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A WORLD BANK STUDY



Logistics in Lagging Regions

OVERCOMING LOCAL BARRIERS TO
GLOBAL CONNECTIVITY



THE WORLD BANK

Charles Kunaka

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Overcoming Local Barriers to Global Connectivity

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THE WORLD BANK
Washington, D.C.

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Executive Summary

This report is based on two case studies carried out in Brazil and India on the impact of various strategies to reduce the cost of trade for small-scale producers. Small-scale producers especially those located in lagging regions in developing countries lack easy access to efficient logistics services. They are faced with long distances from both domestic and international markets. Unless the enterprises are able to consolidate traffic volumes they can be excluded from international supply chains. However, the process of consolidation is not without cost nor does it occur on its own accord. It is typically handled by outside parties in the form of intermediaries.

However, the role of the intermediaries is controversial. In some cases, it has been shown that they exploit small-scale producers while in others they have been found to facilitate trade that otherwise would not have occurred. This paper explores the role that different intermediaries play and the impact they have had on trade costs and flows. The assessment is carried out for lagging regions in large, middle-income countries. Such countries have well developed core regions but at the same time have large areas with economic and social indicators well below the national averages. It is important that measures are taken to improve logistics services performance in the lagging regions so as to make growth and trade expansion inclusive.

The study was designed around the horizontal relationships between the small-scale producers and their vertical connections to higher tier parties involved in the same supply chain. It analyzes the cooperative approach to linking producers, the role of itinerant traders, and a newer and innovative approach to the same problem through virtual integration of farmers using modern information communication technologies. These approaches were explored by studying two separate supply chains, sisal in Brazil and soybean in India, enabling the assessment of logistics patterns from the farm gate to on-board vessel at the export gateway.

The assessment showed that small-scale agricultural producers linked through these various approaches are more integrated to international supply chains than those who are not. The intermediaries facilitate, among other things, transport services, market exchanges, payments, risk sharing, and quality improvements along the value chain. Coordination between producers enables them to manage supply chains longer than would otherwise be the case. Information asymmetry is one of the major sources of rent for some intermediaries in lagging regions. In conditions of poor information flows, supply chains are highly fragmented. Otherwise, information technology driven innovations make it easier to acquire, manage, and process information and allow closer integration between adjacent steps in the value chain. There is, therefore, greater integration of supply chains based on information availability.

The assessment of logistics performance at the sub-national level is still evolving. The more widely used, density-type indicators emphasize the infrastructure dimension of logistics but do not handle effectively the relationships and service quality attributes identified by the study. A model built around spatial and social networks is proposed to represent the horizontal and vertical attributes of logistics in lagging regions.

Based on the research findings some of the policy recommendations are outlined below:

Customize Strategies to Improve the Quality of Logistics Services. The fundamental problem with logistics services in lagging regions lies in low demand spread thinly both spatially and temporally. Special measures are necessary to encourage and facilitate consolidation of volumes so as to reduce unit costs of logistics. The strategies encompass all major dimensions of logistics, including appropriate provision of infrastructure, services, payment systems, and coordination mechanisms between producers.

Develop Core Infrastructure to Fit Purpose. The type and location of transport infrastructure has a major influence on logistics performance. Strategic investment by the public sector can signal to potential buyers and sellers to commit to market production. It also lays the foundation for the private sector to provide logistics services. Inventions that bring the factors of production nearer together by lessening spatial dispersion will tend to increase the volume of market exchanges.

Tap Private Sector Innovations. Some of the most successful interventions to reduce transaction costs for small-scale producers have been the result of collaboration between small and large-scale producers. However, this requires the development of appropriate policies and consistency in policy. Frequent changes in policy make it difficult to develop long term strategies on infrastructure and services.

Nurture Cooperation and Coordination. A distinguishing characteristic of supply chains in lagging regions is that each player manages a short segment then hands management over to the next player. As there are cost increases at each stage, the total costs for the whole value chain become very high rendering small-scale producers uncompetitive. There are proven measures to encourage coordination between individual players that help reduce costs without gaining too much market power. Such measures are founded on social systems and emerging communication technologies. The nature of intermediation is changing from exploiting information asymmetries to providing higher quality services.

Provide Training to Improve Performance. A critical factor in improving supply chain integration in lagging regions is the quality of the products flowing through the system. Training on quality requirements and expectations in downstream processes is important to improving logistics volumes. Such training should cover all aspects of supply chain management including timeliness, consistency, packaging, and handling.

There is Need to Develop New Metrics for Assessing Sub-national Logistics Costs. Existing measures of access and mobility in lagging regions focus largely on infrastructure density. It is critical to design new indicators to measure performance. Such indicators necessarily have to include the quality and cost of services. The existing measures provide some of the building blocks for the new approaches.

List of Acronyms

3PL	Third-Party Logistics
4PL	Fourth-Party Logistics
APAEB	Associação de Desenvolvimento Sustentável e Solidário da Região Sisaleira
APMC	Agricultural Procurement Corporation
B\$	Brazil Real
CONAB	Companhia Nacional de Abastecimento
CWC	Central Warehouse Corporation
DMO	Decorticating Machine Operators
DOC	De-Oiled Cake
EU	European Union
FOB	Free on Board
GIS	Geographical Information System
GSM	Global System for Mobile Communications
ICD	Inland Container Depot
ICT	Information Communication Technology
ITC ADB	ITC Agri-Business Division
LPI	Logistics Performance Index
NGO	Non-Governmental Organization
Rs	Indian Rupees
SME	Small and Medium Enterprise
SWC	State Warehouse Corporation

CHAPTER 1

Connecting Lagging Regions to Export Markets

Introduction

Developing countries are increasingly concerned about the patterns of uneven growth they are experiencing. Distinct leading and lagging regions have become more pronounced and governments are keen to explore various initiatives to engender inclusive growth. This is particularly the case in large middle-income countries, which also happen to have the largest proportion of poor people in the world. The economies of lagging regions are typically dominated by agriculture and small-scale enterprises.

Unless small-scale producers have access to efficient logistics services, they will be excluded from global supply chains. During the recent financial crisis, some enterprises in the developed world shortened their supply chains. A survey on the crisis found that more than a quarter of enterprises in North America and Europe that use third-party logistics service providers shortened their supply chains and also reduced their inventories.¹ When enterprises have minimal buffers, they have little room for error in managing their supply chains and have to rely on agile suppliers. This can work to the exclusion of producers in low-income countries who generally do not have access to efficient logistics services. The predicament of small-scale producers is compounded by the fact that most live in areas that are remote from the core economic regions within countries and are not easily accessible. As a result, both scale and geographical alienation pose the risk that large numbers of people and significant chunks of territory in developing countries remain excluded from integrated global supply chains. Obviously, this diminishes the opportunities for poverty eradication through trade.

Unless strategies are developed to improve the quality of logistics infrastructure and services at the sub-national level, then large numbers of people may not benefit from the elimination of trade barriers. It is trade logistics that allows goods to be shipped from where they are produced in one country to destination markets across the world. Enabling small-scale producers to respond to globalization is important to inclusive growth and development. Both the public and private sectors have long acknowledged the challenges faced by small-scale producers. Some innovative solutions have been designed but have met with varying levels of success. These solutions have included, among others, special postal services and express services tailored to small-scale producers. This paper contributes to the body of knowledge on how logistics services are organized in areas with thin demand and the measures that can be taken to improve the quality of services.

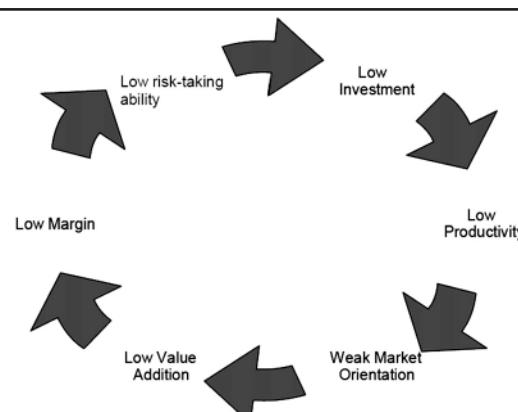
It is important to understand the constraints and weaknesses in the provision of trade-support services to nascent industries and other sectors in developing countries. The ability of producers in such countries to benefit from international trade is generally compromised by high transaction costs. Their remoteness from global and, in some cases, domestic markets is typically exacerbated by poor connecting logistics infrastructure and services characterized by high costs and unreliability. This paper is based on a scoping study of the role that different types of logistics intermediaries play in reducing such costs in lagging regions of large middle-income countries.

The High Cost of Shipping Small Volumes

According to 2010 Logistics Performance Index (LPI) data (World Bank 2010), the marginal cost of shipping one additional ton as part of a less-than-container-load shipment is on average 47 percent higher than shipping the same quantity as part of a full container load. There is, therefore, a significant premium on small volumes and this presents a major hurdle to small-scale producers who are not able to fill a container or a truck. When economies of vehicle size are important, vehicles must be operated with high load factors. In areas with thin volumes this would only be possible between hubs. Less efficient or smaller capacity vehicles are then used to feed freight volumes to the hubs or to distribute from the hubs. The high capacity hubs themselves are connected by high capacity links and services.

Logistics costs in lagging regions are high partly due to poor scale economies. The fundamental problem is one of large areas with demand spread thinly both spatially and temporally. Consequently, consignment sizes on offer are typically small. Primary farming, in particular, is characterized by small holdings. The small holdings make it difficult for farmers to obtain loans from formal lending institutions. Most often, they access capital through local money lenders, often at usurious rates. This has severe negative implications on capital formation in the sector, as it contributes to a rural capital base that is insufficient for farmers and small and medium enterprises (SMEs) to support production improvements. Farmers and SMEs are then forced into quick sales of their products, often at low prices, feeding a cycle of low capital formation (Farhoomand 2008) (figure 1).

Figure 1.1. The Farming Cycle and Low Capital Formation



Source: Farhoomand 2008.

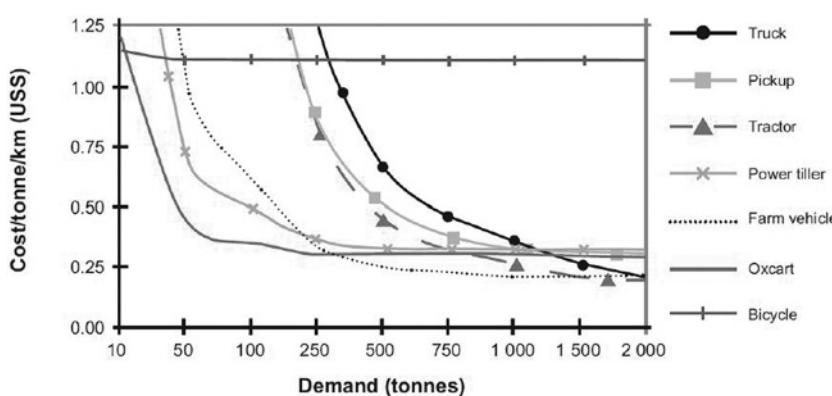
The transaction lot size determines to a large extent the unit cost of transport, given a log linear relationship to lot size (figure 1.2). As a result, small vehicles are used as otherwise larger vehicles experience high idle times, waiting for cargo consolidation. The use of small vehicles increases transport costs per unit carried. Typically, shipping by truckload costs more than by rail wagon, which costs more than unit train, which costs more than shipping vessel, etc.

Unless traffic volumes are high enough, consolidation and deconsolidation of traffic becomes important. However, the process of consolidation is not without cost. Shippers experience prolonged delays and increased costs while waiting for the volume of shipments to increase to be able, for instance, to fill a container. The consolidation of shipments is typically handled by outside parties, such as freight forwarders or shipping companies.² Given these patterns, shipments involving small-scale farmers and SMEs are subject to high unit costs.

Consolidation enables small-scale farmers and SMEs to trade beyond their immediate environments. There is a considerable amount of literature that shows that the probability of being an exporter increases with firm size (Wagner 2003) and that export intensity is positively correlated with firm size. The larger a firm is, the easier it would be for it to engage in exporting (Bonaccorsi 1992).³ However, this is often true for direct exports. There are also significant proportions of small firms that export indirectly, often through supplying inputs to other larger firms. However, some research suggests that this is only up to a certain maximum size where export intensity rises with size but beyond the limit there is a weak association. Small firms avoid international markets because they lack resources to manage market exchanges in distant locations unless they engage in some kind of cooperation to gain critical mass. Therefore, in general, small firms tend to trade locally and would not want to deal with the risks associated with exporting, while large firms have to export to increase their sales.

Evidence suggests that most global supply chains do not develop deep roots at sub-national levels and local chains do not always reach leading regions. Consequently, it is important to have detailed analysis of what happens in supply chains between small-scale producers and their integration into national and regional corridors or markets. Detailed assessment at that level can reveal the logistic constraints in sub-national areas.

Figure 1.2. Costs per ton km for Different Modes and Carrying Capacities



There is an increasing realization that deliberate processes need to be initiated to generate the virtuous cycles involving access improvements and demand generation to drive continuous improvements. The Spatial Development Initiative approach in Southern Africa and the concept of economic corridors as used in South East Asia take this approach to integrated planning aimed at promoting investment in regions that are underdeveloped but have potential for growth. These approaches involve an initial upgrading of infrastructure followed by crowding-in of further public and private sector investments and a deepening of the sub-regional economic base to support local economic development. The objective is to achieve densification from the rents from mining or agriculture that are then channeled into the provision of infrastructure and promotion of linkages to support smallholder agriculture and local SMEs. Much the same objectives could be achieved through the development of clusters or growth poles, which are, however, much more confined in geographical space.

By employing a corridor approach, investments are focused on the same geographic space to maximize development impact while minimizing development costs. The success of the approach is conditional on there being sufficient latent potential in the project locality. An example of the concept in operation is the Maputo Development Corridor linking South Africa and Mozambique where there has been significant investment in farming and mining that was unlocked by the development of core infrastructure in what was originally only a transport corridor. As a result, there have been continuous improvements to the core infrastructure, which have, in turn, generated more demand. Logistics systems at the local level, therefore, have to be seen as part of the same continuum of space leading to international trade logistics.

What are the mechanisms that are available to small-scale producers to reduce their costs of trade logistics and enable them to participate in international trade? That is the question that is explored here by focusing on the role of intermediaries who are involved in facilitating market exchanges leading to international trade.

The Challenge of Coordination and Cooperation

The logistics problems faced by small-scale producers start at the farm gate. Fafchamps and Hill (2005) found that, in agricultural markets, selling produce is more likely when the quantity to be sold is large and the market is close by. In fact, they establish that selling at the farm gate is not driven by the need for self control but by the need to minimize transaction costs. Even when selling at the farm gate is not as remunerative, farmers may not be able to afford the cost of transporting their produce to the market. They acknowledge that there has not been much research on how farmers sell their produce and what measures they can take to minimize their costs. Nevertheless, even though the evidence that is available may not be definitive, in some cases wealthy farmers are found to prefer to travel to distant markets where they can fetch higher prices. At the same time, poor farmers, who have low opportunity costs of time, also prefer to do the same.

There is need for specific logistics policy options to foster coordination at the local level in addition to those for the provincial and national levels. Exploring how coordination evolves in localized regions would be a valuable complement to the generalized approach adopted in most studies (e.g., Gonzales, Guasch, and Serebrisky 2008; Devlin and Yee 2005; Amiot and Salama 1996; Banomyong 2007). Obviously, in the absence of international border posts, service providers have greater freedom to connect locations

than they do with international transactions. As such, logistics services at the sub-national level are about network dynamics to connect nodes as efficiently as possible while minimizing cost. Further, a focus on the organization aspects of logistics and how export supply chains work (credit, service providers, brokers, warehousing, etc.) would complement the studies that focus on infrastructure and transportation issues (e.g., World Bank 2006, Gonzales et al. 2008).

