The Effects of Cost, Time and Uncertainty in Sub-Saharan Africa.* Washington D.C.: U.S. International Trace Commission.

Díaz, C. T. (Septiembre 2006). *Medidas Sanitarias y Fitosanitarias y Obstaculos Técnicos al Comercio: Informe sobre Honduras y Nicaragua.* Washington, D.C.: Banco Interamericano de Desarrollo.

Dissanayake, S., & Litao, L. (2010). *Geomatric Design and Other Characteristics Affecting operating Speeds on Gravel Roads.* Retrieved May 22, 2012, from Transportation Research Board: http://144.171.11.39/view.aspx?id=1100356

Djankov, S., Freund, C., & Pham, C. S. (2008). *Trading on Time.* Retrieved November 11, 2011, from Doing Business, Methodology, Trading Across Borders: http://www.doingbusiness.org/methodology/~/media/FPDKM/Doing%20Business/Documents/Methodology/Supporting-Papers/DB-Methodology-Trading-On-Time.pdf

Duarte, N. L. (2007). *Guía Práctica de Exportación de CARNE BOVINA a los Estados Unidos.* Managua: Instituto Inveramericano de Cooperacion para la Agricultura.

Fernandez, R. (2011, March 31). Agricultural Supply Chains in Costa Rica. (G. Fries, Interviewer)

Fernandez, R., Flores Gomez, S., Estrazulas de Sauza, F., & Vega, H. (2011). Chapter 6. Supply Chain Analyses of Exports & Imports of Agricultural Products: Case Studies of Costa Rica, Honduras and Nicaragua. In J. H. Lopez, & R. Shankar, *Getting the Most out of Free Trade Agreements in Central America* (pp. 151-181). Washington D.C.: The World Bank.

FINAL REPORT OF AN AUDIT CARRIED OUT IN HONDURAS COVERING HONDURAS' MEAT JNSPECTION SYSTEM FEBRUARY 22 THROUGH MARCH 4,2005. (2005, September 7). Retrieved March 16, 2012, from Food Safety and Inspection Service, United States Department of Agriculture: http://www.fsis.usda.gov/OPPDE/FAR/Honduras/Honduras2005.pdf

Goyal, A., & Gonzalez-Velosa, C. (2012 (forthcoming)). *"Improving Agricultural Productivity and Market Efficienty in Latin America and the Caribbean: How ICTs can make a difference." Background paper for regional study on Assessing Agricultural Export Performance in LAC.* Washington D.C.: World Bank.

Guerrero, R. (2012, February 3). *Robo de Cargas en C.A.* Retrieved March 10, 2012, from El Nuevo Diario de Nicaragua: http://www.elnuevodiario.com.ni/nacionales/240503-robos-de-cargas-ca

Hoel, L. A., Garber, N. J., & Sadek, A. W. (2008). *Transport Infrastructure Engineering.* Toronto: Thomson Nelson.

Hummels, D. (2001). *Time as a Trade Barrier.* Retrieved from Purdue CIBER Working Papers: http://docs.lib.purdue.edu/ciberwp/7

Kjollerstrom, M. (2004). *Liberalización comercial agricola con costos de transporte y transacción elevados: evidencia para América Latina.* Santiago de Chile: ECLAC.

Kull, R. A., & Burchell, R. W. (2009). *New Jersey State Development and Redevelopment Plan: Infrastructure Needs Assessment: 2008 to 2028.* Trenton, NJ: New Jersey State Planning Comission.

Kunaka, C. (2010). *Logistics in Lagging Regions: Overcoming local barriers to global connectivity.* Washington, D.C.: World Bank.

Lam, F. (2006). *Como Calcular los costos de exportacion de productos agricolas.* Miami, FL: IICA.

Larios, R. (2012, September 11). *Denuncian Robo de 492 Contenedores.* Retrieved May 5, 2012, from Siglo 21: http://www.s21.com.gt/node/23201

McLinden, G., Fanta, E., Widdowson, D., & Doyle, T. (2011). Border Management Modernization. Washington D.C.: World Bank.

Menon, J., & Warr, P. (2006, October). *Does Road Improvement Reduce Poverty? A General Equilibrium analysis for Lao PDR (Draft Only).* Retrieved May 22, 2012, from Asian Development Bank: http://www.adbi.org/files/cpp.road.improvement.paper.pdf

Murthy, R. (2003). *Selection of least cost paths for extraction of Forest Produce using Remote Sensing and GIS.* Retrieved May 22, 2012, from GIS Development.net: http://www.gisdevelopment.net/application/environment/pp/mi03114.htm

S., J. F. (2009, February 15). *Criminalidad en Guatemala golpea transporte de carga.* Retrieved May 1, 2012, from Nacion/El mundo.com Costa Rica: http://www.elnuevodiario.com.ni/nacionales/240503-robos-de-cargas-ca

Schwartz, J. Z., Guash, J. L., & Wilmsmeier, G. (2009). *Logistics, Transport and Food Prices in LAC: Policy Guidance for Improving Efficiency and Reducing Costs.* Wiña del Mar, Chile: The World Bank.

Secretaria de Integracion Centroamericana. (Marzo 2012). *Centroamerica: Informe Mensual de precios al por mayor de productos agropecuarios seleccionados y precios al detalle de algunos prductos derivados del petroleo.* Guatemala City, Guatemala: SIECA.

The World Bank. (2010). *Guatemala: SME Development in Guatemala: Let 10,000 Firms Bloom (Vol.2).* Washington D.C.: World Bank.

Thirumalaivasan, D., & Guruswamy, V. (2002). *Optimal Route Analysis using GIS.* Retrieved May 22, 2012, from GISDevelopment.net: http://www.gisdevelopment.net/application/Utility/transport/utilitytr0004pf.htm

USDA FSIS. (2007, October 6). *Final Report of an audit Carried Out in Honduras Covering Honduras' Meat Inspection System: January 30th through February 12th, 2007.* Retrieved January 5, 2012, from United States Department of Agriculture: Food Safety and Inspection Service: http://www.fsis.usda.gov/OPPDE/FAR/Honduras/Honduras2007.pdf

van der Meer, K., & Ignacio, L. (2011). Sanitary and phytosanitary measures and border management. In G. McLinden, E. Fanta, D. Widdowson, & T. Doyle, *Border Management Modernization.* Washington D.C.: The World Bank.

Varios. (2012). *El Ojo del Lector*. Retrieved May 1, 2012, from Prensa Libre de Guatemala: http://www.prensalibre.com/multimedia/el_ojo_del_lector/

Vitasek, K. (2006). *Supply Chain and Logistics Terms and Glossary*. Retrieved January 3, 2012, from Supply Chain Visions: http://www.scvisions.com/PDFs/Glossary_October_2006.pdf

World Bank. (2011). *Crime and Violence in Central America.* Washington D.C.: World Bank.

World Bank. (2010). *Trade and Transport Facilitation Assessment: A Practical Toolkit for Country Implementation.* Washington, D.C.

Yusof, K. W., & Baban, S. (2004). *Least-cost pipeline path to the Langkawi Island, Malaysia usind a geographical information system (GIS).* Retrieved May 22, 2012, from Geospatial World, Geospatial Communication Network: http://www.geospatialworld.net/index.php?option=com_content&view=article&id=16632%3Aleast-cost-pipelines-path-to-the-langkawi-island-malaysia-using-a-geographical-information-system-gis&catid=167%3Autility-others&Itemid=41lo voy cre

ANNEX I. Laboratory Analysis Fees for Beef & Dairy

Beef Exports	HONDURAS		COSTA RICA		NICAGARUA	
Laboratory Tests	**Lempiras**	**USD**	**Colones**	**USD**	**Cordobas**	**USD**
Prueba de metales pesados (1 muestra)*	L. 4,500.00	$ 236.84	₡12,332.00	$ 24.09	C$ 2,583.36	$ 112.00
Determinacion de Residuos de Hormonas	L. 900.00	$ 47.37	₡62,248.00	$ 121.58	C$ 1,360.88	$ 59.00
Determinacion de Especie Animal	L. 500.00	$ 26.32	₡12,332.00	$ 24.09	C$ 253.72	$ 11.00
Residuous Ivermectina	L. 1,100.00	$ 57.89	₡38,758.00	$ 75.70	C$ 691.97	$ 30.00
Residuous Benzimidazoles	L. 1,000.00	$ 52.63	₡51,090.00	$ 99.79	C$ 830.37	$ 36.00
Residuous Cloranefenicol	L. 650.00	$ 34.21		$ 40.14	C$ 668.91	$ 29.00
Residuous de Antibioticos en Carne	L. 500.00	$ 26.32		$ 16.06	C$ 922.63	$ 40.00
Residuous de Sulfas en Carne	L. 2,300.00	$ 121.05		$ 21.79	C$ 968.76	$ 42.00
Escherichia coli O157:H7	L. 5,360.00	$ 282.11	₡17,317.00	$ 33.82	C$ 922.63	$ 40.00
Coliformes Totales			₡7,047.00	$ 13.76	C$ 230.66	$ 10.00
Clorinados	L. 550.00	$ 28.95	₡9,983.00	$ 19.50	C$ 922.63	$ 40.00
Fosforados			₡38,758.00	$ 75.70	C$ 807.30	$ 35.00
Salmonella	L. 600.00	$ 31.58	₡7,634.00	$ 14.91	C$ 461.31	$ 20.00
Listeria	L. 700.00	$ 36.84	₡9,983.00	$ 19.50	C$ 691.97	$ 30.00
Recuentro total de Bacterias	L. 200.00	$ 10.53	₡12,617.00	$ 24.64		
Humedad					C$ 138.39	$ 6.00
Total	**L. 18,860.00**	**$ 992.63**	**₡320,030.00**	**$ 625.06**	**C$ 12,455.48**	**$ 540.00**