Over large scales, market integration may fail to develop sufficiently to reduce transaction costs. The costs of arranging market exchanges can be so high as to prevent trade. Transaction costs include, among other things, the costs of searching for a partner with whom to exchange, screening potential trading partners to ascertain their trustworthiness, bargaining with potential trading partners (and, in some cases officials who can hold up trade) to reach an agreement, transferring the product (this typically involves transportation, processing, packaging, and securing title, if necessary), monitoring the agreement to see that its conditions are fulfilled, and enforcing (or seeking damages for any violation of) the exchange agreement. There have been numerous analyses of these costs including exploration of market approaches to organizing economic activity in terms of various forms of coordination costs or transaction costs (e.g., Coase 1937 and Williamson 1987).

Intermediaries can establish social relationships that can bridge different parties through gathering information on potential market exchanges. The advantage of intermediaries stems from the fact that market exchange is subject to increasing returns in three respects: first, information on buyers and sellers can be used repeatedly (meaning the cost of gathering information can be spread over time); second, a large number of transactions will take place, which will reduce the cost per transaction; and last, there is benefit in specialization.

Coordination costs take into account the costs of gathering information, negotiating contracts, and protecting against the risk of opportunistic bargaining (Benjamin et al. 1986). Kopicki (2010) argues that the spatial and temporal parameters that determine the economic viability of any transaction involving primary commodities is determined mainly by two items: a) production cost at the supply end and b) the transaction cost between the supply and demand ends of the chain. The higher the transaction costs, the smaller the geographical extent of the feasible market. The competitiveness of SMEs is a function of both productivity and transaction costs. Without improvements in either, it may not be possible to enhance the competitiveness of small enterprises.

Transaction costs include coordination as well as specialization. The investigation of the role of transaction costs in trade has a long history going back to Coase (1937) who argued that “the most obvious cost of organizing production through the price mechanism is that of discovering what the relevant prices are.” Generally, given that there is a cost attached to discovering, negotiating, and concluding an exchange, long-term contracts would cost less than several short-term contracts. Coase demonstrated that, all things being equal, a firm will be larger if the costs of organizing reduce with an increase in the transactions organized; the number of mistakes an entrepreneur will make does not increase with the number of transactions organized; and the lower the increase in supply prices of factors of production to firms of a larger size. The first two characteristics are typically called “diminishing returns to management.” In fact, Demsetz (1997)⁴ argues that Coase’s theory is focused more on managing coordination than it is on firm specialization.

However, transaction costs are difficult to estimate. There are only a few studies that have attempted to estimate such costs in different environments. Staal et al. (1997) found that transaction costs in Ethiopia and Kenya lead to reduced milk production. Maltoglou and Tanyeri-Abur (2005)⁵ found that, in Peru, besides transport costs and market prices, the other factors that influence quantity sold are information, negotiation, and contract monitoring costs. The general evidence from other studies suggests that apart from prices, the costs of organizing and the losses through mistakes will tend to increase with an increase in the spatial distribution of the transactions organized, the dissimilarity of the transactions, and the possibility of changes in the relevant prices. As Wagner (2003)⁶ argues, if the costs of coordination increase as the number of supplies increases, then there is a limit beyond which an enterprise becomes unprofitable. Most of the studies tend to be at the household or firm level, leaving a gap in understanding how consolidation of volumes can occur, which would also drive down logistics unit costs.

An understanding of the network economies is, therefore, critical as each transaction typically entails several logistics components. The consolidation of cargoes is an important activity in logistics everywhere. It is the only way to develop synergy with higher volume/lower cost transport services to the nearest trade gateway. Though there is some empirical evidence of this (e.g., Raballand 2010), what is often not fully explored is how such consolidation would take place. It cannot be assumed that cooperation to trade will necessarily take place on its own (Gibbon 2001). Working in Uganda, Fafchamps and Hill (2004)⁷ found that farmers do not trust each other sufficiently to empower one of them to carry all neighborhood produce to the market for sale, even though doing so would reduce everyone's costs.

One of the major considerations is access to timely information. Grabowski (1999) argues that in deciding to undertake production an individual has to have advance assurance that he will find a market; his customers are in a similar position, in that they have to assume they will find suppliers. Therefore, some external coordination mechanism may be needed to bring buyers and sellers simultaneously into market exchange leading to integration of exchange over large geographical areas.

However, in reality, the role of intermediaries is controversial. In some instances, intermediaries are seen to play a benevolent role, while in other cases, they are seen to play an exploitative one. An example of the former is Wei et al. (2003), who found a win-win relationship between farmers and traders in Indonesia, while elsewhere traders are deemed to play a detrimental role, as it is argued that they survive through arbitrage (e.g., Masters 2007).⁸

Overview of Main Findings

This report explores the various issues surrounding the above challenges and proposes some policy options to increase the quality of logistics services at the local level. The main issues are summarized below.

Lagging Regions Suffer from Poor-Quality Logistics Services

Logistics costs in lagging regions are typically high, partly due to poor economies of scale. The fundamental problem is one of large areas with low demand spread thinly both spatially and temporally. Consequently, consignment sizes on offer are typically small and unit costs of logistics are high. As a result, it should not be surprising that

lagging regions are excluded from global supply chains. Therefore, scale and geographical alienation pose a risk that large numbers of people in middle- and low-income countries will struggle to grow out of poverty. This is unless deliberate actions are taken to improve the quality of logistics infrastructure and services.

Core Infrastructure Has a Major Influence on Logistics Performance

Inadequate or inappropriate provision of core infrastructure, such as roads or storage, can be a major impediment to logistics improvements. Market failure is, therefore, a major justification for government to take the lead in the provision of core logistics infrastructure. Strategic investment by the public sector can signal to potential buyers and sellers to commit to market production. However, the public sector need not necessarily provide the entire infrastructure. A significant proportion of the storage infrastructure is provided by the private sector. It can play a facilitating role to enable private-sector investment in developing integrated commodity markets. Any inventions that bring the factors of production nearer together by lessening spatial dispersion will tend to increase the volume of exchanges and also the sizes of enterprises.

Private Sector–Driven Measures Can Help Improve Logistics Performance

Some of the most successful interventions to reduce transaction costs for small-scale producers have been the result of collaboration with large-scale producers. Where the former provide input to the latter, it has been in both their interests to cooperate. However, such cooperation is often hampered by inconsistent policy actions. Frequent changes in policy make it difficult to develop long term strategies on infrastructure and systems development. For instance, in India at the start of the food crisis decisions were made to bar private-sector enterprises from purchasing agricultural products. This led to a slow roll-out of the IT system at the core of virtual intermediation initiative. It is important that there is a certain basic infrastructure to allow some of the private sector initiatives to get traction.

Cooperation and Coordination Are Important

A distinguishing characteristic of supply chains in lagging regions is that they are highly fragmented. Each player manages a short part of the chain and then hands over management to the next player. As there are cost increases at each stage, the total costs for the whole value chain become very high and render small-scale producers uncompetitive. Associations between producers offer a potential solution to this problem. Such associations enable the producers to retain ownership of their product and to extract as high a rent as possible. At the same time, it enables them to extend the chain to the final market for their products. The Brazil case study used in this report shows that an association of farmers has been able to maintain sales outlets in its core markets of Europe and the United States.

Information asymmetry is one of the major sources of rent for intermediaries in lagging regions. Long distances and dispersed economic activities make it difficult to obtain information on market conditions and leads to erratic freight flows. IT innovations make it easier to acquire, manage, and process information and allow closer integration between adjacent steps in the value chain. There is, therefore, virtual integration of supply chains based on information availability. A major area of impact is price discovery. Producers are able to obtain information on the likely prices before deciding when to sell

their produce. Developments in mobile telephony make it easier and cheaper to provide the infrastructure for rapid information communication. The India case study shows how the development of IT infrastructure has enabled small-scale farmers to take part in international trade more than those who depend on traditional channels. Product purchased from farmers linked to the IT network is more likely to be exported than for those who do not take part. Rural supply chains can also be integrated using virtual linkages rather than just through single management.

Various intermediaries, therefore, facilitate logistics in lagging regions, but their role is different from those normally involved in international trade. At the local level, individual traders, social systems, information technology, and contract arrangements all contribute to influencing logistics flows. However, they also play other roles, including facilitating payments, which in turn affects freight-flow patterns.

Training Is Necessary to Improve Performance

There is an implicit assumption in most studies that cooperation between small-scale producers will take place on its own. This is not the case. It is necessary that small-scale producers be trained on the benefits of coordination between themselves if they are to reduce some of the costs that they face. Such training can be provided by the larger enterprises that obtain inputs from small-scale traders or by civil society. One of the critical determining factors in seeking more supply chain integration is to improve the quality of the products flowing through the system. Both case studies used here show that quality concerns are a major determining factor into developing closer relationships with upstream suppliers.

There Is Need to Develop New Metrics for Assessing Sub-national Logistics Costs

There is need to develop new approaches to estimating logistics costs at the local level. It is important to assist countries to design measures to assess the impact of logistics related interventions. Presently, there are no well developed techniques for assessing logistics performance at the sub-national level. The difficulty lies in the dispersed nature of the demand for logistics services, which has led to partial solutions and contributed to market failure. Typically, there are numerous freight origins and destinations. However, assessing this in practice is complex as it includes various players involved in influencing supply, including government, producers, suppliers, and service providers. Some of the existing tools, such as the density-type indicators and supply-chain analyses provide the building blocks for the new approaches. However, they would have to be complemented by techniques to model horizontal interactions between producers and service providers.

Outline of Report

The next section explores some of the methods that can be used to assess logistics performance at the local level. This is then followed by a review of the various types of logistics intermediaries in general and those that cater for low-income regions in particular. A distinction is made between intermediaries who operate upstream and downstream in logistics chains. Sections 3 and 4 then present details on two case studies of logistics service in lagging regions. Two commodities are used to study the effects of electronic intermediation and those of a cooperative approach. Section 5 identifies the roles that

logistics intermediaries play in lagging regions. The last section draws some conclusions and lessons for developing countries in general.

Notes

1. Lieb and Lieb (2009) Executive Summary and Regional Comparisons 2009 3PL CEO Surveys.
2. In the USA, for instance, express shipping companies consolidate parts orders for printer repairers and ship them to central locations in different geographical areas where the repairmen then collect their orders.
3. Bonaccorsi (1992) On the Relationship between Firm Size and Export Intensity, *Journal of International Business Studies*, Vol. 23, No. 4 (4th Qtr., 1992), pp. 605–635.
4. Demsetz (1997) The Firm in Economic Theory: A Quiet Revolution, *The American Economic Review*, Vol. 87, No. 2, Papers and Proceedings of the Hundred and Fourth Annual Meeting of the American Economic Association (May 1997), pp. 426–429.
5. Maltoglou and Tanyeri-Abur (2005) Transaction Costs, Institutions and Smallholder Karmet Integration: Potato Producers in Peru, *ESA Working Paper No 05-04*, FAO.
6. Wagner (2003) Unobserved Firm Heterogeneity and the Size-Exports Nexus: Evidence from German Panel Data, *Review of World Economics*, Vol. 139 (1), pp. 161–172.
7. Fafchamps and Hill (2004) *Selling at the Farm-gate or Traveling to Markets*, CSAE WPS/2004-30, Economics and Social Research Council UK.
8. Masters (2007) Middlemen in search equilibrium, *International Economic review*, 48(1), pp. 343–362.

CHAPTER 2

Assessing Logistics Performance at the Sub-National Level

Introduction

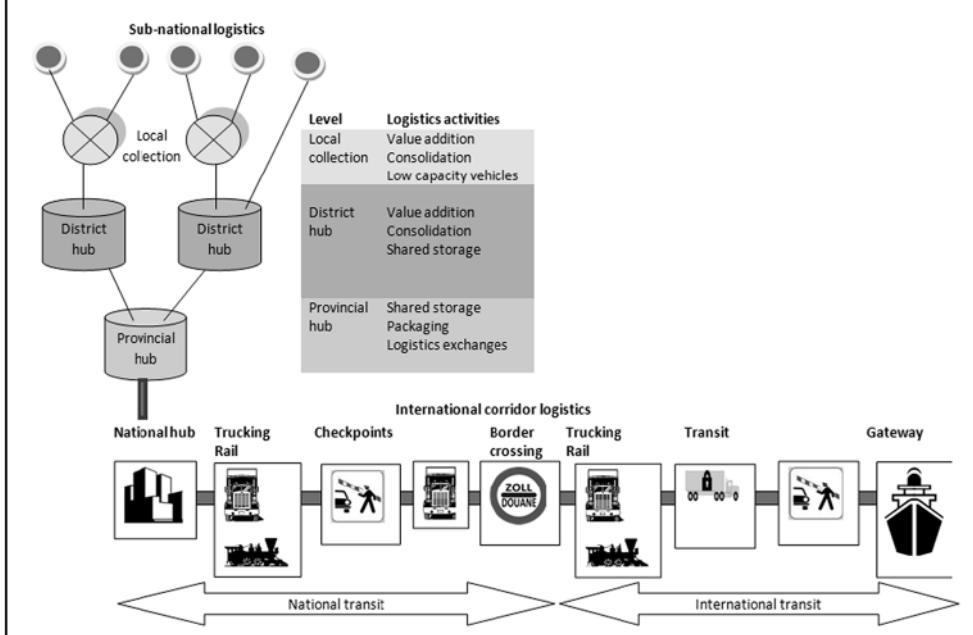
There are no well-developed techniques for assessing logistics performance at the sub-national level. The fact that freight transport and logistics services supply is dependent on spatial organization of economic activity is well recognized. This is particularly the case in situations where there are numerous freight origins and destinations. Assessing this in practice is complex as it includes various players involved in influencing supply, including government, producers, suppliers, and service providers. Efforts to employ analytical approaches to the problem of the spatial patterns of logistics networks tend to become rather intricate. As such, measuring performance at the sub-national level requires a clear understanding of the interdependencies between players within the region and beyond. The interactions are dependent on the spatial configuration of physical transport networks and the social and economic relationships between the different parties.

Local Barriers to Global Connectivity

Most of the existing and rapidly evolving body of work on trade and transport logistics has, perhaps not unexpectedly, focused on the international dimensions of logistics. Landlocked countries in particular, face special challenges in connecting to global supply chains deriving from long distances to seaports and the need to cross borders. These issues and their impacts have been studied intensively. It has been shown in Krugman (1991), Gallup et al. (1998), and MacKellar et al. (2000) that the distance to a seaport adversely affects a geographical area's economic growth performance. Limao and Venables (2001) and World Bank (2010) have shown that the volume of trade flows of landlocked countries is smaller than those of others not similarly handicapped. This is primarily due to high logistics costs and lower global economic integration. Hausmann (2001), Raballand (2003), and Teravaninthorn and Raballand (2008) establish that the costs of crossing borders are usually high, and the existence of a border often imposes infrastructure costs if transport corridors on either side of it are not well coordinated. As a supporting corollary, the absence of frontier controls and informal, cross-border trade in some commodities can lead to substantial economic benefits through enhanced food security (Ackello-Ogutu et al. 2002; Schwartz 2009).

As illustrated below (figure 2.1), there are different scales at which to explore trade logistics, starting at the local level by looking at how territories within a country are

Figure 2.1. Local to Global Connectivity



Source: Author.

connected to the core regions to an international scale that encompasses global connectivity. Much more work has been done on the international logistics chains (e.g., Teravaninthorn and Raballand 2009) than on the local dynamics. Yet, there are regions even within large coastal countries that face as serious of logistics problems as some landlocked countries. Improving access for such regions to core national and global markets can have a significant positive effect on incomes and poverty reduction.

Krugman (1991) maintains that external economies of scale can be realized at the local level as much as at the national and international levels. It is important to understand the factors that lead to increased competitiveness at the local level and, in that regard, sensitivity to geography is important. Without serious efforts to improve logistics and transport systems at this level, large numbers of people in developing countries will not be able to take advantage of opportunities provided by globalization and lower, rules-based barriers to trade (Carana 2001). The key issue is how small-scale producers organize to overcome the friction of distance in a manner that enables them to connect to domestic and global supply chains.

There are five main reasons why a focus at the sub-national level is important. First, there has been a significant increase in government and donor agency resources being invested in improving international trade corridors. The investment is either to increase production or to improve accessibility. The assumption is that following the investment there will be an improvement in trade flows following a reduction in transport costs. The evidence of this happening is mixed, and in some cases, in fact, the infrastructure that is developed is not always appropriate to the demand that exists. It is apparent that the factors that shape the service supply response are not always well considered.

Second, high logistics costs at the local level reduce the chances of success of regional development strategies succeeding within countries. Many governments have tried to institute policies to transform lagging areas through dirigisme in industrial development (i.e., through subsidies and tax breaks).¹ The basic premise is that industrialization of lagging areas would result in the movement of goods and services related to industrial products, including semi-finished or value-added goods, rather than raw outputs from farm gates or agro-industrial inputs.

Lagging regions are largely rural, where agriculture and related occupations (horticulture, fishing, etc.) constitute the main economic activities and livelihoods. The flows of goods and services between lagging and leading regions, therefore, tend to be related to agricultural production. Efforts to have such regions connect to global chains at a higher level face many challenges. For example, Lall et al. (2009)² analyze internal migration from the lagging northeast to the leading southeast region in Brazil and find that “push” factors related to lack of access to services and basic infrastructure in the lagging region (piped water, electricity, sewerage, healthcare, and transportation to areas of high economic density) are the most important, as is the attraction factor of economic opportunities in the leading region. They propose that the need to enhance inclusive growth should be accompanied by improved services in lagging regions to reduce the “push” effect. Understanding the “push” factors necessarily requires a local-scale approach to understand those parts of supply chains with a more immediate link to producers.

Third, in some countries, domestic transport costs are higher than on some international corridors (e.g., Raballand, Kunaka, and Giersing 2007). Limited competition on domestic routes has been identified as an explanatory factor behind the high prices that are charged for domestic shipments. However, what has not received as much attention is the link between the small volumes of demand and supply of services. Thin demand, concentrated over a few months in a year, is unattractive to highly contestable markets. The small volumes lead to minimal supply, which in turn leads to high prices (Arvis et al. 2007).

Fourth, there are a few global trends that require an ability to trace how the various components of a supply chain are connected. Increasingly complex consumer demands and shifting global regulatory regimes are affecting the global agri-food system, with a trend towards product traceability (Opara and Mazaud 2001; Golan et al. 2004; and Smith and Furness 2006). This requires that suppliers, including small-scale producers, connect transparently to international supply chains. This would necessarily imply a push towards more vertical integration in supply chains. However, the high costs for producers of dealing with vertically coordinated global commodity chains are a potential threat to the future of smallholder production systems. For instance, there are specific concerns about the marginalization of smallholder tea growers in the global tea economy due to the entry barriers associated with traceability requirements. The experience of the fresh fruit and vegetable sector, where traceability initiatives are perhaps most advanced, suggests a potential loss of competitive advantage held by smallholders in developing countries (Dolan and Humphrey 2000; Weatherspoon and Reardon 2003; Brown 2005). The renewed emphasis on carbon footprint will also likely exacerbate these pressures.

Last, there are no well defined measures of logistics at the local level. It is apparent that some of the most widely used measures of rural access are designed to indicate the spatial extent of transport infrastructure, but they do not deal adequately with the level and quality of logistics services that are available. Ultimately, such infrastructure only has impact if there are transport services provided along with it. As such, the indices

would have to be complemented by other measures that reflect logistics services as a whole. This may require a rethink of the types and characteristics of logistics infrastructure that is provided.

There are, however, several measures used in transport and logistics that have potential to approximate a measure of the quality of logistics services at the sub-national level. One of the main ones of relevance to lagging regions is a measure of density of transport infrastructure, such as length of road or rail per unit area. The Rural Accessibility Index (RAI) is the most frequently used example of this approach. The RAI estimates the proportion of the rural population who have access to an all weather road. However, the density indices and the RAI do not reflect the actual level and quality of service, as infrastructure is not necessarily a guarantee of service. Some recent research has questioned the appropriateness of the index (e.g., Raballand et al. 2010) based on these grounds.

One of the established ways of assessing the impact of various costs on enterprises is to apply the producer surplus approach. In order to survive, enterprises must generate satisfactory producer surpluses through improved organizational management or cost reductions. Smart (2008) estimates producer surplus as a function of mass-distance price and finds that commodity flows into a market vary inversely and linearly with transport price. In order to increase producer surplus, enterprises should make greater use of the economics of specialization, develop economies of scale, exploit economies of integration, and integrate operations and logistics.

The first two strategies have already been discussed above. Suffice it to say that the idea of specialization or core competence is at the heart of logistics intermediation. The focus on analyzing the impact of intermediaries, therefore, lies in understanding the extent to which supply-chain integration affects logistics costs. Fabbe-Costes and Jahre (2008) identify four layers of integration: integration of flows (physical, information, and financial); integration of processes and activities; integration of technologies and system; and integration of actors. Though all four are important, from a logistics costs perspective, focus is typically on the physical flows.

Properly capturing the influence of geographical space is central to exploring linkages between locations in lagging regions. As a result, this study uses the theoretical underpinnings found in the World Development Report (2009).³ The WDR makes a distinction between leading and lagging regions and makes the observation that while economic growth in different regions is unbalanced, development can be inclusive. It proposes that one of the ways to achieve this goal is improving connectivity and reducing economic borders to allow easy market entry to take advantage of scale and specialization. The policy framework that is proposed in the WDR has transport as a connecting infrastructure. Research shows that transport infrastructure has the most important external impact on firm-level costs.⁴ Improving connectivity through appropriate services can reduce the tariff-barrier effect of long distance from major markets. The WDR makes the argument that there is a virtuous circle between transport and trade—transport costs reduce as trade increases, which, in turn, lowers transport costs. Therefore, increasing local interactions and reducing economic distances within a country and globally contributes to these virtuous circles.

Supply Chain Analysis

Supply chains are a common concept in exploring linkages between different stages of value addition. A logistics system comprises several interconnecting elements, starting

at the local level and linking to national and international supply chains. Elements of the logistics systems are, therefore, found at the sub-national, national, regional, and global levels. Supply chain analysis belongs to the same group of techniques as global commodity chains. Global commodity chain (GCC) analysis has its roots in the 1970s theories of dependency and how agents in lower value segments of trade can link to global chains. Coordination is important to how effectively the chains function, and, in this case, to how producers in developing countries link to the chains. While some researchers such as Gibbon (2001) maintain that the GCC approach provides a coherent device for arriving at case-specific accounts of conditions for economic upgrading, others, such as Cramer (1999), argue that the GCC approach places limits on economic activity in developing countries. However, as an analytical tool, the approach is useful to identifying how producers in developing countries can participate in global trade.

Supply chain analysis is suited to assessing the vertical linkages in the flow of products between subsequent stages of a value chain. It is necessary that a study of logistics in lagging regions focuses on the opportunities and constraints to global integration of specific commodities on the basis of studies of the specific chains; at the same time, those conducting the study must understand the relationship dynamic between the small-scale producers and immediate buyers of their products. The processors have some options as to the position at which they want to connect to the global chains. The GCC framework is useful for appreciating how export opportunities in the lagging regions can be generated and sustained.

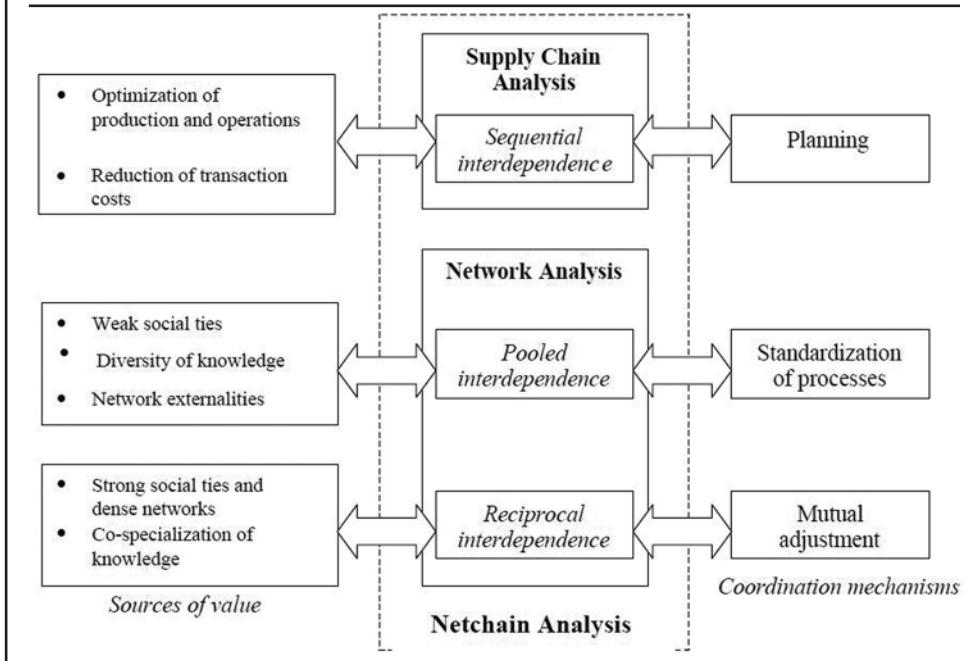
However, a supply chain approach does not deal with a second dimension of sub-national logistics organization, which is the mapping of the horizontal relationships between enterprises at the same level, especially at the primary production level. This dimension applies to the social and economic relationships between the enterprises and how they are manifested in geographical space with implications on freight flows. Lazzarini et al. (2001) term the approach that combines the vertical and horizontal links netchain analysis. A netchain is defined as a set of networks comprised of horizontal ties between firms within a particular industry or group that are sequentially arranged based on vertical ties between firms in different layers. The concept is appealing because it provides an analytical framework for exploring how small enterprises at any level, more likely at the lowest level, interact with each other in their selling decisions and how they interact with buyers who purchase their products.

The methodology of this study was designed around the concept of netchain analysis. This approach (figure 2.2) provides a way to explore both value creation and coordination mechanisms. These are the strategic variables influencing cost reduction and rent creation. However, in some of the literature, the two dimensions have been treated using models that are considered to be alternatives, mainly because they have evolved as distinct strands of analysis. This study treats the two as complementary and supports the argument made by Lazzarini et al. that combining them provides an enhanced framework to assess both vertical and horizontal inter-organizational collaboration.

Modeling Logistics Performance at the Sub-National Level

In order to model the spatial and social relationships that influence logistics in lagging regions, the present study employed the power of geographical information systems (GIS). The most common GIS systems use relational databases which enable them to

Figure 2.2. An Overview of Netchain Analysis



Source: Lazzarini et al. (2001).

represent both the vertical relationships of supply chains and the horizontal aspects of both physical and virtual connections. The core GIS network analysis concept is based on points, nodes, and links and is, therefore, a more accessible implementation of the graph theoretic approach.

Though netchain analysis provides a conceptual framework, it requires appropriate techniques to model the real-world interactions. Graph theoretic approaches offer great potential to model logistics interactions at the sub-national level. This is because they have the capacity to model both the spatial and economic attributes with both quantitative and qualitative aspects. Graph theory reduces networks to key nodes and links whose relationships can lead to versatile models. Spatial markets have been investigated using this approach since the pioneering work of Enke (1951), who attempted doing this by looking at electric circuits. Since then, his basic approach has been refined and developed into fairly robust graph theory models. An example is Faisal et al. (2003), who use such an approach to explore how a supply chain responds to short-term changes in the market. Similarly, Wagner and Neshat (2007) use the same approach to explore how a supply chain would respond in the event of risk. Generally, the whole area of supply chain vulnerability is receiving a lot of attention, even more so after global chains were disrupted by the volcanic eruption in Iceland in April 2010.

Network analysis can be used to explore interdependencies between adjacent steps in a supply chain and the flow of products and information within the chain. A measure of proximity or association index can be an effective descriptor of network structure. It becomes possible to compare different supply chains and to assess how they evolve over time. Understanding interconnections in society is receiving a lot of research⁵ and policy

attention as it helps to determine how physical, information, and financial flows take place. Network analytic approaches can handle not just the physical flows of commodities in logistics chains, but also the transmission of information within the chain; this can be done without adopting overly reductionist, simplifying assumptions. For instance, Voelkl and Noe (2008) propose a network approach to information transmission based on the propagation of information in social groups. They find that association patterns influence the speed of propagation of information. This is important as access to information is critical to understanding physical flows in lagging regions.

However, as with most network based analyses, modeling the physical attributes of supply chains is probably easier than representing the relationships between them. It is as difficult to identify causal relationships in supply chains as it is to assign a level of integration between the parties. Fabbe-Costes and Jahre, therefore, suggest that there is need to strike a balance between quantitative and qualitative analysis of supply chains. Therefore, even though graph theoretic approaches offer great potential to exploring logistics costs and performance in lagging regions, they tend to mask some of the spatial variations typical of dispersed spatial markets. In addition, even though the concepts and principles that underpin them are relatively sound, their actual use is rather complex and their application to real world situations is often time consuming. Hence, the use of GIS to simplify the analysis.

Data Requirements

The study considers lagging regions within large middle-income countries, Brazil and India. These are countries with highly developed core logistics systems and large territories that are relatively less developed. It is accepted that some federated states, such as India, have internal border controls and tax collection points, though these are not of the same magnitude as found at international border crossing points. Understanding domestic logistics in middle-income countries in particular is becoming increasingly important as they endeavor to move up the value chains. However, unless these efforts are inclusive, they will exacerbate disparities between the core and lagging areas and diminish the opportunities to reduce poverty.

Quantitative and qualitative data are collected from various players involved in the logistics chains, including producers, intermediary service providers, processors, and government agencies. The data included details on the locations, characteristics, and relationships between components of the supply chains. Some of the data were collected by questionnaire while some were collected through detailed interviews of logistics service providers and users in the study areas. In Brazil, more detailed data were collected in one area where there is a cluster of related production activities while in India detailed data were collected in three districts that are also at the core of the soybean value chain. The data were analyzed to identify the key logistics determinants, costs, and volumes. The study did not cover logistics costs beyond the international gateways.

Notes

1. In 2000, China launched its Western Development Strategy to address the problems of its lagging regions. These provinces constituted about 71 percent of China's area, but only 29 percent of its population and 17 percent of its output in 2003. The policies included investments in transport, energy, and telecommunications; concessions for foreign investment; and improvement of educational facilities.

2. Lall, Timmins, and Yu (2009) *Connecting Lagging and Leading Regions The Role of Labor Mobility*. Policy Research Working Paper 4843, World Bank, Washington DC.
3. World Bank 2008, *World Development Report 2009*, World Bank, Washington DC. See chapters 1 and 2, in particular pages 72–79. In summary, economic density is output generated per unit of land. Economic distance is the ease or difficulty for goods, services, labor, capital, information, and ideas to traverse space. Though related, it is not identical to physical distance.
4. Lall, Funderburg, and Yépes (2004) Location, Concentration, and Performance of Economic Activity in Brazil, Policy Research Paper 3268, World Bank.
5. For example, Easley and Kleinberg (eds) (2010) *Networks, Crowds, and Markets*, New York: Cambridge University Press.