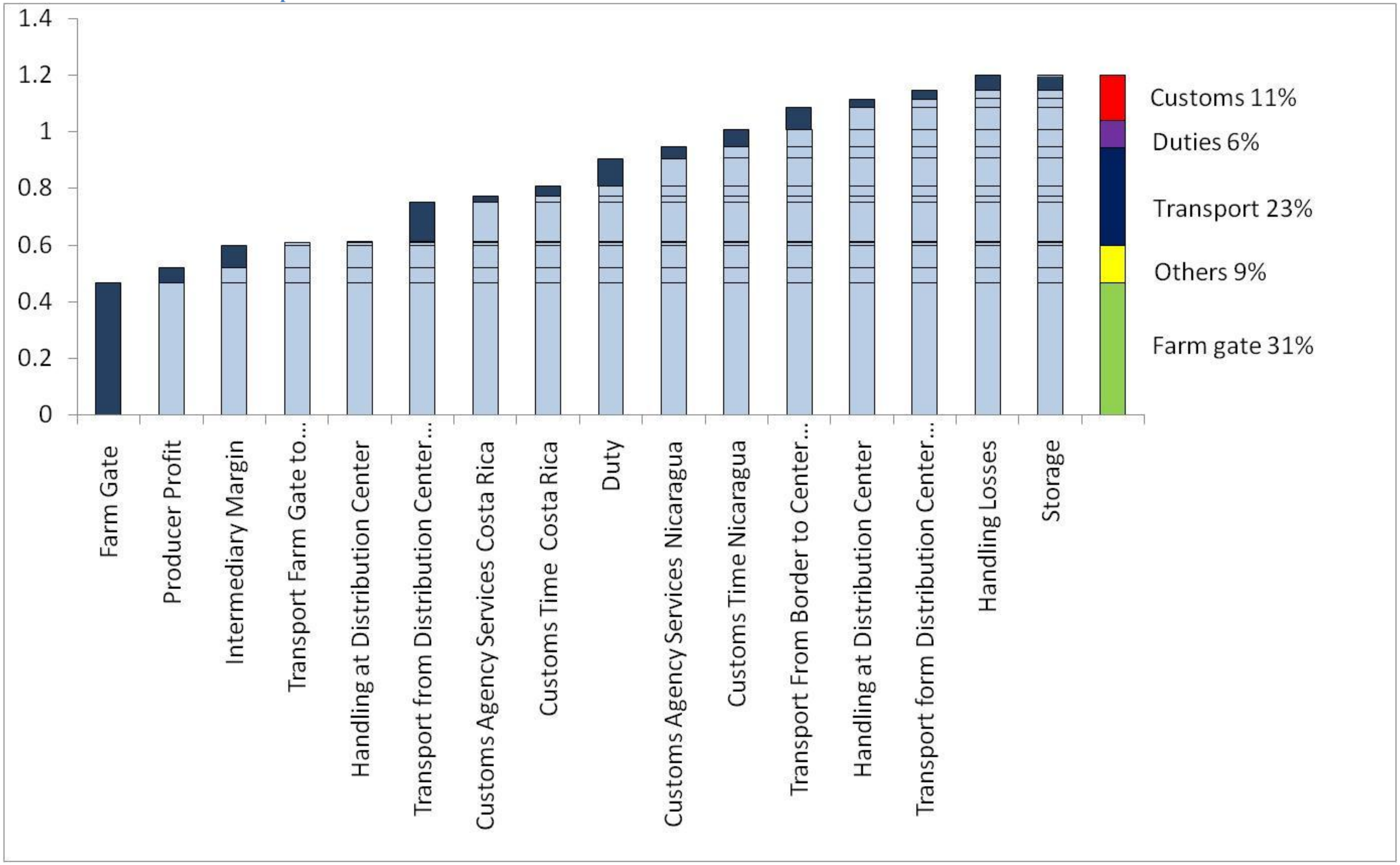
Dairy Exports	HONDURAS		COSTA RICA		NICAGARUA	
Laboratory Tests	**Lempiras**	**USD**	**Colones**	**USD**	**Cordobas**	**USD**
Plagacuidas Clorianados	L. 600.00	$ 31.58	₡9,983.00	$ 19.50	C$ 922.63	$ 40.00
Plagacuidas Fosforados	L. 1,200.00	$ 63.16	₡38,758.00	$ 75.70	C$ 807.30	$ 35.00
Ivermectinas	L. 1,100.00	$ 57.89	₡11,157.00	$ 21.79	C$ 691.97	$ 30.00
Antibioticos	L. 500.00	$ 26.32	₡12,332.00	$ 24.09	C$ 922.63	$ 40.00
Plomo	L. 900.00	$ 47.37	₡12,332.00	$ 24.09	C$ 645.84	$ 28.00
Cadmio	L. 900.00	$ 47.37			C$ 645.84	$ 28.00
Cobre	L. 900.00	$ 47.37			C$ 345.99	$ 15.00
Hierro	L. 900.00	$ 47.37			C$ 345.99	$ 15.00
Coliformes Totales	L. 240.00	$ 12.63	₡7,047.00	$ 13.76	C$ 230.66	$ 10.00
Echerichia coli	L. 240.00	$ 12.63	₡7,047.00	$ 13.76	C$ 230.66	$ 10.00
Staphylocuccus Aureus	L. 275.00	$ 14.47	₡6,459.00	$ 12.62	C$ 345.99	$ 15.00
Salmonello spp	L. 600.00	$ 31.58	₡7,634.00	$ 14.91	C$ 461.31	$ 20.00
Listeria Monocytogenes	L. 700.00	$ 36.84	₡9,983.00	$ 19.50	C$ 691.97	$ 30.00
Levaduras y Hongos	L. 200.00	$ 10.53	₡6,459.00	$ 12.62	C$ 230.66	$ 10.00
Bacterias	L. 225.00	$ 11.84	₡12,617.00	$ 24.64		
Total	**L. 9,480.00**	**$ 498.95**	**$ 141,808.00**	**$ 276.97**	**C$ 7,519.42**	**$ 326.00**

Notes: Required tests for exportation vary by country, both by name and by content.. A rigorous attempt has been made to confirm with officials at each country's national laboratories to ensure the validity of the figures. For Honduras, the laboratory fees listed closely matched those reported by exporters. Where a test was not required, or could not be found in the official list, it has been left blank. The test for heavy metals, here written in Spanish as "prueba de metals pesados" refers to a series of tests for cadmium, copper, lead and iron. For dairy exports from Costa Rica, the 4 heavy metal tests appear combined as one test, which costs approximately $24 (see chart).

Sources: 1) Honduras: CENTEX; 2) Costa Rica: LANASEVE; 3) Nicaragua: DGPSA.

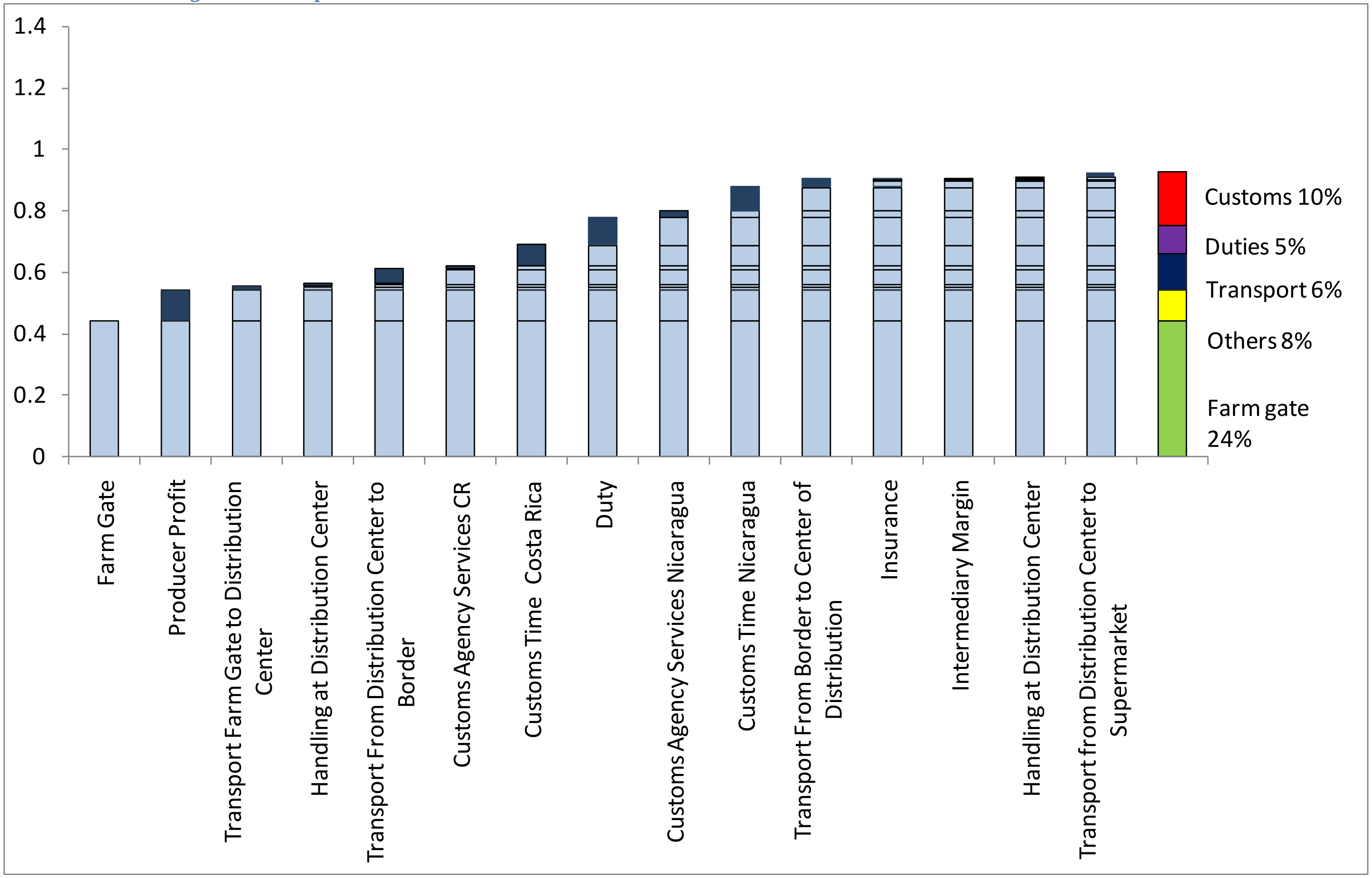
ANNEX II. Cost Structures for Selected SCAs

Cost Structure 1. Small Tomato Exporter



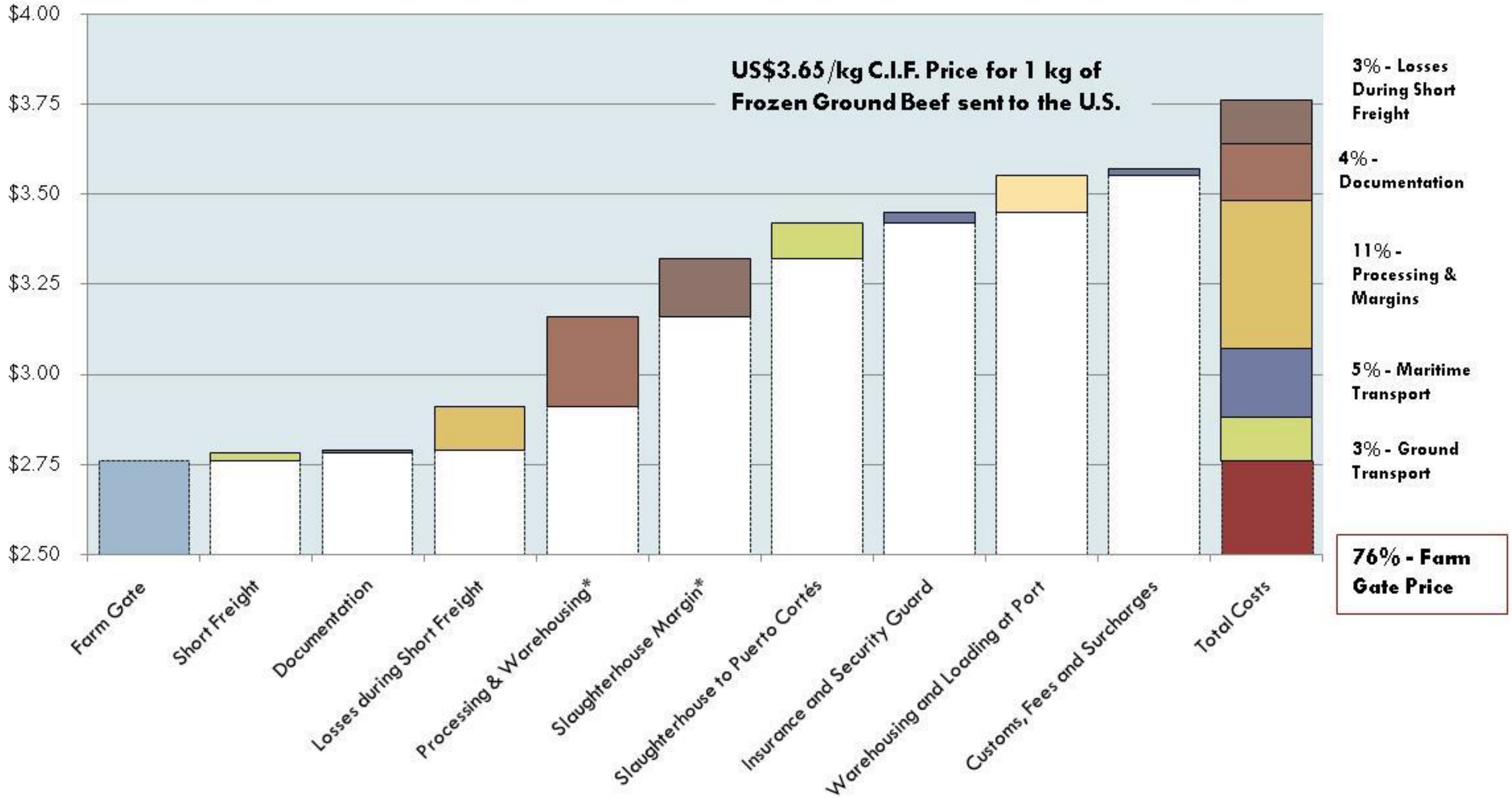
Small Exporter	Additional Cost US$/Kg	Cumulative Cost
Farm Gate	0.47	
Producer Profit	0.05	0.52
Intermediary Margin	0.08	0.60
Transport Farm Gate to Distribution Center	0.01	0.61
Handling at Distribution Center	0.00	0.61
Transport from Distribution Center to Border	0.14	0.75
Customs Agency Services Costa Rica	0.02	0.77
Customs Time Costa Rica	0.06	0.83
Duty	0.10	0.93
Customs Agency Services Nicaragua	0.04	0.97
Customs Time Nicaragua	0.06	1.03
Transport From Border to Center of Distribution	0.08	1.11
Handling at Distribution Center	0.03	1.14
Transport form Distribution Center to Open Air Market	0.03	1.17
Handling Losses	0.05	1.23
Storage	0.00	1.23
Retail Cost	0.05	1.27
Retail Profit	0.23	1.50