CHAPTER 3

Logistics Intermediaries

Introduction

Developing countries spend a far greater proportion of GDP on transportation and logistics than developed countries. Efficient transport intermediaries can contribute to the trade competitiveness of a country, thereby boosting economic growth. The presence of logistics intermediaries offering a range of value added services better enables exporters to meet the demands of buyers abroad. Efficient transport intermediaries can help drive down the cost of transportation services in the market. Lower transportation costs mean savings to the exporter in the form of lower-priced import components and lower costs of the export product. These savings can be passed on to the buyer in the form of discounts, thus making the product more competitive. Swift and regular movement of goods allows exporters to meet just-in-time delivery requirements. Efficient cargo movements can thus enable exporters to participate in previously unavailable markets.

In this context, an intermediary is a service provider who intervenes in a supply chain between producer and consumer to provide one or more logistics services. A large proportion of world cargo is handled by logistics intermediaries, such as freight forwarders, consolidators, customs brokers, and other third- and fourth-party logistics service providers. A recent study found that non-manufacturing exporting firms in China account for as much as 22 percent of the country's aggregate exports.¹ It was further established that, through intermediaries, small firms in particular can access foreign markets, though they may not be able to cover the costs of direct exports.

Generally, logistics intermediaries act as third-party logistics (3PL) providers and fourth-party logistics (4PL) providers. 3PL providers are entities to whom logistics functions are outsourced. They often come from a background of a core supply chain activity, such as forwarding or transportation that has been expanded to encompass a bundle of services. 4PL providers are the equivalent of Business Process Outsourcing in logistics for a client. Using outcomes based not merely on cost reduction methodologies, a 4PL provider can actually manage several 3PL entities to meet a client's business needs. There are various types of 3PL and 4PL service providers (box 3.1).

Intermediaries in supply chains in lagging regions are different from those in more sophisticated product markets and highly dependent on the characteristics of a particular commodity. Generally, the intermediaries are positioned much lower within the value chain than they are in typical international trade transactions. For instance, in Indonesia Wei et al. (2003) found that mandarin traders involved in the inter-island supply chain play a key role as managers providing information, extension services, working capital, and fertilizers to farmers. Similarly, in a study of Mexican fruit exports to

Box 3.1. Typical Global Logistics Intermediaries

Freight forwarders: typically act as shippers agent, select the mode of transport, provide and process document, and make various shipment related payments on behalf of the shipper. Forwarders are particularly useful in consolidating small shipments into a larger consignment which can then be shipped at a lower cost.

Non-vessel operating common carriers (NVOCCs) buy space from ocean carriers for consolidated shipments from a variety of clients. NVOCCs specialize in less than- container load (LCL) shipments and perform many of the same functions as freight forwarders. Unlike forwarders, however, NVOCCs are common carriers that use containers rather than vehicles or vessels. NVOCCs are frequently the customers of freight forwarders and the clients of ocean carrier.

Customs brokers escort goods through the customs process and have experience with local customs regulations and trade practices. Brokers ensure compliance with laws and verify that customs documentation has been completed.

Export packing firms supply packaging materials and services for overseas shipments. Export packers specialize in packing for maximum shipment cost efficiency and typically are familiar with any agricultural restrictions and quarantines that pertain to packaging material.

Export Management companies act as agents for domestic firms in overseas markets. Using an EMC gives a producer immediate access to foreign market knowledge and export know-how, regardless of its experience in foreign markets. An EMC is an independent firm, which in effect acts as the exclusive export sales department for a producer or industrial group.

Export trading companies locate buyers in foreign markets and manage most of the export arrangements for the product. This may include documentation, inland and overseas transportation, and compliance with foreign governmental regulations.

Information—a category that has seen significant growth. It is based internet tools to provide electronic markets for transportation and logistics services.

Transportation, warehouse and distribution—offer a comprehensive set of logistics offerings and may use the assets of other firms, including providing storage facilities.

the United States, Martner (2004) found brokers consolidate not only pineapple production but several horticultural products in order to offer a mix of fresh produce to big retailers in the United States. Since these retailers' commercial practices favor dealing with a reduced number of suppliers for their purchases, intermediaries provide a service that is essential for successful exportation and unlikely to be provided by the farmers themselves. It is, therefore, important to differentiate between gateway logistics and the more upstream logistics constraints. The logistics services and providers would differ depending on their position within the supply chain.

Before identifying the roles that intermediaries play in logistics in lagging regions' countries, it is important to discuss the role that the governments play in influencing logistics patterns in lagging regions. The fact has already been alluded to that regional planning decisions in countries can have an important influence on logistics performance. A common approach is to use transport infrastructure as the foundation of development.

Logistics Infrastructure in Lagging Regions

The basic infrastructure and services that enable movement and market exchanges to take place is an important foundation of logistics services in any environment. Most of

the attention and investments go into building the core national and regional infrastructure. These are the parts of the networks that have the highest rates of return.

However, given that the majority of poor people in low-income countries and, indeed, in the lagging regions of middle-income countries are poorly connected to global supply chains, effort and attention should also be invested in the first tiers of the networks, the local and provincial connections. Yet this is also the one area that suffers from market failure. Inadequate or inappropriate provision of core infrastructure, such as roads or storage, can be a major impediment to logistics improvements. Market failure is, therefore, a major justification for government to take the lead in the provision of core logistics infrastructure. Strategic investment by the public sector can signal to potential buyers and sellers to commit to market production. However, the public sector need not necessarily provide the entire infrastructure. It can play a facilitating role to enable private sector investment in developing, integrated-commodity markets. Any inventions that bring the factors of production nearer together by lessening spatial dispersion will tend to increase the volume of exchanges and the sizes of enterprises.

Road Infrastructure

The basic assumption is that provision of roads would lead to lower transport costs. Over the past decade in particular, the World Bank and other donors, as well as governments, have invested huge resources into rebuilding and extending road networks. For example, the average condition of road networks in Africa has greatly increased while attention is increasingly focusing on the secondary and tertiary networks. The road network developments are typically predicated on the premise that transport costs would be reduced and there will be greater volumes of both domestic and international trade traffic.

However, in rural Africa, Raballand et al. (2010) recently demonstrated that this approach ignores the fact that farmers may not be able to afford to use a truck because of a low agricultural surplus and because vehicle operating costs savings may not be passed to users to lower transport tariffs. This would be, in part, be due to the political economy of the trucking industry; it would also be due to the small volumes per capita that are produced, which can make it uneconomical to run motorized vehicles. Some of the possible solutions that Raballand et al. propose include the following: giving more attention to intermediate means of transport to complement the road improvements, and exploring innovative marketing models that enable farmers to consolidate their produce.

It is apparent that the provision of road infrastructure alone is not a sufficient condition for efficient logistics services. Based on established theory (Von Thunen 1826; Hotelling 1929; Enke 1951; Weber 1953; Christaller 1933), there are three principles on agricultural production, location of processing plants, and market areas that are relevant and useful to the present analysis:

- The locations of markets or points of consumption has an effect on the organization of production in geographical space.
- The nature of the product, whether it gains or loses weight during processing, will influence where it is best to sell it.
- There is an interplay between economies of scale and transport costs that leads to a hierarchy of market locations.

Strategies to minimize production and logistics costs are a function of several forces, including trade-offs between transport costs and economies of scale. For instance, if there is likely to be an increase in economies of scale, it may mean that, to consolidate sufficient volumes, processing will have to take place at locations that are farther away from most areas of production. If the commodity is subject to weight loss during processing, then this would require that the benefits from scale economies exceed the additional transport costs. Ultimately, logistics, especially in lagging regions, would require both the public and private sectors to play complementary roles in terms of both transport and storage infrastructure and related services.

Storage Facilities and Value Addition Centers

Bernischka and Binkley (1995) explore the relationship between production of agricultural commodities and storage. They find that the need for storage is due to the fact that harvest normally occurs over short periods while consumption is spread over the course of the year. In a geographically dispersed market, the prices that farmers are offered decline as distance, and therefore cost of transport, to the market increases. Therefore, the opportunity cost of storage decreases as distance to the market increases. Central to the theory of storage is the fact that the price appreciation net of storage costs must equal the rate of return of holding the stock. However, as Benirschka and Binkley established, this is not supported by evidence. They find that agricultural markets typify what has been termed the storage at a loss paradox. The gap between contemporaneous spot and future prices is normally less than the cost of storage. This has two effects: first, farmers, especially small-scale farmers, are forced to sell their produce as soon as they harvest; and second, there is little incentive to invest in the infrastructure for long-term storage, except possibly by the public sector.

Therefore, the location of a storage facility or a processing center would determine whether or not it is worthwhile for producers to sell their produce. That would be the case unless, of course, there are economies of scale and the producers are able to consolidate their volumes to make it worthwhile to sell to a far away location. Where the product is perishable, treatment may be different. In that case, time considerations may be the overriding factor.

Given low volumes, the spatial structure of a transport service network is a function of the dispersion of the demand. Typically, network evolution patterns would lead to a hierarchy of consolidation centers with varying catchment-area sizes. Small centers would have very small catchments with increases in sizes depending on the centrality of the center in the network. The most common network configurations are shown below (figure 5).

- The **point-point network** is typical with one-off shipments. The logistics requirements are minimal but at the cost of efficiency as volumes tend to be less than a full-load.
- The **trader network** is quite common in rural areas and has received the most attention in the literature. They are seen in some cases as playing a useful positive role in facilitating market exchanges and of exploiting small-scale producers in other cases.
- The **Hub-and-spoke networks** are more pronounced in networks that do not require path infrastructure, such as air and sea transport. However, some of the

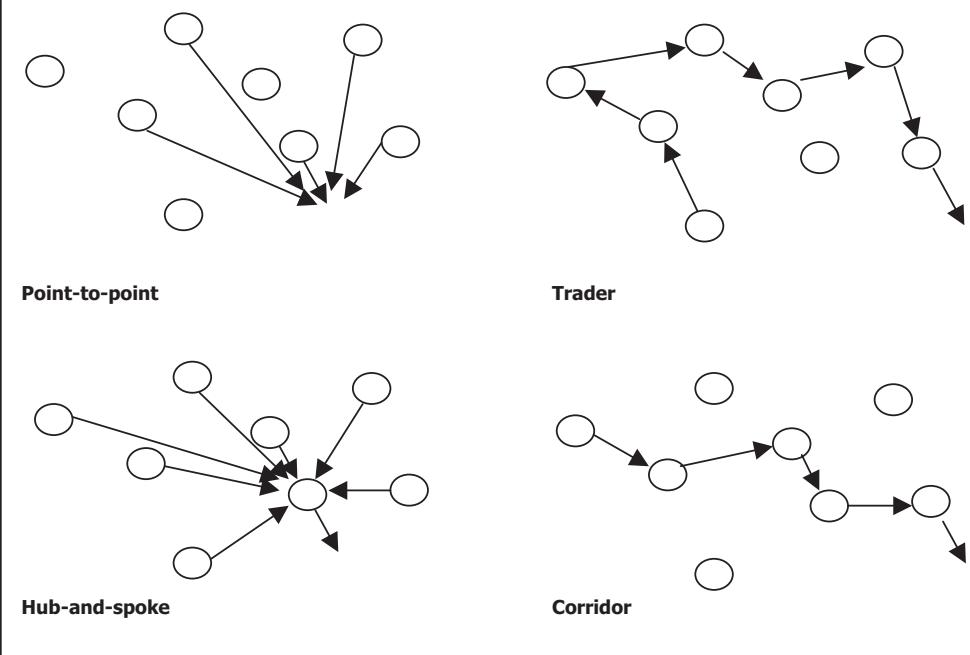
local level small farmers and SME logistics networks also resemble this network definition. The networks are possible only if the hub has sufficient capacity to handle large volumes. Efficiency gains would be obtained at the hub where location becomes the most strategic issue.

- **Corridor network** configuration is used to link high volume consolidation centers, typically to export gateways. Loads can be consolidated and transshipped at local and provincial centers. Both the public and private sectors have been much more effective in providing infrastructure to move large volumes of cargo.

Containerization, in particular, has greatly reduced transport and handling costs, especially between hubs. As container penetration in the transport of overseas general cargo increases, inland container depots have also been developed in landlocked areas to cater to containerized overseas trade. Logistics service providers establish and operate ICDs and help to turn around boxes quickly. Subsequently, domestic trade movements also get containerized for reasons of security and ease of mechanized handling. This provides the additional traffic that leads to more investment in ICDs. For example, over the past 15 years, more than 19 customs-licensed ICDs have been developed in the Kampala area in Uganda. “Through Bills of Lading” are used on destined cargo passing through the port of Mombasa in neighboring Kenya; these are issued by shipping companies sub-contracting to or acting as 3PL entities. These processes tend to reinforce the need to consolidate cargo at a few locations.

Similar developments have taken place in the inland regions of other countries, such as China and India, which have been developing large ICD networks and extending

Figure 3.1. Different Types of Network Configuration



Source: After Hesse and Rodrigue (2004) and Raballand et al. (2010).

these to their lagging regions. In India, there are over 100 ICDs owned by the private sector while Indian Railways' (IR) subsidiary CONCOR² also operates a large number. However, IR is currently constructing new dedicated freight corridors for additional transport capacity using double-stack container movements.³ In China, most container movements are also connected to external trade and are linked to the ports along the eastern seaboard.⁴

Based on the above, a typology of links and nodes within logistics networks can be defined (table 3.1):

Table 3.1. Typology of Local to Global Export Logistics Systems

	Local Links and Nodes	Regional Links and Nodes	National Corridors and Centers	Regional and International Connections
Characteristics of logistics services	Local production centers, small volumes, initial processing and packaging, consolidation, use of small trucks, on the spot market exchanges to arrange logistics services	Consolidation, shared storage, processing, packaging, documentation, larger vehicles, customized logistics exchanges	Shared storage, processing, unitization, inspection, documentation, multimodal transport, national corridors, some integration of services, joint logistics solutions	Interstate infrastructure and corridors, export documentation, transit procedures, etc. Joint logistics solutions by professional agencies

Source: Author.

There is a clear need to consolidate freight volumes. How this can be coordinated or managed to make it feasible to connect to the national and global networks is a major challenge. It is exacerbated by the fact that the logistics intermediaries who normally facilitate international trade do not operate at levels low enough to help small-scale producers.

Logistics Intermediation in Lagging Regions

The foregoing suggests that the intermediaries who intervene to facilitate logistics in the upstream segments of the supply chains in lagging regions and the developing world are different from those who serve the global chains. When transaction costs or coordination issues cannot be overcome by some form of vertical or horizontal integration, intermediaries develop to fill this gap. Sometimes, market intermediaries specialize in providing services to fill a particular gap, such as information, consolidation, credit, etc.

There are four main approaches to coordinating between small-scale producers: independent traders, electronic intermediation, producer groups and contract producer schemes.

Itinerant Traders

Producers in developing countries have a choice between delivering their produce to the market or selling it to itinerant traders. Fafchamps and Hill (2005), working in Uganda, found that the likelihood of selling to the market increases with quantity sold and proximity to the market. In fact, they found that poorer and wealthier farmers sold to the

market while intermediate ones sold at the farm gate. This result is argued to be due not to a self-control motive, but to the opportunity cost of travelling and farmers ability to pay. It is found that farmers benefit from increasing return in their own transport. An interesting finding is that transaction costs are not constant for all farmers. Farmers' characteristics influence the sale mechanism.