Cost Structure 2. Large Tomato Exporter

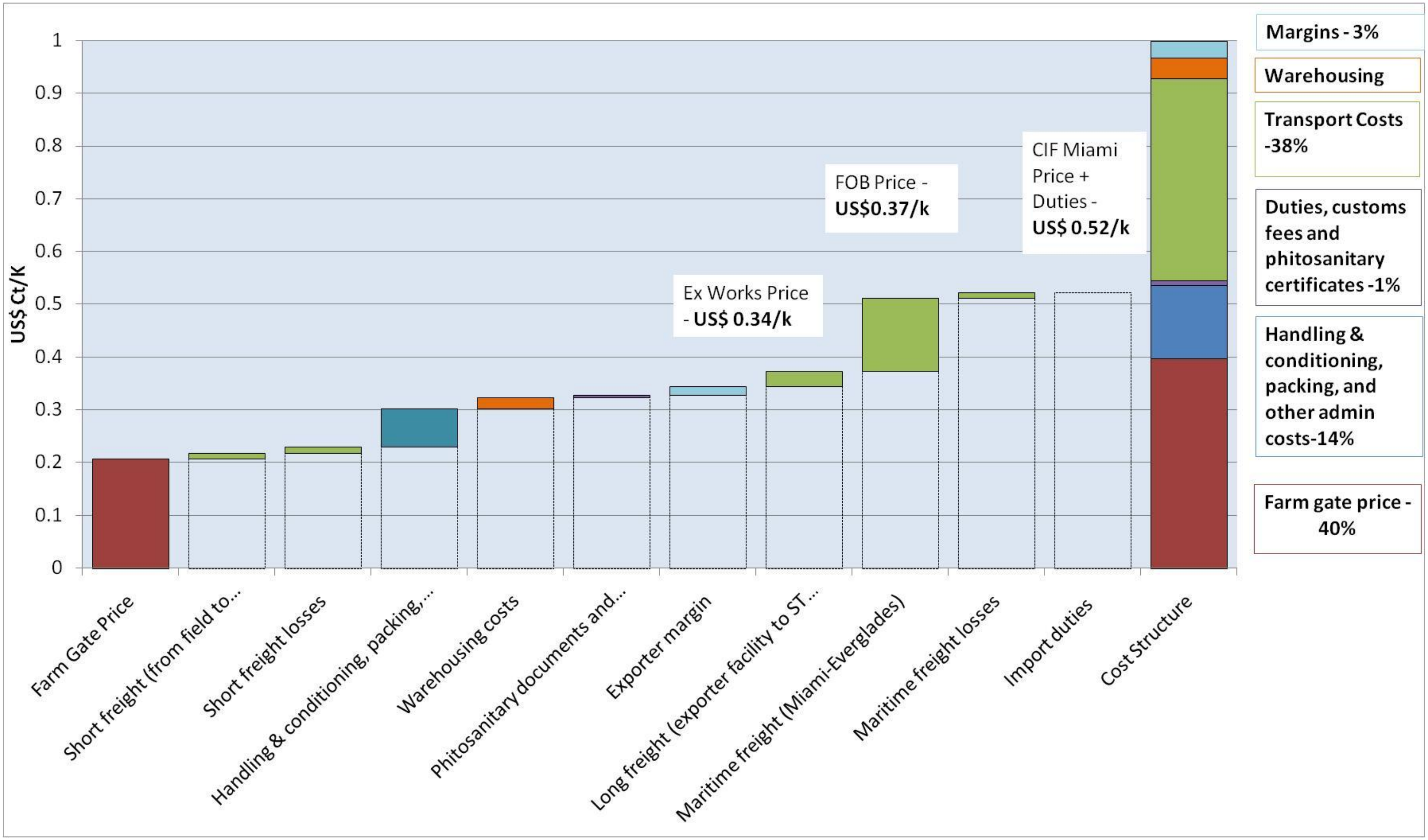


Large Exporter	**Additional Cost US$/Kg**	**Cumulative Cost**
Farm Gate	0.44	
Producer Profit	0.10	0.54
Transport Farm Gate to Distribution Center	0.01	0.55
Handling at Distribution Center	0.01	0.56
Transport From Distribution Center to Border	0.05	0.61
Customs Agency Services CR	0.01	0.62
Customs Time Costa Rica	0.07	0.69
Duty	0.09	0.78
Customs Agency Services Nicaragua	0.02	0.80
Customs Time Nicaragua	0.08	0.88
Transport From Border to Center of Distribution	0.03	0.90
Insurance	0.00	0.90
Intermediary Margin	0.00	0.90
Handling at Distribution Center	0.01	0.91
Transport from Distribution Center to Supermarket	0.02	0.92
Retail Cost	0.60	1.52
Retail Profit	0.31	1.83

Cost Structure 3. Nicaragua Beef Supply Chain

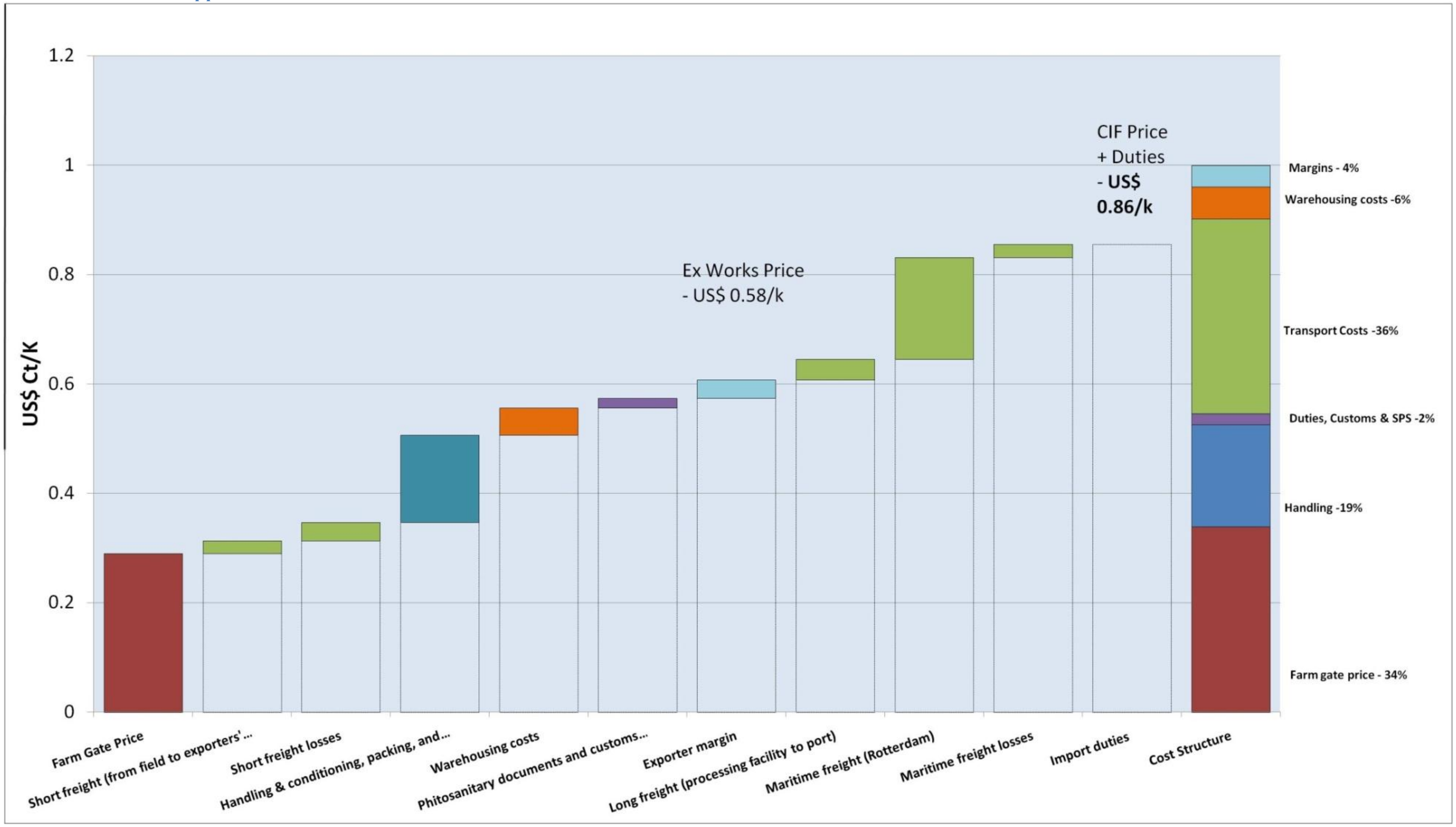


Cost Structure 4. Snow Peas from Guatemala



Source: Interviews with Supply Chain actors, 2010.

Cost Structure 5. Pineapple from Costa Rica



Annex III. Supply Chain Methodological Note

Supply Chains vary in the importance of specific movements, procedures and steps, as well as the power and responsibilities of individual actors along the chain. While selection criteria, surveys, results and their presentation, as well as conclusions are likely to vary greatly, the following methodological note presents a framework for performing SCA which will ensure some comparability across supply chains, particularly in terms of the type of information collected, as well as some advice for troubleshooting.