Market intermediaries can, therefore, provide a market solution to the issues plaguing trade and logistics in rural regions. However, such intermediaries do not always play a positive role in all cases in liberalized markets and can have perverse impacts. Fafchamps and Hill (2005)⁵ found that while increases in international coffee prices were generally reflected in export, wholesale, and processing stage prices, growers received a smaller increase than warranted. The number of itinerant traders who tour the countryside in search of coffee rises when the price increases. Their purchase prices do not increase proportionately to their sale prices to established trader-millers, suggesting that they take advantage of farmer's ignorance about price movements. Middlemen can, therefore, exploit small-scale producers and take advantage of farmers' ignorance about price movements to insert themselves between farmers and permanent traders.

However, the decision as to whether a farmer will deliver to a selling location or have the produce collected depends on the pricing strategy for the commodity. Furlong and Slotsve (1983)⁶ distinguish between three basic spatial pricing strategies: mill pricing, uniform pricing, or discriminatory pricing. The distinction is based on which agent pays for transportation services. Under mill pricing, the producer bears the costs of transport; under uniform pricing, this cost is borne by the purchaser. Based on some analytical work, Beckmann (1976)⁷ established that, in fact, uniform pricing has the potential for greater welfare gain for firms. Generally, the evidence points to the fact that farmers who are selling large quantities are more likely to travel to the market, suggesting that there are increasing returns in having their own form of transport. Zhang and Sexton (2001) find that mill pricing is used under competitive structures and uniform pricing is used under conditions of less competition. They estimate the welfare effects of the two pricing structures and find that uniform pricing tends to attract more business from distant suppliers than mill pricing, but as the competitiveness of the market increases, mill pricing provides greater welfare than uniform pricing. Discriminatory pricing, in this context, involves offering different pricing to consumers based on their geographic location. It is not as widely used as the other forms of pricing.

Cooperatives

There are several types of cooperatives, especially in the farming sector. Such cooperatives play an important role in how farmers are organized to pursue common interests. Some of the functions of the cooperatives include the management of the logistics function surrounding agricultural inputs and outputs. Examples include farmer associations that grew in the United States in the 1920s, which were based on long-term, legally binding contracts with grower members; a centralized organization structure; pooling of products according to grade; and controlling a large enough proportion of the crop. The associations became a dominant market factor, to the extent that the farmers had countervailing monopoly power through strong commodity cooperatives (Togerson 1977). There are other similar examples of farmer or farmer and private company cooperative arrangements that evolved in Europe with similar objectives and impacts. Generally, cooperatives were designed to maintain long-term supply and production contracts

designed to be a production-marketing coordinating device designed to provide a predictable quantity of products for sale. In Japan, supplier associations or Kyoryoku Kai were encouraged by companies such as Toyota to spread innovative strategies, work practices, and manufacturing techniques synonymous with large Japanese final assemblers throughout the extended supplier network. The associations are based on building inter-company relationships and creating world-class supplier bases, to the benefit of the final assemblers (Hines 1994).

Generally, cooperatives have twin objectives: a transaction cost and an ownership relationship. They can minimize transaction costs and increase value for members through sequential interdependencies. When producers own and control the chain, they are in a position to avoid potential disruptions to supply chains arising from location and temporal asset specificity (Lazzarini 2001).

The effectiveness of producer cooperatives in developing countries is highly variable. In a study of a 120-member potato farmers cooperative⁸ in Uganda, Aliguma et al. (2007)⁹ found that it was well run (governance, participation, extension training, raising skills, and productivity) and the degree of trust between the members and other actors in the supply chain was high. The cooperative provided continuous extension training using national seed and research organizations and NGOs.¹⁰ With their support, quality production was linked to guaranteed purchases by a fast-food restaurant chain in Kampala in 2003. By 2005, rejection rates had fallen from 80 percent to 10 percent. These arrangements provided positive benefits to members, increasing their income by 75 percent over three years.

In Kenya, farmers considered cooperatives as a way of overcoming some of the weaknesses they experienced in dealing through middlemen.¹¹ The cooperatives would increase farmers bargaining strength in negotiations with buyers, especially in negotiating the terms of trade, particularly prices; they would also develop storage facilities. However, the cooperatives were afflicted by poor governance and lost the trust of farmers. Also, given that agricultural produce is seasonal, the cooperatives found it difficult to survive outside the marketing season as there would be no commission income from farmer sales.

Some of the cooperatives in developing countries are supported by NGOs that provide training and capacity building in the farming communities. In parts of India, NGOs facilitated the buyer and sellers coming together in tomato-marketing chains and provided support to develop confidence between sellers and buyers. They also provided training, technical, and financial services to farmers and the farmer federations (Alam and Verma 2007; Berdegué et al. 2008).¹² The NGOs helped facilitate farmers' movement into new activities like organic farming certification. Farmers supported this way had incomes that were 50 percent higher than for farmers selling to private buyers. Selling prices were about the same¹³ for both categories, but transaction and marketing costs were lower for the federated supply chain farmers.

Contract Farming

An important intermediation structure that has developed in agro-businesses worldwide is contract farming. In many countries where supermarkets (or modern retail) have taken root,¹⁴ this vertically coordinated logistics and supply chain structure is emerging as a way of ensuring high-quality agro-supplies for sale to consumers. It is similar to other vertical coordination activities through cooperatives or producers' associations,

except that the initiative comes from the purchasing entity. It is an important mechanism for sharing production and market risks.

An example of contract farming is DrumNet,¹⁵ which was launched in late 2002 to deliver a set of critical business support services directly to smallholder farmers in Kenya. It is designed as marketing, financial, and information services for mainstreaming resource-poor farmers. It combines information and commodity transaction services and financial linkages into a single business service model that provides access to markets, market information, and credit for the rural poor to support sustainable agriculture and rural development. In order to increase market access, the DrumNet network allows farmers to sell their produce directly to the buyer at the right time. By aggregating the produce of members, direct access to wholesale and corporate buyers is possible. This allows farmer members to circumvent the existing supply chain of small-scale brokers, local transporters, resellers, and other intermediaries that currently extract value from each transaction.

DrumNet's support centers are simple, stand-alone facilities catering to clients who require financial, market, and technical information in order to make more profitable transactions. Each support center is equipped with a computer with a dial-up connection to the internet and a mobile phone (GSM) to link up with the central hub in Nairobi, which acts as the main server and database and provides an access center for the storage and retrieval of information. Each support center is managed by an agent, usually a member of the local community, who collects and disseminates information, assists in forming farmer groups, and arranges buy and sell deals. However, it should be acknowledged that DrumNet is at an early stage of development and its long term sustainability is yet to be demonstrated.

Further, to increase overall efficiencies, DrumNet enters into contracts with buyers to provide transportation of the market commodities from the specially allocated collection points. This ensures a single point-to-point trip between rural community and buyer and reduces transportation costs.

Elsewhere, it has been observed that contract farming is more profitable than independent production. In studies in India it has been found that the main benefit comes from reducing the transaction costs in sales and also in accessing technical and market assistance to enable them to diversify their products. It increases price competition in local markets. For example, in some cases in India contract farming contributed toward improving milk yield and reducing production costs only slightly. However, contract farming has been viewed with skepticism because it is seen as a contract between unequal parties with the weaker entity—the producer—more vulnerable to exploitation. That said, there is evidence that cooperation does in fact help farmers to mitigate bargaining power asymmetry when negotiating contracts.

Birthal et al. (2008)¹⁶ in a study of the costs and benefits of contract farming in milk in the state of Rajasthan in India found that the benefits of contract farming were skewed toward large producers, mainly due to economies of scale in the use of family labor in production and disposal of milk. At similar scales of production, smallholders derived significant benefits from a reduction in transaction costs due to contract farming. For scaling up this experience in India and applying to the agro-processing sector generally, some laws would have to be changed along with infrastructure related to transport and cold chains. Birthal et al. (2005)¹⁷ show that, in the case of Punjab, with these improvements in place, Nestle India Limited was able to revolutionize its milk production with vertical coordination.

Electronic Intermediation

There are two basic mechanisms for coordinating the flow of goods through adjacent steps in a value chain: markets and hierarchies (Benjamin et al. 1986). Markets coordinate through supply and demand forces and exchanges between individuals and firms. Such exchanges are influenced by price, quality, quantity, and availability of the given good that will serve as an input into the next process. Hierarchies, on the other hand, coordinate the flow of goods between adjacent steps by controlling and directing at a higher level in the managerial hierarchy, rather than letting market forces coordinate such flows. Managerial decisions, not market forces, determine the quantity and price of the goods required.

As the size of a market grows, communication costs increase. New information technologies have greatly reduced the cost of acquiring, processing, and communicating information. The reductions have, in turn, resulted in changes in the way tasks are accomplished within firms and how firms manage the flow of goods within value chains.

As such, and not surprisingly, they have had an important impact on logistics. Electronic coordination has two other important effects: brokerage and integration effects. Brokerage effect is the ability to put into contact with each other the many potential buyers and sellers and match them. When electronic information is used to link different processes, this is the electronic integration effect. A major benefit of such integration is the time saved. Electronic markets reduce the unit cost of coordination. The complexity of a product often determines the suitability of electronic markets. Products that are simple and can be standardized are particularly suited to such markets.

It has been argued that early developers of biased electronic channels should expect that their competitive advantage will not continue indefinitely. O'Sullivan (1981) found that, initially, the use of IT leads to an overall shift towards increased coordination by markets rather than internal decision making by firms. IT innovations make it easier to acquire, manage, and process information and allow closer integration between adjacent steps in the value chain. However, over time, early adopters should plan for unbiased channels as information becomes more readily available.

It is often asked if electronic markets lower the cost of market transactions and lead to disintermediation (i.e., the elimination of the role of intermediaries). However, several pieces of research now suggest that markets do not become dis-intermediated but become facilitated by information technology. In fact, the Gellman hypothesis holds true that while some traditional intermediaries may be diminished in electronic markets, new roles of intermediaries emerge. In this context, one of the areas receiving a lot of attention in low-income countries, especially those in Africa, is the role that mobile telephones are playing in facilitating development and trade. This trend requires detailed analysis and is the subject of a dedicated study to complement this initial report.

The next two sections explore in some detail logistics services intermediated by a cooperative and those managed through electronic intermediation.

Notes

1. Anh, Khandelwal, and Wei (2010) The Role of Intermediaries in Facilitating Trade, draft research paper.
2. The Container Corporation of India Ltd was established in 1988 and has off loaded about 37 percent of its equity on the stock market.
3. This is a significant innovation pioneered by U.S. Class I railroads that has contributed signifi-

- cantly to the growth of containerization in North America. Railroads there participate vigorously in the logistics market in a variety of roles.
4. Except for long-distance container movements to Beijing and on the Yangtze River corridors to Wuhan and Chongqing.
 5. Fafchamps and Hill (2005) *Price Transmission and Trader Entry in Domestic Commodity Markets*, GPRG WPS-038, Economics and Social Research Council, UK.
 6. Furlong and Slotsve (1983) "Will That be Pickup or Delivery?": An Alternative Spatial Pricing Strategy, The Bell Journal of Economics, Vol. 14, No. 1 (Spring 1983), pp. 271–274.
 7. Beckmann (1976) "Spatial Price Policies Revisited." Bell Journal of Economics, Vol. 7, No. 2 (Autumn 1976), pp. 619–629.
 8. Nyabyumba United Farmers Group, Kabale. Formed in 1998 with forty members.
 9. Aliguma, Magala, and Lwasa (2007) *Uganda: Connecting small-scale producers to markets: The case of the Nyabyumba United Farmers Group in Kabale district*, Regoverning Markets Innovative Practice series, IIED, London.
 10. Ugandan National Seed Potato Producers Association, Kachwekano Zonal Agricultural and Research Development Institute, National Agricultural Research Organisation, International Center for Tropical Agriculture and Africare.
 11. Abdi (2004) The Influence of Rural Logistics and Rural Transport Costs on Farm Income and Poverty in Kenya: The Case of Kisumu and Nyandarua Districts, Kenya, World Bank Report, December 2004.
 12. Alam and Verma (2007) *India: Connecting small-scale producers to markets. A case study of a successful supply chain in Uttarakhand, India*. Regoverning Markets Innovative Practice series, IIED, London. Also, Berdegué, Biénabe, and Peppelenbos (2008) *Keys to inclusion of small-scale producers in dynamic markets: Innovative practice in connecting small-scale producers with dynamic markets*, Regoverning Markets Innovative Practice series, IIED, London.
 13. One overall benefit that all tomato producers in the region received, owed to the Mother Dairy contracting arrangements, was that with its entry in the market other buyers were forced to compete on pricing with all farmers.
 14. Reardon and Berdegué (2006) identified three established waves in the spread of super markets since the 1990s and one emerging one. China and India were considered pace setters for the third wave and for future developments. (Reardon and Berdegué (2006) *The Retail-Led Transformation of Agrifood Systems and its Implications for Development Policies* Rimisp-Latin American Center for Rural Development).
 15. www.drumnet.org/projects
 16. Birthal, Jha, Tiongco, Marites, and Narrod (2008) *Improving Farm-to-Market Linkages through Contract Farming*. Discussion Paper 00814. IFPRI.
 17. Birthal, Joshi, and Gulati (2005). *Vertical coordination in high-value food commodities: Implications for smallholders*. Markets, Trade, and Institutions Division Discussion Paper No. 85. Washington, D.C. IFPRI.

CHAPTER 4

Case Study One: Cooperative Approach to Logistics Intermediation

Introduction

Brazil is one of the largest producers of sisal in the world. Sisal (*Agave sisalana*) is a perennial plant with leaves that yield fibers valued for their strength, durability, and resistance to weather conditions. Sisal fiber is mainly used in the cordage industry, especially in the manufacturing of agricultural twines (used in binding hay and sheaves of grain) and ropes widely employed for marine, agricultural, and general industrial use. Additionally, sisal fiber is used to manufacture carpets and rugs, specialty paper, buffing cloth, and more recently as a strengthening agent to replace asbestos and fiberglass in composite materials (especially in the automobile industry).

After reaching a peak of almost 800,000 tons in 1970, worldwide production of sisal declined steeply due to competition from petroleum-based synthetics (in particular, poly-propylene harvest twine) and currently stands at approximately one-third of its peak value. Sisal production was about 270,000 tons in 2008, with Brazil (105,000 tons), China (60,000 tons), Tanzania (33,000 tons), and Kenya (22,000 tons) accounting for 92 percent of the world's production (FAO 2009).¹ Brazil has been the world's largest producer and exporter of sisal over the last four decades, producing between one-fifth and one-half of the world's total tonnage per year (FAO 2000). The composition of sisal exports differs significantly between the African countries, which export mainly sisal fiber without any manufacturing, and Brazil, which has a more diversified export composition that includes fiber and manufactured products like twines, yarns, and carpets.

Imports of sisal are heavily concentrated in three main blocks, namely the United States, China, and the European Union, each with marked differences in import patterns. China is responsible for 46 percent of the world's imports of sisal fiber and almost no manufactured products. The United States is a major importer of manufactured goods (57 percent of world's imports—mainly baler twine) and negligible fiber imports. The European Union is responsible for a similar share of the world's imports of fiber (23 percent) and manufactures (21 percent). (FAO 2009)

Table 4.1. Bahia: Number of Sisal Farmers and Harvested Area (2008)

Municipality/Region	Harvested Area (ha)	No. of Producers	Average Holding (ha)
Traditional Sisal Region	100,412	17,043	5.89
Piemonte Norte do Itapicuru	91,800	7,921	11.59
Piemonte da Diamantina	46,000	6,512	7.06
Chapada Diamantina	11,665	1,744	6.69
Bacia do Jacuípe	4,370	832	5.25
Irece	3,580	354	10.11
Others	4,641	594	7.81

Source: Author's estimates from IGBE data.