The Supply Chain Analysis Methodology used for this report can be divided into 5 stages:

1. Product Selection
2. Preliminary Analysis
3. Data Collection
4. Data Analysis
5. Presentation of Results

Please see Table 1 for an illustration of the time and tasks related to each step.

1. Product Selection

Selecting the supply chain product requires the development and application of objective criteria, careful review of trade data and consideration of several different product candidates. Data concerning trends in trade and land use, in addition to consultations with experts from the ministry of agriculture or chamber of commerce, are helpful to inform the selection process[46].

High Relevance & Low Connectivity

For exports, relevance can take on one of two meanings: a primary export relative to others in terms of volume or value per year, or identified as a high-potential product with excellent growth potential. Relevance for an import product candidate means that the crop is a staple good with a low price elasticity of demand, and either a history of high imported volume, or recent growth in imported volumes.

In terms of connectivity, qualified product candidates are those produced in zones far removed from main transport corridors. A long or awkward path to market allows the SCA to better illustrate the logistics barriers faced by rural producers or consumers for the region or country in question. Low connectivity often means that poor road quality, long wait times at inefficient ports, or complicated phytosanitary reviews at border-crossings complicate the route to market, in addition to limited access to primary roads.

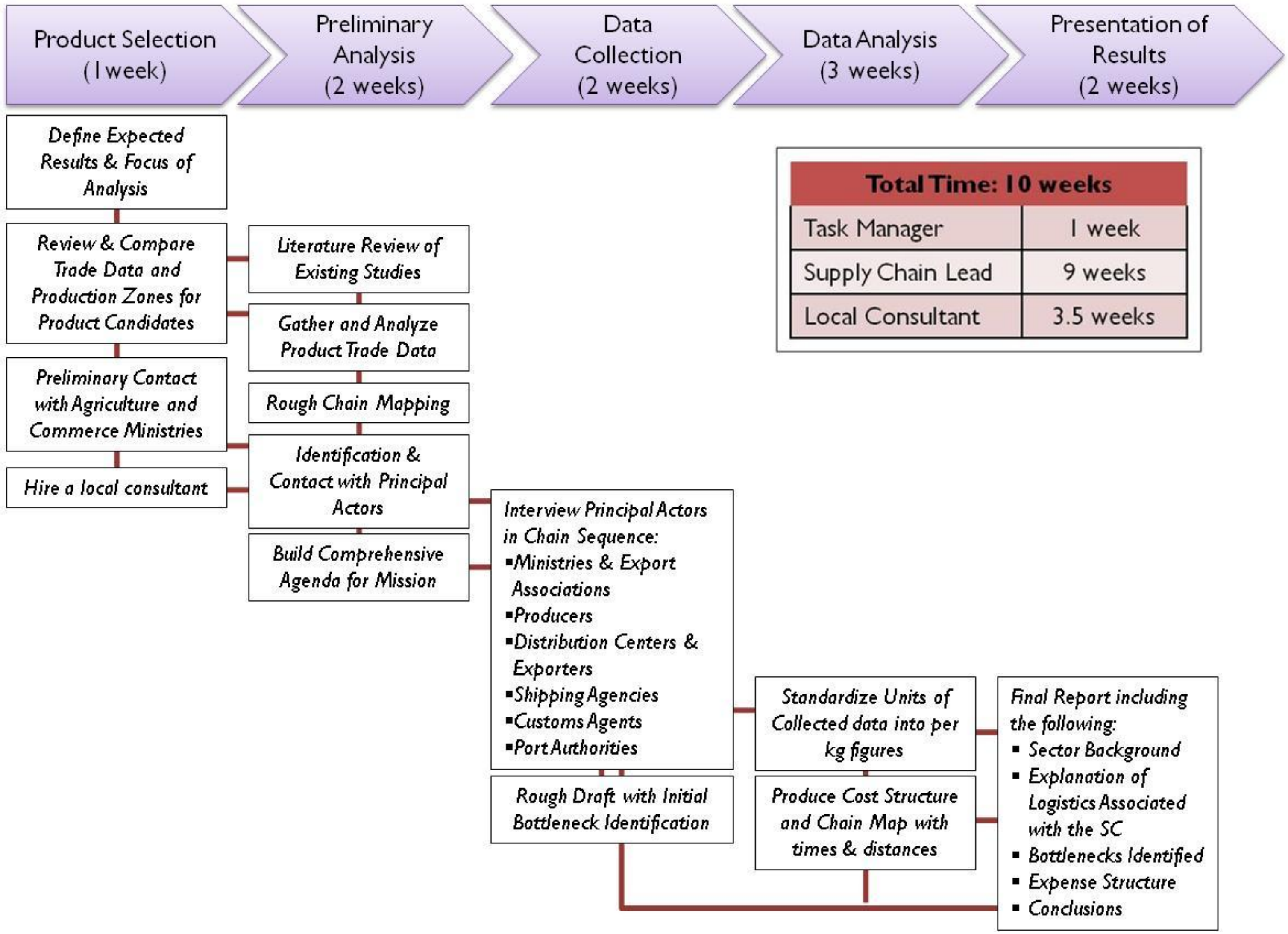
[46] Often as a condition for execution of the analysis, governments insist on particular goods of interest. Wherever possible, it is best to develop objective criteria to independently determine product selection.

Product selection should take into account the number of potential constraints presented along the most likely path to market. Potential constraints enrich SCAs by answering questions about different types of infrastructure and services encountered along the way, they include:

- More than one transport leg, with multiple cases of loading, unloading and cargo consolidation.
- Delicate products that need protective packaging
- One or more border-crossing
- Sanitary/phytosanitary inspection
- Include a strategic port of exit/entry

Ultimately, SCA products should be chosen to illustrate the trade-offs that exporters must make in terms of costs, time, distance, and potential losses – actual barriers to competitiveness. For example, the maritime journey for grain imports from the U.S. to Nicaragua is four times as long as that for grain imports into Honduras; importers prefer to travel through the Panama Canal and make landfall at Nicaragua's Puerto Corinto, rather than navigate the logistics and phytosanitary hassles or brave the unpredictable, poor-quality road network and slow border-crossings associated with making land fall in Honduras.

Table 1. Supply Chain Analysis Process Map



Strategic Group Product Selection

SCAs are often conducted together for a set of products, in order to provide a basis for comparison and improve understanding of quantitative results. The same export may be studied for a variety of countries to compare regional logistics costs and times, or to identify a regional benchmark. Key exports and imports may be studied together to contrast the efficiency of their paths. To compare challenges of intra-regional commerce to those of extra-regional commerce, SCAs may unveil the costs and times associated with the movement of one product to two different export markets. Together, SCAs for identical goods coming from both a small and a large firm may be used to quantify the advantage of scale in a particular economy.

Implications for Poverty Reduction

The SCAs seek to identify those logistics barriers that have a disproportional effect on the poorest producers and consumers, by selection products with an eye towards market structure. On the producer side, goods produced by small firms or farms in remote production zones face the greatest barriers to international markets, and are of particular interest. Product selection therefore requires a preliminary analysis of the market structure, with a focus on large numbers of small producers, as opposed to cash crops produced by large multinational firms.

On the consumer side, staple goods, like basic grains, for which logistics costs make up a large share of the market price, are also excellent candidates for this type of analysis. Also important is spoilage; small producers of highly perishable products confront often insurmountable obstacles in reaching final markets. For these products, time spent in transit is of crucial importance.

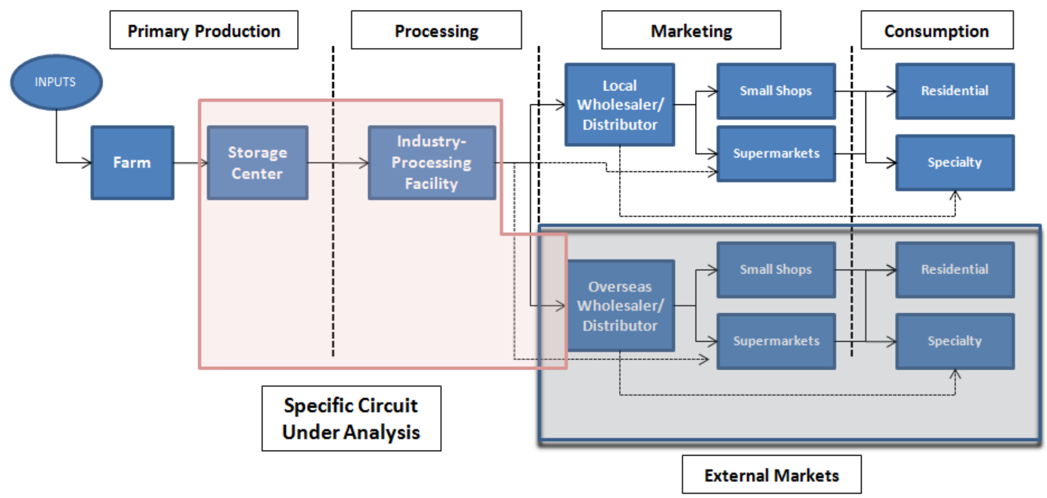
Kunaka (2008) rightly notes that, though SCA is a helpful analytical framework for understanding vertical relationships, across levels of commerce from local to global, it leaves unexplored the horizontal relationships between producers of the same level. A netchain analysis, focusing on networks of producers on the same level, can more profoundly explore how cooperation and coordination can cut costs and increase profit margins for small producers, and is a fitting complement for SCAs that focus on poverty reduction.