Sisal Production and Exports in Brazil

The production of sisal in Brazil is heavily concentrated in a few states in the northeast region. The state of Bahia accounts for 95 percent of the country's total production while the states of Paraíba, Rio Grande do Norte, Ceará, and Pernambuco are responsible for the remaining 5 percent (IGBE 2009). Furthermore, production in Bahia is concentrated in a few municipalities located around the "sisal territory," an area where sisal production originally took place and where most of the sisal processing plants and factories are located (table 4.1). In 2007, only ten municipalities were responsible for 77 percent of Bahia's sisal production and twenty municipalities (all located within a 200 kilometer radius) were responsible for 95 percent of the state's total production (IGBE 2009).

The Northeast region is home to 28 percent of the country's population (53 million inhabitants) and has traditionally been one of the less developed regions in Brazil. Income per capita is less than half that of the south and southeast regions, and the region ranks last in GDP per capita, HDI, life expectancy, infant mortality, and literacy rates. There are, nevertheless, some enclaves of high growth in the northeast, typically those where soybean is produced. However, the "sisal territory" is one of the poorest in Bahia, with incomes per capita in the lower quintile of the state (IGBE 2009). It is estimated that 700,000 workers in the region are employed directly and indirectly in the sisal production and exporting complex, generating around US\$80 million in revenues and making sisal the tenth most important export product in Bahia (tables 4.2 and 4.3).

Table 4.2. Bahia—Sisal Exports in 2008 (tons)

	Fiber	Baler Twine	Yarns	Rugs and Carpets	All Products ³
United States	25	34,594	5,688	21	41,205
China	10,739	0	0	0	10,739
Mexico	2,393	0	0	0	2,393
Portugal	966	0	1,227	0	2,193
Germany	245	893	0	20	1,504
Netherlands	0	70	0	230	1,444
World	27,143	36,480	8,925	298	74,739

Source: Author's estimates from UN COMTRADE data.

Table 4.3. Bahia—Sisal Exports in 2008 (million USD)

	Fiber	Baler Twine	Yarns	Rugs and Carpets	All Products
United States	0.02	44.1	7.1	0.05	52.5
China	7.6	0	0	0	7.6
Netherlands	0	0.06	0	0.5	2.3
Germany	0.2	1.0	0	0.05	2.4
Portugal	0.7	0	2.0	0	2.7
Mexico	1.7	0	0	0	1.7
All countries	19.5	46.2	12.1	0.7	81.9

Source: Author's estimates from UN COMTRADE data.

The domestic market for sisal products in Brazil is very limited and almost the entirety of the production is exported.² The majority of exports contains some degree of manufacturing and is in the form of twines, ropes, and yarns, although there are still substantial fiber exports especially to China. Following worldwide import patterns, sisal exports are heavily concentrated in a few countries depending of the particular product, with United States and China dominating the trading relationships. The main destination and product composition of sisal exports is shown in the following tables.

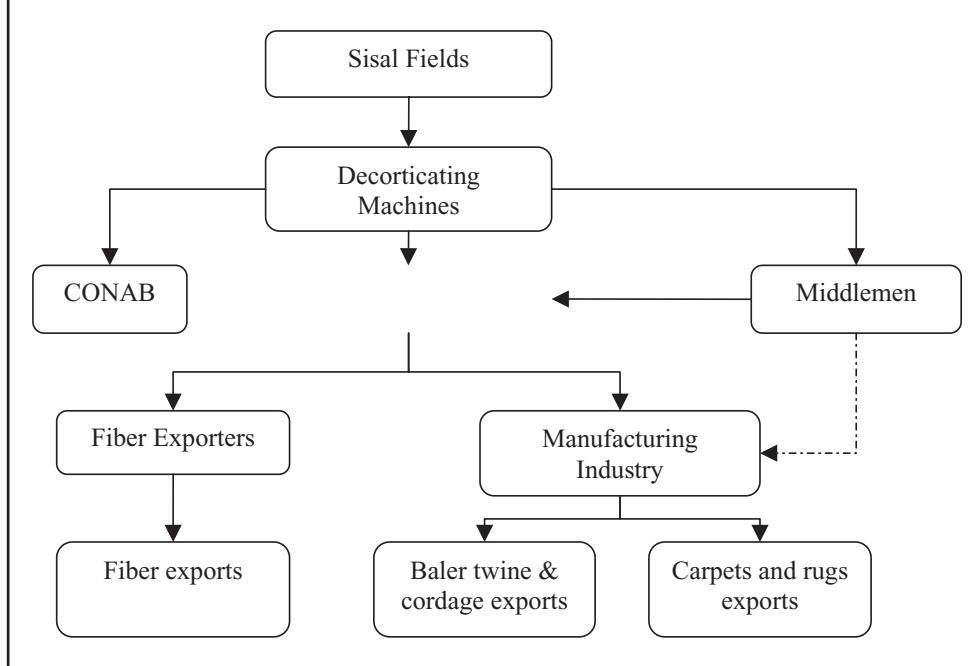
The Sisal Value Chain

As with most natural fibers of vegetal origin, sisal must go through a process of extraction, cleaning, and selection before it can be manufactured into final products. The first step, fiber extraction or decortication, consists in separating the leaves' pulp from the fiber and is usually accomplished by introducing the sisal leaves in a machine that scraps the pulp without cutting the fiber. The extracted fiber still retains some residual pulp and other impurities that need to be eliminated by brushing it to eliminate the residual matter. However, the brushed fiber presents differences in terms of length and quality, some of which are not suited for manufacturing; the brushed fiber is classified into different types according to their final use. After classification, brushed fiber is either exported or sent to manufacturing industries where it is transformed into final products.

The characteristics of sisal production in Brazil influence the arrangement and geographical location of the key activities in the supply chain. In Brazil, sisal is grown by a large number of farmers with small plots of land that usually do not exceed 20 hectares. This, however, contrasts with the more concentrated nature of the other two phases of sisal production: brushing and manufacturing. Figure 4.1 presents the traditional sisal supply chain in Brazil.

Most sisal farmers do not own decorticating machines to extract fiber and hire the services of a decorticating machine operator (DMO). The machines process between 150 to 200 kilograms of dry fiber per day and produce waste of fibers of around 20 percent to 30 percent of the fibers contained on the leaves. Due to their simplicity, they are highly mobile and are moved from field to field. The DMO directly employs the field workers, establishing work relationships with them and exempting the field's owner of formal work commitments. In an effort to minimize costs, the DMOs tend to use family members in the decorticating process (at the machine or cutting the leaves). However, they

Figure 4.1. Traditional Sisal Supply Chain



Source: Alves et al. (2005).

are not always successful, and several DMOs are indebted to middlemen and owners of brushing facilities. Some of the DMOs believe that the “brushing facilities owners” prefer this situation as a way of ensuring that the DMOs will supply them.

The payment for the fiber is usually split 30–40 percent for the field’s owner and 60–70 percent for the owner of the decorticating machine who then has to pay workers and operating costs. Based on field survey data, the machine owners do not make huge amounts of money, making around R\$39.00 per ton of fiber.

The extracted fiber is dried in the sun for eight to ten hours until it reaches an acceptable humidity level after which it is collected in small bundles and taken to a shed for temporary storage until sold and transported to brushing centers. The DMO is responsible for making contact with potential buyers and selling the fiber. This usually happens with the DMO going to the nearest town and contacting either a manager or owner of a brushing center—if there are any in the area—or a middleman who will in turn transport the fiber to brushing centers. Since the financial needs of both farmers and field workers are high and there are no storage facilities on the fields beside make-up sheds, the sisal fiber is collected and paid for weekly by the buyer once a contract has been agreed on.

Otherwise, farmers also have the option of selling sisal fiber to CONAB, a government agency that sets up a minimum price for basic agricultural products including sisal, or to a private company. There are several firms that specialize in sisal trade. Although

volumes bought by CONAB are not high, the agency is an important player because it provides a pricing floor that signals minimum requirements for the subsistence of sisal farmers. It is also important to note that the vast majority of CONAB's warehouses and buying points are located near the traditional sisal territory, although the agency also has warehouses in Campo Formoso, the most important producing municipality outside the traditional sisal territory. This suggests there is some inertia in the development of logistics support infrastructure.

CONAB on the other hand accepts produce only from registered farmers. However, in order to get access, some middlemen or brushing facilities use the registrations of the producers to sell the "gross fiber" to CONAB. Additionally, CONAB does not purchase brushed fiber. The middlemen and brushing facilities offer less than CONAB, so they also benefit from selling to the agency. For example, in 2009, CONAB was buying raw fiber at R\$1.04 per kilogram, whereas middlemen in Campo Formoso were buying at R\$0.90.

The dried sisal fiber is transported to centers where it is brushed, classified, and pressed into bales. During the brushing process, dust, dried pulp, and other impurities stuck to the fiber are removed. Usually, 8 percent of the original weight of the fibers is lost during this process due to the removal of residues and short-length fibers. After brushing, the fiber is separated according to the standard classification that takes into consideration the length of the fiber and its impurity rate. The fiber then goes through the pressing process, an operation that prepares the sisal for its transportation to foreign countries or other industries in the region where the fiber is transformed into manufactured products like twines, cords, carpets, and rugs.

The above describes the traditional sisal value chain. It is characterized by high levels of fragmentation with each player handing over control of the product to the next level along the chain.

Logistic Issues in the Sisal Export Chain

There are several factors that influence sisal logistics patterns in Bahia:

Payment Terms

There is a trade-off between the length of time it takes to receive payment and the price that is offered (table 4.4). Lower prices are offered for immediate payment and higher ones when payment will take several days. This is a well established pattern in agricultural markets. In Bahia, the lowest price offered seems to be influenced by the price that is set by CONAB. Middlemen offer a price that is, on average, 4 percent below that offered by CONAB.

Table 4.4. Average Time for Payment and Distance to Brushing Machine

Responsibility for Transport	Average Time to Get Paid	Price in R\$ per kg	Distance to Brushing Machine
Brush operator	7.38	0.92	36.75
Middleman	0.00	0.83	38.83
Farmer	6.57	0.98	23.86

Source: Author's estimates from field survey data.

Even though farmers earn less from selling to middlemen, they still choose to sell to them and brushing facility owners because payments are made on the spot or within a few days. CONAB meanwhile takes on average 10 days to pay for the fiber it receives. In addition, the brushing facilities accept a higher humidity percentage (between 17–18 percent against 14 percent for CONAB). However, there is a maximum volume of sisal that each registered farmer can sell and, therefore, this limits the volumes that middlemen and brushing facilities can sell through this route. As a result CONAB is not a large operator in terms of fiber purchases.

Middlemen and brushing center owners also provide financing for the decorticating machines operations and the sisal field owners. Since farmers and decorticating machine operators and owner usually struggle to access credit and have problems with working capital, resources for worker payments and for the acquisition of the machine oil are advanced by the owners of *batedeiras* or exporters (or middlemen if that is the case). Anecdotal evidence also suggests that brushing center owners receive advance payment from exporters and manufacturers when purchasing sisal.

Location of Brushing Centers

The brushing operation is the pivot of the sisal logistic chain. Brushing facilities determine the prices that are paid to sisal producers and the quality of the fiber that is sent and used in downstream value addition. Locally, the brushing operations are known as the empresas de beneficiamento (value addition centers). It is clear that there are such centers with varying capacities distributed across the sisal region. The smaller centers process on average 30 tons per week, while the larger ones process around 1000 tons. Losses during brushing are around 5 percent of the fiber. There are around 60 brushing operations across the sisal region (figure 4.2).

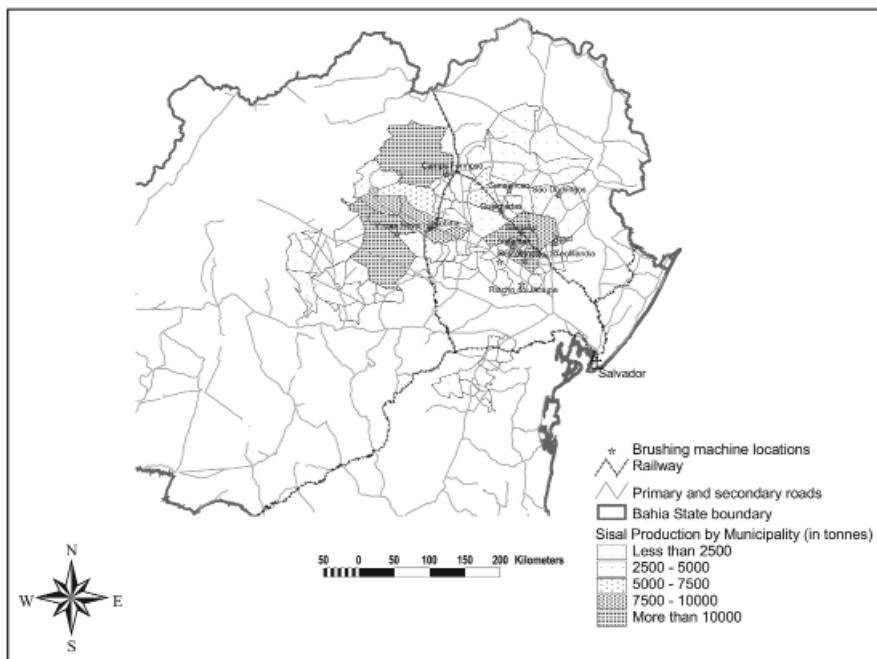
Distance from the brushing centers is an important determinant of the presence of middlemen in the supply chain. Average distances to brushing centers are 24–37 kilometers. Inside the traditional sisal region, where brushing machines can be located at a maximum distance of 40 kilometers from the majority of sisal fields, middlemen are not an important presence in the commercialization of sisal. In more remote areas like Campo Formoso, where the closest brushing center could be located 200 kilometers away, middlemen become more relevant for commercialization.

Transport

The other reason farmers choose to sell to middlemen is that they are relieved of the responsibility of organizing transportation of the fiber. In the municipality of Conceição do Coité, the cost of the freight is in the range R\$0.03–0.05 per kilogram inside the municipality. This means that based on the CONAB price, if the DMO could sell to the CONAB and decide to wait, he could earn around R\$0.09–0.10 per kilogram more than he does by selling to middlemen. Actually, this is the more or less the cost of the freight inside the entire traditional region. All municipalities of the traditional region have a CONAB storehouse.

The middlemen not only provide transportation services but also serve as consolidators of sisal fiber, establishing contact with decorticating machine operators in different fields to consolidate production and reduce transport costs to the traditional area where most brushing machines are located. Taking into account the average productivity of decorticating machines and the carrying capacity of the trucks used by intermediaries in the region, middlemen would have to consolidate the weekly production

Figure 4.2. Sisal Production and Location of Brushing Facilities



Source: Author.

of 15 decorticating machines to make a full trip to the traditional region. Of course, the production could be consolidated over several weeks before transportation takes place; however, the lack of appropriate storage facilities of large size makes this strategy harder to implement.

Quality Requirements

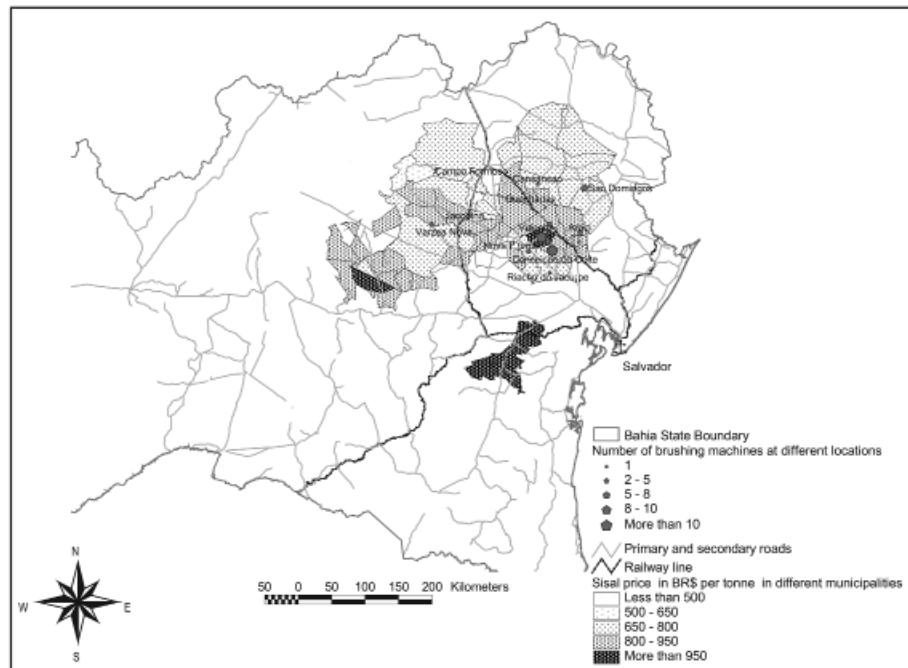
According to government directives, sisal is classified in three types depending on its moisture content, impurities, color, and length of the fiber. The classification is important because end products with higher price use higher quality fiber. For instance, type one fiber is used to manufacture carpets and yarns, type two for agricultural twine, and type three is used for cordages. Due to differences in the end-product use, types of sisal fetch different prices in the local market, with type one having a 20 percent price premium over type two and a 40 percent difference with respect to type three.

One important characteristic of the production cycle of sisal is that the quality is only discovered at the brushing machine level when fiber is classified. This situation prevents higher prices for better quality fiber from reaching farmers. Thus, the organization of the productive process and the broken flow of information ensure the farmer and the decorticating machine operator do not have incentives to improve the quality of the fiber.

Pricing Patterns

Beside price differences by quality, there is also significant spatial price dispersion in the municipalities that produce sisal. Although the differences seem to be related to

Figure 4.3. Location of Brushing Machines and Pricing Spatial Pattern



Source: Author.

higher transport cost in the case of the municipalities that are not part of the traditional sisal region, these costs do not seem to account for all the variation in prices. The location of brushing machines, on the other hand, is one of the reasons of this variation (figure 4.3).

In addition, it was noted that differences in prices in the main poles of Valente and Conceição do Coité are also partly due to timing of payments. Although part of the differences could be attributed to the player who is responsible for transportation, even after deducting transports costs there are significant differences that are explained by the financing needs and the almost non-existent credit in the market. Thus, a farmer could forego a 10 percent premium on the price if he has to wait 10 extra days for the payment, which amounts to a large 380 percent annual interest rate.

Cooperative Approach to Coordination

Clearly the typical sisal chain is fragmented. Only the medium and large farmers are able to bypass middlemen or establish different relationships with decorticating machine owners. Given the importance of quality, fragmentation of the chain makes it difficult for farmers to obtain higher prices. There are broken flows of information leaving farmers and the decorticating machine operators with little incentive for better quality. The field survey showed that the problem becomes worse as the farmers become more removed from the brushing center where quality is discovered.

In addition, farmers have long felt that they were being exploited by middlemen. One of the ways that the small-scale producers have sought to extract maximum rent

from sisal is through forming cooperatives as a way for rural farmers to improve trade conditions. Given the geographical dispersion of sisal farms, the highly decentralized nature of decortication contrasts heavily with the concentrated location of brushing machines and manufacturing industries and exporters. More than 72% of the brushing machine capacity is located in four districts of the traditional sisal territory—viz: Conceição do Coité, Valente, São Domingos, and Retirolândia—while manufacturing plants are concentrated around the municipalities of Valente and Conceição do Coité, as well as in Salvador (da Hora et al. 2008). This pattern affected the relationships in the supply chain, as farmers had to travel to the few centers to sell their products. The problem was that in order to get to the open markets in the cities, farmers were required to pay a tax (*fisco*) at the entrance of the cities. In addition to taxes, they were charged a fine for illegal transportation of goods (MOC 2007b). In fact, at times, farmers ended up giving away their produce rather than sell it.

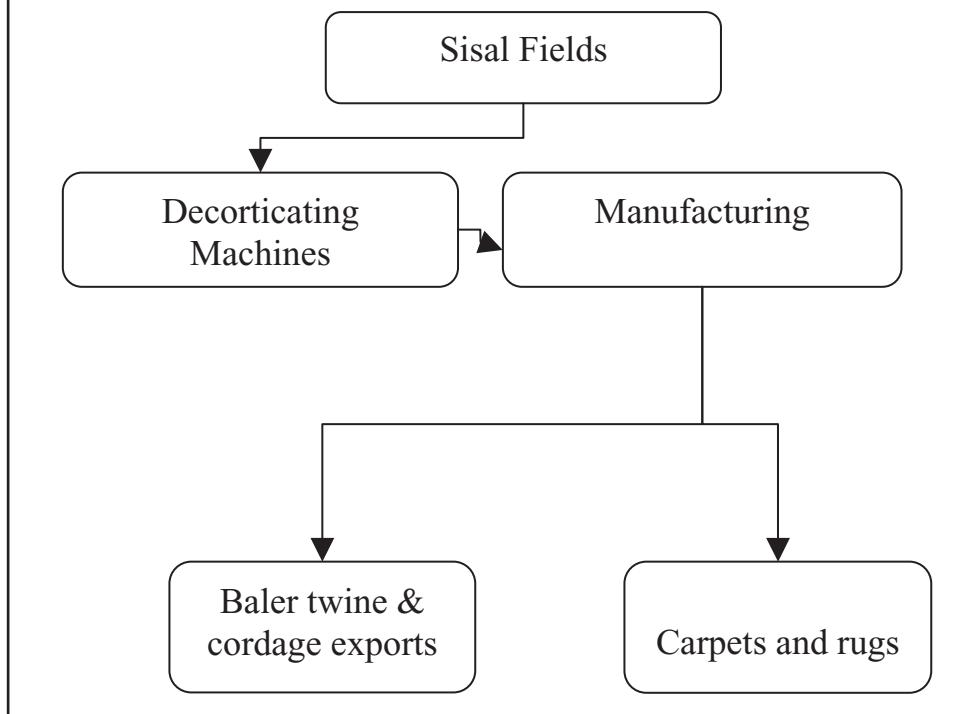
Farmers, therefore, started a movement called the “ICMS movement,” which led to the establishment of five local farmers associations in five cities of the sisal region. One of these associations was the Associação dos Pequenos Agricultores do Estado da Bahia (the Association of Small-scale Farmers of the State of Bahia, or APAEB), which was formed in 1980. APAEB grew into one of the most politically and economically influential associations in its home city and surrounding ones. It has some 169 sisal fiber suppliers in 11 municipalities in the sisal tradition with more than 800,000 families.

APAEB coordinates production among hundreds of independent sisal growers, and arranges transportation and processing of the fiber, and ultimately manufactures sisal cords, rugs, and carpets (figure 4.4). Half of its current production is marketed and sold overseas. By 2000, APAEB had created 3,900 jobs in a city of 20,000 people, and the region’s per capita income tripled. At the same time, APAEB’s own assets went from \$4,000 to \$9 million. APAEB now injects more funds into the local economy than does the local government. APAEB has a marketing partner in Germany, where it owns 51 percent of the partnership, to distribute its products in Europe. Previously it has worked with a distributor in the Netherlands. It provides credit lines and skills training and undertakes a range of ecologically beneficial activities, including recycling and use of production wastes, production of goat milk, etc. It now has a number of other activities, including radio and television communications for training, schools, a community centre, a cooperative bank, and a large grocery store. The international development community and external foundations, such as W.K. Kellogg, partner and support it.

Since APAEB manufactures sisal fiber for yarns and rugs, but also has its own brushing machines, it can offer farmers a much shorter supply chain than would otherwise be the case. This reduces not only the number of intermediaries in the chain but also the transaction costs associated with a fragmented supply chain, making the operation relatively more efficient.

Another way in which the APAEB intervention addresses the issues raised above is the fact that the association buys sisal fiber directly from farmers and offers different prices according to quality, a situation that is not the norm since only after fiber is brushed do batedeiras charge different for types of sisal. According to Alves, the market price was R\$0.85 (type two) and R\$1.05 (fiber extra). Meanwhile, APAEB paid R\$1.13 for type extra, R\$1.03 for type one, and R\$0.93 for type two. APAEB brushes the fiber on premises, classifies them, keeps the best quality fiber for use in the carpet factory, and sells the rest to other industries (mainly bale twine industries).

Figure 4.4. APAEB's Sisal Supply Chain



Source: Author.

Impact of Cooperation

A comparison of the three main types of sisal value chains is given in table 4.5. The data show that the cooperative has the highest total costs, mainly due to the location of the manufacturing facility relative to the export port. The cooperative does not produce enough volume to justify investing in its own transport fleet and has to rely on third parties. The private company on the other hand is able to minimize costs as it has a fleet of trucks that are used to deliver product to the port for export.

Although APAEB offers some solutions to the issues raised in this case study, even this initiative seems to have its limits in terms of reaching a sizeable share of sisal farmers. Advocating for this as a solution will probably not fix the problem. Any solution would have to take into account the setting and characteristics of the relations and institutional arrangements among the different players in the sisal value chain.

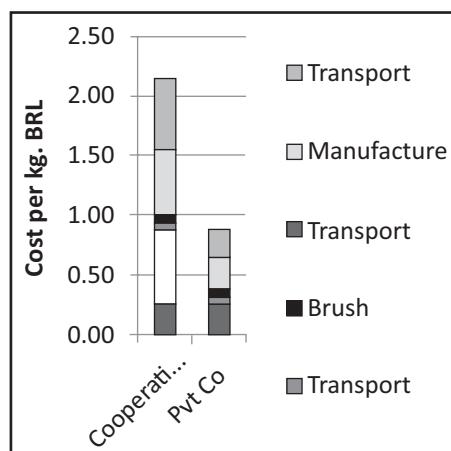
Some issues remain a mystery and need to be studied. The question of price transmission between exporter prices and farm gate prices, and how this is intermediated by middlemen or brushing centers, is an important issue that has been studied in other settings. Similarly, some of the practices of manufacturing industries, and in which situations they adopt farm gate or uniform delivery pricing, are worth exploring further.

Figure 4.5 shows that the costs per kilogram for the private company are lower than those of the cooperative. However, the private company chain does not engage in harvesting of fiber from the fields. This is a major cost component of the cooperative. Further, the private enterprise manufactures most rope and twine, whereas the cooperative

Table 4.5. Comparison of Cooperative and Private-Firm Costs and Outputs

Activity	CONAB State Body	Farmer Association	Private Company
<i>Quantity of fiber purchased per week</i>	50	250	900
<i>Price paid</i>	0.86	1	1.1
<i>Payment terms</i>	Cash	Cash	Cash
<i>Responsibility for transport</i>	Middleman, farmer	Farmer	own account
<i>Output in terms of fiber</i>	60		850
<i>Output in term of product</i>		2 containers per month	25 containers per month
<i>Payment terms</i>	8 days	Few days	Several weeks

Source: Author.

Figure 4.5. Sisal Value—Cooperative and Private Firm

Source: Author.

manufactures mostly rugs and carpets. Ultimately, the outputs are totally different, with the cooperative producing two containers per month as compared to the company that produces goods that fill 25 containers every month. The business imperatives of the two entities are very different. In fact, the cooperative is engaged in various other activities intended to benefit its members.

Notes

1. Other producers of sisal include Venezuela (10,500 tons), Madagascar (8,300 tons), and Haiti (2,200 tons). Mexico is an important producer of henequen (17,000 tons), a plant belonging to the same family and with the same end use as sisal. Following FAO's reporting practices, total world estimates shown here for sisal production, exports, and imports include henequen.
2. In 2008, excluding government purchases, more than 80 percent of the sisal production was exported.
3. Includes products not shown like ropes, other cordage, and tow.

CHAPTER 5

Case Study Two: Electronic Intermediation

Trade in Soybean

Soybean is widely grown across the world, and is the second largest oilseed after groundnuts. Its production has increased rapidly since the early 1970s, mainly due to its adaptability to various agro-climatic conditions. The United States is the largest producer in the world (figure 5.1). India is the fifth largest producer, accounting for some 4 percent of global production in 2008. More than 50 percent of production in India is in the state of Madhya Pradesh (figure 5.2). Farming in India is characterized by a predominance of small-size farms, with at least 80 percent of farms being 2 hectares or less.

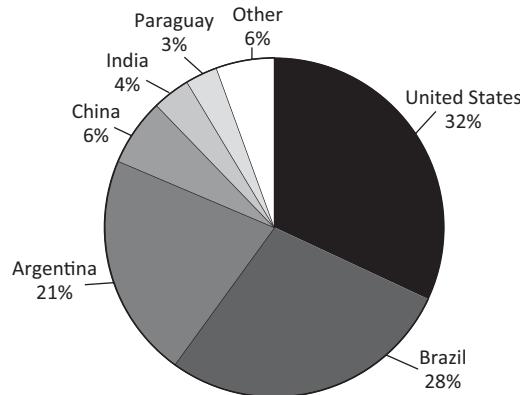
Soybean is processed to extract oil and a high protein residue called soy meal or de-oiled cake (DOC), which is used as a major animal feed ingredient for poultry and cattle. In India, soybean composition is about 80 percent DOC and 18–20 percent edible oil¹ (figure 5.3). Oil is sold to wholesalers in the domestic market where it is purified, blended, branded, and marketed. About 30 percent of DOC is consumed in the domestic market and the rest is exported as animal feed to the Middle East and Southeast Asian Countries (figure 5.4). In 2008, the average FOB price for DOC was just over \$400.00 per ton (figure 5.5). About two-thirds of the DOC exports from India were handled through the ports of Kandla and Mumbai. The total exports were approximately 600,000 tons in 2008 (figure 5.6).

Soybean Logistics in Madhya Pradesh

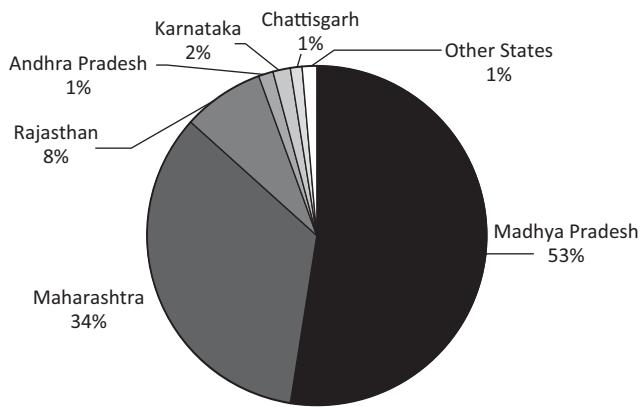
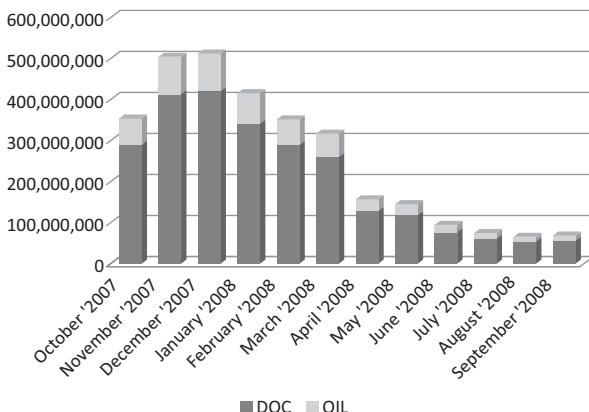
As stated above, more than half of the soybean production in India is in the state of Madhya Pradesh (MP). MP is the second largest state in India with an area of 308,000 square kilometers. During the last census in 2001, MP had a population of more than 60 million people.