2. Preliminary Analysis

Exporter organizations, government ministries and producers are more willing to cooperate with teams that show a genuine interest in the chain and have done some background work. Preliminary research should (i) identify key actors, including local counterpart(s), as well as geographical production zones; (ii) uncover trends in export/import data, especially related to country markets, transit routes, and ports of entry/exit; (iii) understand the market structure, including the breakdown of producers by size, and conduct a preliminary mapping of the chain.

Example of Supply Chain Mapping

Snow Peas Exported to the United States from Guatemala



Source: LCSSD Economics Unit, 2010

Preliminary analysis shows how well selected producers, exporters, and shippers typify the movement of the selected product.[47] Consultations with industry organization *must not* be the first attempts to understand the structure of the chain. Individual actors, and particularly small producers, may understand how they relate to 1 or 2 other actors, but have only a vague idea of the overall structure of the chain.

Local Counterpart(s)

Strong local partnership is essential along two main fronts including (i) promotion of country-ownership, so that the products to be studied are considered relevant by the client countries and the results informative and useful and (ii) adoption of the supply chain methodology so that countries themselves can continue to make use of it and periodically evaluate transport and logistics bottlenecks in-country through the use of this and other logistics performance tools.

Caution and mindfulness are encouraged when partnering with public sector entities. Individual public institutions may represent particular special interests, and solicit the analysis with predetermined expectations for the outcome; they and may try to exercise some control over the results according to a subjective point of view. It is best to interview private sector entities without accompaniment of government officials to avoid any influence that may introduce a bias in the SCA findings.

It is strongly encouraged to hire a local consultant with some experience in the industry of interest, and a demonstrated knowledge of the production zone. A local consultant may both 1) organize meets

[47] Though supply chain analyses are not meant to be representative, it is still important to choose products that can serve as ambassadors for the largest body of exports. For example, it would not be prudent to choose a manufactured good exported from a country that primarily exports perishable agricultural products.

through previous contacts with producers 2) facilitate meetings with producers and 3) help anticipate and prevent logistics inconveniences for the analytical team before the mission and while in the field. Local knowledge is essential for those supply chains that require travel to remote rural areas. This individual should not be an expert on supply chains, but an expert on the industry of analysis, familiarized with production zones, and well-connected within the industry.

3. Data Collection

Comprehensive surveys should be developed for each actor in the chain, according to the type of information likely to be obtained in each interview. Interviews should be scheduled with actors that are receptive and relevant. In many cases, such as with customs agents, information required is readily available on the web. For a comprehensive list of data by actor, please see Table 2.

Expenses, times and distances should be collected for the movement of the product from the farm gate to the port of exit; in the case of extra-regional exports/imports, it may also be necessary to include the maritime transport costs. Logistics costs can be organized into three main categories: transport costs, warehousing costs, and information costs, including the costs for circulation documents and customs expenses. For a detailed list of all expenses related to logistics, please see Annex II.

Identifying Silent Bottlenecks

Interviewees will not report so-called "silent bottlenecks", which have a small and predictable effect on individual products, but a large effect at the aggregate level; these hindrances to trade are more difficult to identify without a regional/global benchmark or comparative perspective, and can only be roughly estimated. For example, the absence of a bridge could be preventing several small producers from entering the market, expanding their operations, or producing new crops; at the industry level, it may add hours to travel times and increase maintenance costs for all agricultural products traveling that route; at the national level, the absence of that same bridge may impact overall competitiveness and influence private investment decisions. Silent bottlenecks include the following:

- Actual transit speeds are slower than road design speeds.
- Comparatively high costs for ground transport services.
- The absence of a bypass around an urban area.

Indirect route preference due to poor quality of more direct roads, absence of bridges, etc.

In order to accurately identify constant bottlenecks (1 & 2) and estimate their impact, it is essential to diligently gather information on costs, speeds, times, distances, and identify traveled routes for each segment of the chain. In fact, the primary value-added of the analytical team is to complement local knowledge by lending context and regional perspective to the logistics for the SCA. To measure missing infrastructure barriers, multi-year investments in transport infrastructure could plan for an impact evaluation that can actually measure the increase in trade of individual products on a case-by-case basis.

To ensure successful data collection, it is important to interview actors in sequence on the chain, interview at least 3 of each type of actor, check for consistency in the data collected, and interview in teams of at least 2 people. Surveys should be tailored to suit individual actors and designed with more qualitative and general questions at the beginning, and requests for more sensitive information towards the end; they should serve as a guide to a more casual, conversational interview, and should never be emailed in place of a face-to-face interview[48]. Please see some examples of surveys to guide interviews at the end of this section.

Important Considerations for Interviews

The good will and cooperation needed on the part of the producers, exporters, and shipping lines should not be underestimated. In many cases, actors are entirely unwilling to share sensitive information, particularly when it comes to margins, prices and costs of production. Though much of this sensitive can make an SCA much more robust, it is often not entirely necessary to collect; establishing and maintain a good relationship with actors on the chain is more important than collecting profit margin values.

In other cases, actors may feel uncomfortable openly refusing to share information, and instead provide incorrect information. It may be the case that the most amicable of interviewees is also the least informed; those that are overly willing to share information should not be the sole source of data for any given step along the chain.

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[48] Emailing the survey is appropriate in two cases: 1) to provide a future interviewee with an idea of what to expect, giving them a chance to prepare; 2) after an interview, to clarify, or get more comprehensive data in written form.

Encuesta Agente Aduanero

Nombre del/ la Agente:
Datos de Contacto:
Cargo del/a Encuestado/a:
Ubicación:
Tipo de Productos que Maneja Normalmente:

Sección I. Informacion del Sector

Cuantos Contenedores de productos lacteos cruzan la frontera cada semana?

La mayoria vienen de una sola empresa? O vienen de varias empresas distintas?

Cual es el producto mas comun que se ve en su trabajo?

Vienen en contenedores refrigerados sobre todo?

De cuanto es la capacidad del vehículo?

Como funciona el negocio? Quienes contactan a Usted para transportar los bienes?

Seccion II. Lista de Documentos

Cuales son los documentos que tienen que entregar para poder transportar el producto?
Hay algun costo relacionado con cada documento que tienen que pagar alli en aduanas?

Documento	Costo?	Agencia que lo emite

Seccion III. En General

Desde el momento en que llega un contenedor a la frontera, mas o menos, cuanto tiempo toma para que salga por el otro lado?
De ese tiempo, cuanto pasa el contenedor:
- Esperando en una fila?
- Procesando documentos en aduanas?
- Pasando por una inspeccion?

Hay un sistema, o un carril que permite que los bienes perecederos pasan antes que otros tipos de bienes?

Seccion IV. Inspecciones

Inspeccionan los productos muy seguido?
Como es el proceso cuando realizan una inspeccion del producto?

Tienen instalaciones refrigerados para realizar la inspeccion? O la hacen en el aire? Donde lo hacen?

Esta claro las razones por las cuales inspeccionan los bienes, o parece que lo hacen aleatoriamente?

Cuando inspeccionan los productos, tienen que mandar una muestra a un laboratorio?
cuanto tiempo tardan en emitir los resultados?

Los contenedores esperan en algun lugar? Por cuanto tiempo?

Hay algun costo relacionado con esta espera?

Cual diria usted que es el problema mas grande que enfrentan los exportadores de leche desde Honduras?
en terminos de la logistica?

Cual es el proceso que mas trabas implica para su trabajo, como agente aduanero?

Los costos por los servicios de los agentes aumentan con la incidencia de inspecciones/problemas en la frontera?

Cual es el costo del sevicio por contenedor (si me puede estimar un rango, esta bien)?

Encuesta Exportador Planta Procesadora de Productos Lácteo

Nombre de la Empresa: ______________________________
Nombre del Encuestado/a: ______________________________
Datos de Contacto: ______________________________
Cargo del/a Encuestado/a: ______________________________
Ubicación: ______________________________

Sección I. Desde la Finca hasta la Planta (Verificación de datos del productor)

Cuanta Cantidad de leche viene a la planta cada semana?
La mayoría de los productores son pequeños, medianos o grandes?
Intenta definir un rango para pequeño, mediano y grande
Como se transporta la leche?
De cuanto es la capacidad del vehículo?
El servicio de transporte se paga la planta o los productores mismos?
En caso de productores mismos: Usted sabe mas o menos cuanto cuesta el servicio de transporte?
En caso de la planta: Como cobran por el servicio de transporte?
Donde se ubican la zona de producción de donde viene la mayor cantidad de leche?
Tiempo promedio del viaje desde esta zona: _____________
Distancia estimada (en kms) desde esta zona:____________
Cual es el precio que ustedes pagan en este momento por litro de leche?
Este precio algún tipo de impuesto? Servicio de seguridad? Tarifa relacionado al transporte?

El precio que ofrecen es competitivo en el mercado? O tienen mucho competencia con productores de queso artesanal?

Sección II: Definición del Producto y Exportación

Cual es el producto de mayor volumen que producen para la exportación? ______________________________
Temporada de mayor producción (meses) ______________________________
Cuanta Leche se necesita para producir 1 unidad de ese producto? ______________________________

Cuanto de este producto exportan a la semana? ________ al mes? __________ al año?
Cuales son los principales destinos para este producto?
De estos destinos, que porcentaje estima usted que va a El Salvador?
La cantidad que se exporta se ha mantenido estable en los últimos años? O varia mucho?

Sección III: Almacenaje, Empaque y Transporte Terrestre

Después del proceso, cual es el tiempo promedio que espera el producto en las instalaciones de esta planta, antes de salir para su destino final?
Cuanto tiempo toma para cargar un vehículo de producto? Tienen maquinaria para eso?

Cuando se vende este producto, como viene empacado?
El empaque para el mercado local es distinto al empaque para el mercado local?
Cuanto cuesta, por cada unidad, la caja/bolsa, etc. del empaque?
Estos productos del empaque son productos nacionales, o los importan de otro país?

Que tipo de vehículo se usa para transportar este producto?
Cuanto producto normalmente se transporta dentro de cada vehículo (un promedio)?
El vehículo siempre va lleno? Regresa vacío?
Como la planta consigue estos vehículos?
Son propietarios de #___________
Los alquilan______________
Incluido en el costos del servicio de transporte_____________

Sección IV. La Ruta
Cual es el puerto de salida (que sea frontera o puerto marítimo) que mas se usa para recorrer este tramo?

Desde salir de la planta hasta llegar al primer destino (centro de acopio, almacén, etc.):

Tiempo Total:	
Distancia Estimada:	
Tiempo promedio de espera en la frontera:	
Costo Total del Servicio de Transporte:	
Quien lo paga:	

11. Que tipo de camino es?

Carretera en Buen Estado		Distancia promedio		Tiempos	
Vía Secundario Pavimentado		Distancia promedio		Tiempos	
Vía Terciaria, no pavimentada		Distancia promedio		Tiempos	
Otro: ____________________________					

Donde pesan el producto? Hay sistema de bascula en el pais?

Como esta la ruta durante la época de lluvia? Han tenido que cambiar la ruta en años recientes?

Sección V. El Precio

Cual es el precio total de un lote de este producto?
nde? _______ Ex-Works ________F.O.B. ________C.I.F. ________ Otro:______________
Cuantos litros/libras/kilogramos vienen en cada lote?

El precio se ha mantenido estable en los últimos años?

Table 2. Actors & Data Collection

Reference Table of Actors and Data for Mission Planning					**PS = Product Selection, PA = Preliminary Analysis DC = Data Collection, PR = Presentation of Results**
Actor	**Stage**				**Information to Obtain** **(What you can expect to retrieve)**
	PS	**PA**	**DC**	**PR**	
Ministries of Agriculture	X	X		X	· Production, trade, and consumption statistics
Agricultural Research Institutes		X	X	X	· Price data at wholesale markets in the country/Producer prices/Farm-gate prices
		X			· Data on farm sizes and producer participation
		X		X	· Land use maps
	X	X			· Existing Studies of the Selected Industry/Product
		X	X		· Producer contact lists
Ministries of Trade and Commerce	X	X		X	· Trade data by volume and value
Trade Promotion Agencies			X	X	· Import duties
Export Promotion Agencies		X			· Market analysis studies by product that may help with the chain's mapping
Exporter Associations		X	X	X	· Guides detailing export requirements by product
			X	X	· F.O.B. prices by product
			X	X	· C.I.F. prices by product
				X	· Estimated retail prices at destination markets
			X	X	· Main bottlenecks for exporters
		X			· Contact list of exporters/importers
			X	X	· Main logistics and transport bottlenecks
Ministries of Transport and Planning			X	X	· Domestic shipping routes
			X		· Quality of road data
				X	· Road Infrastructure Investment Information
			X		· Road maps & circulation speeds
Producers			X		· Farm gate prices
Producer Associations			X		· Logistics bottlenecks faced by producers
			X		· Transport costs from farm to packaging plant/distribution center
Exporters			X		· Terms of trade (Ex-works, F.O.B, C.I.F)
Intermediaries			X		· Transport costs from farm to packaging plant/distribution center
			X		· Handling and packaging costs
			X		· Warehousing/inventory costs
			X		· Domestic shipping costs
			X		· Customs costs
			X		· Phytosanitary costs
			X		· Transit Times
			X		· Losses during land transport legs
			X		· Estimated producer, intermediary, exporter, importer margins
			X		· Estimated C.I.F. price at destination market
		X			· Contacts brokers/importers/shipping services/shipping lines/customs agents
Customs Authorities			X	X	· Border Management and sources of delay
Customs Agents			X		· Documentation
			X		· Customs service and time costs
Phytosanitary Authorities			X		· Phytosanitary costs
Trucking Companies/Associations			X		· Internal transport costs (service and time)
				X	· Levels of competition in the trucking industry (further surveying required)
			X	X	· Routes
			X	X	· Main bottlenecks in domestic transport
Shipping Lines/ Shipping Associations			X		· Maritime shipping costs (service and time)
			X		· Domestic shipping costs* (service and time)
				X	· Competition of shipping lines
			X	X	· Routes
			X	X	· Main bottlenecks at the port
			X		· Port dwell time
Port Authorities			X		· Port costs (port tariffs, dwell time, stevedoring charges, drayage)
			X		· Vessel Turnaround time
Importers			X		· Main bottlenecks at the port
			X		· Losses

Source: Author's Own

4. Data Analysis

Data collected from interviews should be used to produce the following interconnected products: (i) summary of identified logistics bottlenecks; (ii) a structure of logistics expenses; and (iii) a supply chain map, including times and distances for the most important transport legs.

A summary of logistics bottlenecks should be written immediately after the field visit and include a 3-5 sentence description of logistics bottlenecks that were mentioned more than once by principal actors. Later, data will be organized and designed to provide quantitative support to these conclusions. Also, keep track of what information came from whom, in order to ease follow-up and maintain good relationships with clients.

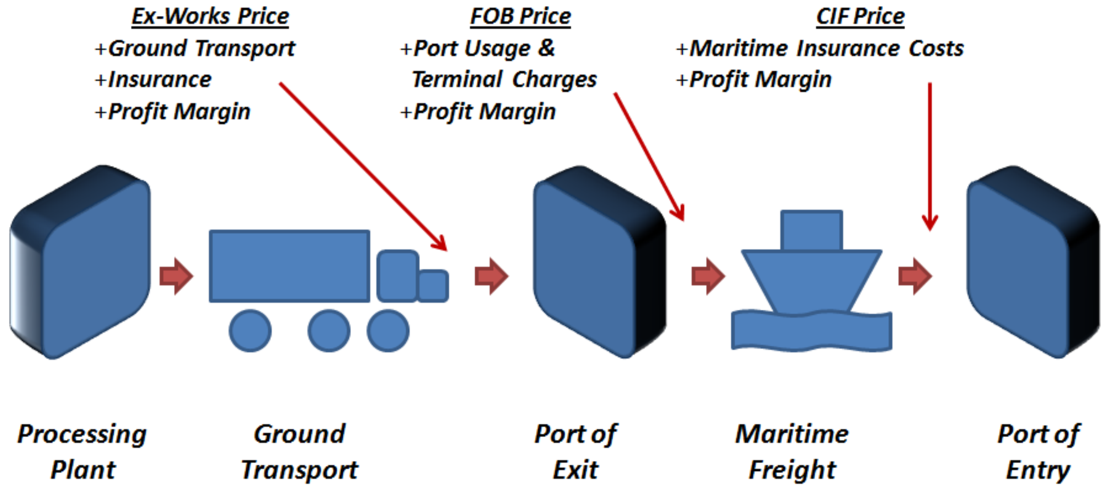
Data must be collected on prices, margins, production expenses and logistics costs for each segment of the chain. Logistics expenses can be organized into a few principle categories (see Annex III). Expenses per kg must be calculated and organized according to transport leg and type of expenses. Final expenses should be presented both in US$ and as a percentage of the final price of the good.

Most audiences are accustomed to seeing logistics expenses presented as a proportion of the final price, though this can be very misleading for very low-value and high-value goods. Wherever possible, logistics costs should be shown relative to logistics costs for different goods on the same route, the same good on a different route/from a different country, or against a benchmark for the same good to avoid any misinterpretation of results. For an example of logistics costs structures, please see Annex V.

Determining the Price

To show logistics expenses as a proportion of the price, the appropriate figure for the denominator must be that which corresponds to the logistics costs included in the total calculation of logistics expenses. The box below depicts the location of these prices along the supply chain; for a richer explanation, Lam (2006) and Vitasek (2006) both detail the components and meanings of common price terms.

Terms of Trade: Components of Logistics Costs



Author's Own using Lam (2006)

Getting accurate information on price for processed products, such as a particular cut of frozen ground beef, a particular quantity of cream can be very tricky – yet another reason to present logistics costs in a variety of forms, rather than relying solely on their presentation as a percentage of the final price. A close proxy can be used from official documents. The Department/Ministry of Agriculture or Finance, or an export promotion agency could likely provide an annual or monthly average F.O.B. price for a particular product category.

Managing Documentation Costs & Times

Required documentation for export can be not only a logistics bottleneck, but also a significant barrier, particularly for small producers of agricultural products. Every time a product changes hands, official documentation reports on the product's origin, volume and value. Common documents for export may include the following:

- Certificate of Origin (producer, with official signature)
- Export Permit (authorized public agency)
- Bill of Sale
- Packing List (exporter)
- Bill of Lading (Shipping Agency)

Foreign Exchange Authorization, issued by the Central Bank, is also often required for high value products. Agricultural products often require a phytosanitary or zoosanitary inspection certificate.

When interviewing actors about documentation, it is important to ask questions not only about the number and cost of necessary documentation, but also the process. The time that it takes to issue a particular permit or certificate could have a profound impact on the regularity, dependability, and volume of a particular export.

Template for Managing Documentation

	Documents to Export	Issuing Entity	Time (in hours)	Cost per container	Notes
1	Bill of Lading				
2	Customs Declaration				
3	Commercial Invoice				
4	Foreign Exchange Authorization				
5	Packing List				
6					
7					
8					
9					
	Total			$ -	

Author's Own

Documentation bottlenecks are likely to be representative at the national level, effecting exports of all similar products. For example, a phytosanitary inspection certificate is required for all agricultural products. Producers often must send a sample to an approved laboratory to perform a series of residual and microbiotic analysis before the product can be deemed suitable for export. Where an SCA uncovers a bottleneck with phytosanitary inspection certificates, it is likely that this bottleneck is a burden for all agricultural products to varying degrees, not just the product under study.

Accounting for Time and Uncertainty

Logistics decision-making at the product level involves a complex set of factors and a variety of implicit trade-offs. SCA must attempt to account somewhat for the interplay between time, distance and uncertainty, in addition to expenses related to a particular path to market.

Time to trade imposes a number of additional costs on exporters which vary in character and degree according to the product. For non-perishable, tine-insensitive products, delays often result in increased logistics expenses for labor, fuel, and storage. Inventory-holding costs include the capital cost of goods in-transit, as well as larger inventories held as physical insurance against uncertainty. These costs vary widely according to the value and time-sensitivity of the good, which determines the likelihood and usefulness of having buffer inventory at common destinations (Hummels, 2001). For example, grain storage is common at some ports in Argentina, where exporters have experienced disruption to their supply chains as a result of labor strikes. Storage costs do not play a significant role in supply chains for perishable products. Depreciation costs include a loss of actual product or product value, whether from spoilage, loss of value for time-sensitive information products, such as magazines, in addition to the increased probability of losing some or all of the good for each additional day that it remains in transit.

The most commonly used methodology for measuring time costs comes from Hummels (2001), in which the author estimates the magnitude of time costs by analyzing variation in the use of air or ocean freight for across exports and manufactured goods. An exporter's willingness-to-pay for one day of time savings is estimated at around .8% of the final price for manufactured goods.

In Christ and Ferrantino (2009), the authors evaluate the potential impact of investments in infrastructure and logistics services by analyzing the effect of uncertainty on the composition of exports for Sub-Saharan Africa, as well as logistics decisions made my exporters. The authors conclude that the value of time calculated in Hummels (2001), is an overestimate for time costs alone, but appears to accurately reflect the combined value of implicit time costs and an uncertainty penalty.

For tomato supply chain from Costa Rica to Nicaragua, interviewees reported that a tomato's lifetime is equal to 5 days or 120 hours, from the time it is picked at the farm gate until it perishes at the shelf. Knowing that a shipment of tomatoes waits 3 hours on average at the Costa Rican side of the border, these three hours represent 2.5% of the tomato's total lifetime. Assuming that this loss in the tomato's lifetime is directly proportional to the loss in product sales upon arrival at the final retail point, multiplying this number by the final price of the tomato- note different final prices for the small and the large exporters- can provide a proxy for time costs at the border in monetary terms (Annex V).[49] This method is imprecise, because a tomato does not spoil in consistent and linear way through time. Still, due to their extremely perishable nature, this method was deemed adequate for this product.

Best and Worst Case Scenarios: One way to illustrate reliability

These SCAs develop a snap shot of the movement of a product in a particular moment in time, and cannot capture the probability of extreme time delays and product loss over the course of a year of exportation. In order to measure the possible impact of extreme delays and losses on logistics costs, the Nicaragua beef chain present both a "Best Case" and "Worst Case" Scenario. The Best Case Scenario includes logistics expenses associated with the movement of the product under good conditions, accounting for regular and expected losses reported along the chain. The Worst Case Scenario includes a valuation of the following costs: (i) actual loss of product, corresponding to the 'least fortunate' of producers interviewed; (ii) loss of product value, and thus producer/exporter revenue; (iii) value of time costs due to delays; (iv) increased logistics expenses related to labor, fuel, and storage, in the case of a delay.

To some extent, the Worst Case Scenario reflects the domino effect of delays on the rest of the chain, and the frequent compounding of explicit and implicit costs relating to logistics bottlenecks. For example, delays in the transport of cattle to market often leads to longer waits at the reception corral, greater loss of cattle weight and a lower final price for the producer.

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[49] For the LCSSD Central America SCAs, the characteristics of the selected good determined the appropriate methodology for time valuation. For perishable agricultural goods (tomatoes, pineapples and snow peas), the value of time was measured according to the shelf-life of the product, confirmed by matching with reported losses in interviews. For frozen beef exports from Nicaragua, which, when frozen, have a useful life of up to one year, the Mummels (2001) time value was applied.

Reported transport service costs often conceal time and uncertainty costs. For example, increased logistics expenses related to labor, fuel, and storage are often already factored into the reported cost of transport; shipping companies set the price for transport services intentionally high to cover the risks associated with related logistics hurdles. To the extent possible, the analytical team must gather information on which party pays the transport costs, which sets the price, and what delay expenses are incurred by whom.

5. Presentation of Results

Results are typically presented in three ways: as a list of logistics bottlenecks, ordered in terms of their contribution to logistics costs or reliability of the supply chain; and as a cost structure, per kg or container, showing the contribution of each step to overall logistics costs, as well as, in some cases, the final cost of the product (see Annex II), and; as a structure of time along the chain, showing which steps take the longest or are most likely to lead to further delays along the chain. Where administrative barriers play a role, a list of documents, as well as corresponding costs and times may also be important. Examples of these and other techniques are included throughout the preceding chapter.

Common sense, as well as a rooted understanding of the relationships and power dynamics along the chain should be used to guide the presentation of results. In particular, for the first leg of the chain, logistics costs may be presented as a proportion of the producer price received in order to show how the burden varies depending on the stage and the actor. Great caution should be taken to state and restate the type of actor on the chain reporting each bottleneck, as well as the number interviewed, so as to avoid drawing sweeping conclusions from a sample that is not representative. When speculating on the representativeness of the supply chain, it is important to think critically about product groupings – by region, time-sensitivity, market structure, or procedural needs.