MP has a total length of roads of 67,600 kilometers. Out of this total, some 3,700 kilometers are part of the national highway network and 7,300 kilometers are part of the state highway network. The state has some 5,000 kilometers of railway and over 420 trains passing through each day. The state is, therefore, well connected to the major economic centers of the country. However, its per capita income is below the national average and agricultural yields are also lower in the state than the national average for most crops.

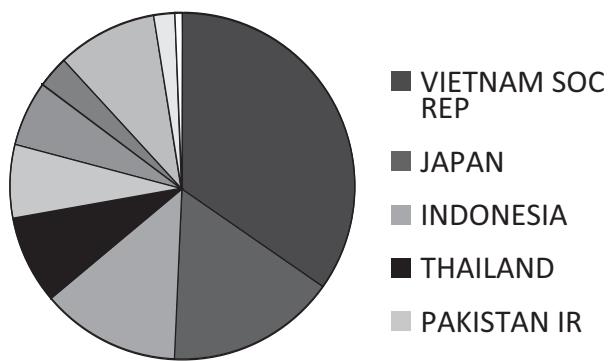
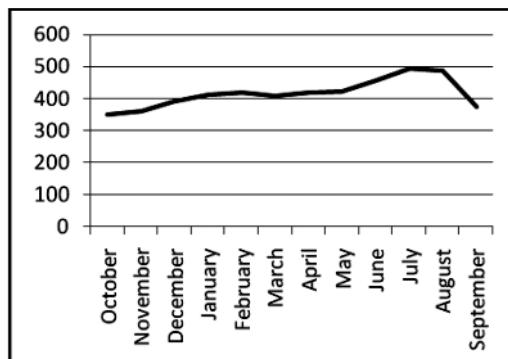
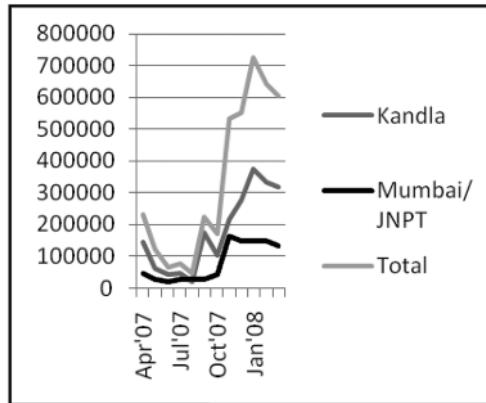
In India, each state is a limited market on its own, subject to its internal regulations and views on agriculture markets, taxes and levies, movement of goods, licensing, and

Figure 5.1. World Soybean Production 2007–8

Source: www.sopa.org.

Figure 5.2. Soybean Production in India by State, 2007–8**Figure 5.3. India Soybean DOC and Oil Production, 2007–8 in Tons**

Source: www.sopa.org.

Figure 5.4. India Soybean DOC Top 10 Export Destinations**Figure 5.5. Average FOB Price in \$/t, 2007–8****Figure 5.6. Monthly DOC Export Volumes through the Main Ports, 2007–8 in tons**

Source: www.sopa.org.

operations of freight vehicles. Agriculture and the licensing of road transport are under state jurisdiction, as are several kinds of local taxes. This necessitates checkpoints and road blocks at state borders and within states to ensure that goods on the move are permitted to do so and that taxes have been paid. These practices result in delays and deterioration of produce and provide numerous opportunities for rent-seeking behavior. Thomas (2008) estimated that with better roads, improved trucks, and removal of unnecessary check posts, transit time between Mumbai and Delhi could be reduced to 24–36 hours from the present 48–72 hours.

Traditional Channel for Crops

Starting in the mid-1960s, every year, the government of India announces guaranteed minimum support prices (MSPs)² for staple food grains to be paid by its agencies and companies. In the same period, the central government mandated sale of farm produce at regulated markets called mandis, with a daily auction of produce offered by farmers to registered traders, held under government auspices. Most Indian states have their own Agriculture Produce Marketing Committee (APMC) Acts to conduct this business.

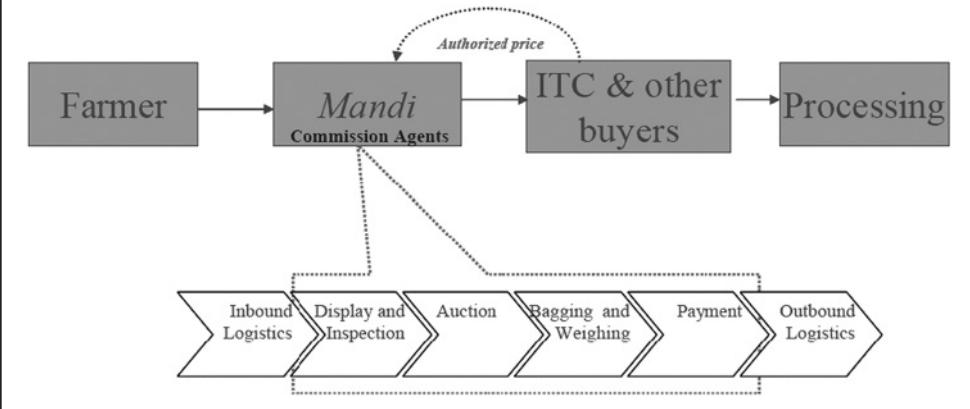
Most of the produce is packed in bags that are stored in the warehouses. Grains are typically packed in 50–90 kilogram bags, which are convenient for handling and storage. Storage facilities at farm level are poorly developed or absent when compared to major centers. Currently government agencies and parastatals are the largest entities providing warehousing, though privately owned warehousing is also available. Though it is generally difficult to have an accurate figure of storage capacity,³ there is a wide network of state-provided storage infrastructure. The estimated storage capacity in Madhya Pradesh is around 1.8 million metric tons, out of which the Central Warehousing Corporation (CWC) accounts for about a one-third of the capacity; the rest is provided by the State Warehousing Corporation (SWC). Utilization rates of the state warehouses is about 80–85 percent and as high as 90–95 percent at some locations. The state infrastructure is complemented by numerous private sector storage facilities across the state.

One of the major problems faced is post-harvest losses. In India, while estimates vary, a recent review⁴ estimated that losses were at least nine percent of total agriculture production.⁵ Losses are 8–10 percent in food grains and 30–40 percent in horticulture. Most post-harvest losses take place in farm storage and the rest in the supply chains to markets in transport, handling, and storage. The bags that are widely used contribute to the relatively high losses compared, for instance, to storage in silos. Even the large government agencies report losses of around 1 percent of stocks in storage and transit each year.

Traditionally, Indian farmers can either sell their produce to a trader or bring their crops to a mandi. Once farmers have brought their crop to the mandi, there is a period of visual inspection by potential buyers, followed by an open oral auction (Bowonder et al. 2002). After the price has been established, the farmers brings their produce to the weighing areas that are operated by the buying agent. At the weighing areas, the produce is bagged into sacks and weighed. With the full weight of his produce calculated, the farmer collects his payment (figure 5.7).

The mandi system has numerous inefficiencies and problems. Most importantly, is that the farmers do not have information about pricing beyond the MSP set by the APMC beforehand. Therefore, farmers are not always able to sell their produce at the optimal time that would allow them to maximize their income. There are also several

Figure 5.7. Traditional Procurement Using Mandis



Source: Anupindi and Sivakumar (2006).

practices that work to the detriment of the welfare of the farmers, including the underweighing of their produce, the obligation of the farmer to pay the costs of weighing and bagging, and the farmer not being paid the full amount at the time of sale, instead having to come back to the mandi for the balance of the payment due to them. In addition, the mandi system causes problems for the enterprises downstream that process agricultural produce. The multiple handling stages result in increased time and costs, inconsistent quality of produce, and inflation of prices by the commission agents, both at the mandi and to the trading company.

Over time, the country-wide mandi system has had a perverse stranglehold on agricultural trade by vested interests, which captured the system and made their living out of the statutory monopsony combined with regional buyers' cartels. Profits are obtained through arbitrage between low prices given to farmers selling produce at the mandis and high prices charged to buyers who have to obtain their agricultural inputs from traders with stocks.

The lack of price information and restricted market mechanisms in rural areas led to substantial malpractices from the village-level trading communities who often had a widespread network that prevented price competition for farm-gate sales. These depressed sales resulted in continuing the smallholder's cycle of poverty and dependency on external intermediaries. It also led to the establishment of a pressure group of traders with considerable influence.

Virtual Collaboration through ICT

The mandi system was the only way to sell produce until the 1990s when there was deregulation of the agricultural markets allowing private sector to participate. With the deregulation, private-sector enterprises in India could take part in produce markets. One of the significant initiatives to emerge and compete with the mandi system was the use of information technology to integrate agricultural value chains. One such innovative scheme, called e-Choupal, was developed in 2000 by the Indian Tobacco Company's (ITC) agri-business division. The intention was to make ITC's procurement business more efficient and to avoid the high transaction costs associated with the mandi system.

E-Choupal sought to avoid some of the payments to traditional intermediaries and instead sought to obtain primary agricultural produce direct from farmers. Quality was indifferent in the mandi system and there were losses owing to multiple handling. The company re-engineered the procurement chain to reduce these avoidable costs.

ITC ABD started e-Choupal operations in MP in 2000 as a one-way platform for the procurement of soybean, which is a homogenized crop with relatively few quality parameters. The first e-Choupals were established in the state of Madhya Pradesh. The system involves establishing a center in a village with a computer, power supply, and reliable internet access.⁶ A trained coordinator (a “sanchalak,” who is also a farmer and paid a commission on completed transactions) operates the village kiosk, providing free internet access to about 600 farmers in five to six villages within a five kilometer radius. Essentially, it is a hub-and-spoke system. When the concept started, ITC’s goal was to have a hub within 30 to 40 kilometers of every farmer. Table 5.1 shows the e-Choupal coverage over time and figures 5.8 and 5.9 show the spread of distances to the nearest hub in two states, Utter Pradesh and Uttrakhand.

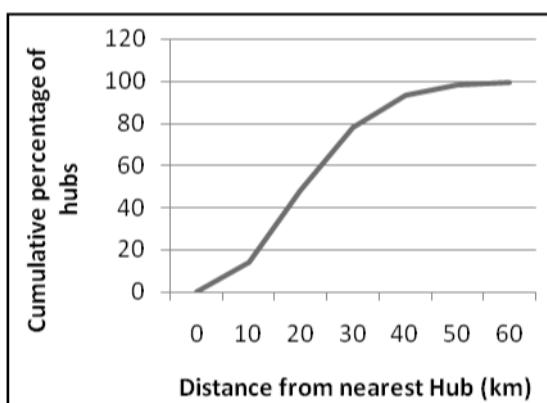
Through e-Choupal, the farmer is provided with a facility for current price discovery and other information regarding his produce and has the option of making an

Table 5.1. e-Choupal Coverage as on March 31 of Each Year

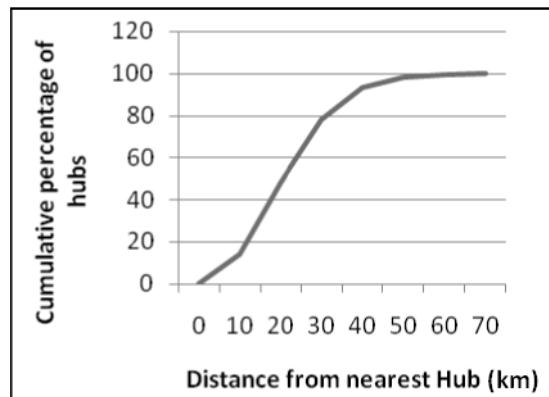
Item	2001	2002	2003	2004	2005	2006	2007	2008	2009
e-Choupals									
Number of e-Choupals	91	484	1,348	3,398	4,930	5,936	6,400	6,426	6,476
Number of Hubs	6	11	35	90	127	139	150	140	130
States covered	3	4	4	7	7	9	9	9	10
Villages networked	420	2,280	6,340	15,975	23,180	27,900	30,080	30,200	30,430
Farmers in coverage area (mill)	0.06	0.3	0.9	2.2	3.2	3.9	4.2	4.2	4.3

Source: ITC ABD.

Figure 5.8. Distribution of e-Choupal Distance to nearest hub in Uttrakhand State



Source: Author's estimates, data from ITC ABD.

Figure 5.9. Distribution of e-Choupal Distance to nearest hub in Utter Pradesh State

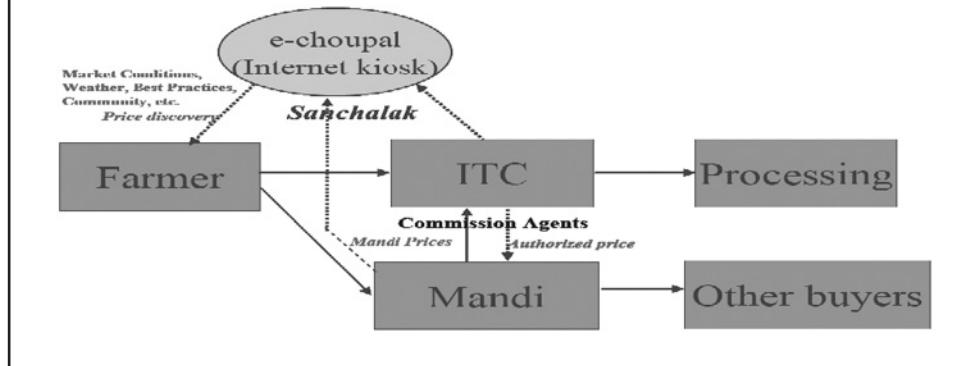
informed deal with ITC for a sale that will take place on the next day. ITC makes daily price offers for purchases from farmers that is set by its field managers in each state, posted at its web portal, and valid for the next day's transactions at each one of its hubs. The price on offer for each hub is based on the nearest mandi or mandis' prices and the market considerations of ITC ABD, somewhere between the high and low mandi prices of that day.

If a farmer chooses to sell to ITC, he first brings a sample to the sanchalak, who conducts a quality assessment using a check list (this provides transparency in pricing). The sanchalak then gives the farmer a tentative price quote a "sauda parchi," from there the farmer proceeds to an ITC procurement hub with his produce. There is, therefore, no uncertainty about the ITC offer price. Sometimes, the ITC price offer is increased around noon of the next day if mandi prices rise sharply but the price is never lowered. (The price can only be reduced if, on inspection, produce quality is less than that stated in the sauda parchi.) This gives reassurance to the farmer, because he can decide to sell at a price that suits his circumstances and then transport produce to the ITC hub rather than take the entire consignment to the mandi and sell at a price that is only known after he is already physically committed to sell.

At the hub, another quality test is undertaken, with price deductions resulting from the presence of foreign matter or moisture content, concepts that are well understood by the farmers (lab tests are not yet accepted by farmers). After inspection, the produce is weighted using an electronic scale, removing possible human errors or other shady practices that occurred at the mandis. With the price and weight known, the farmer then collects his full payment at the hub payment counter. At that time, the farmer is also reimbursed for transporting the crop and receives a copy of the lab report and a receipt. The business platform rapidly obtained the trust and confidence of the farming community.¹⁰ The e-Choupal Procurement system is shown in figure 5.10.

The e-Choupal system still uses the mandi commission agents known as "Samyojaks." The samyojak operate at the mandis and, for a commission, have produce bagged, handled, and transferred to the hub's processing unit warehouse or transports the bags to a nearby warehouse as required. As described below, while ITC ABD may itself own

Figure 5.10. e-Choupal Procurement in Parallel with Mandis



Source: Anupindi and Sivakumar (2006).

warehouses, it also hires some from other parties at various locations. The next stage is processing to extract oil, leaving DOC. The company does not own processing plants and outsources this activity.

Impact of Electronic Intermediation

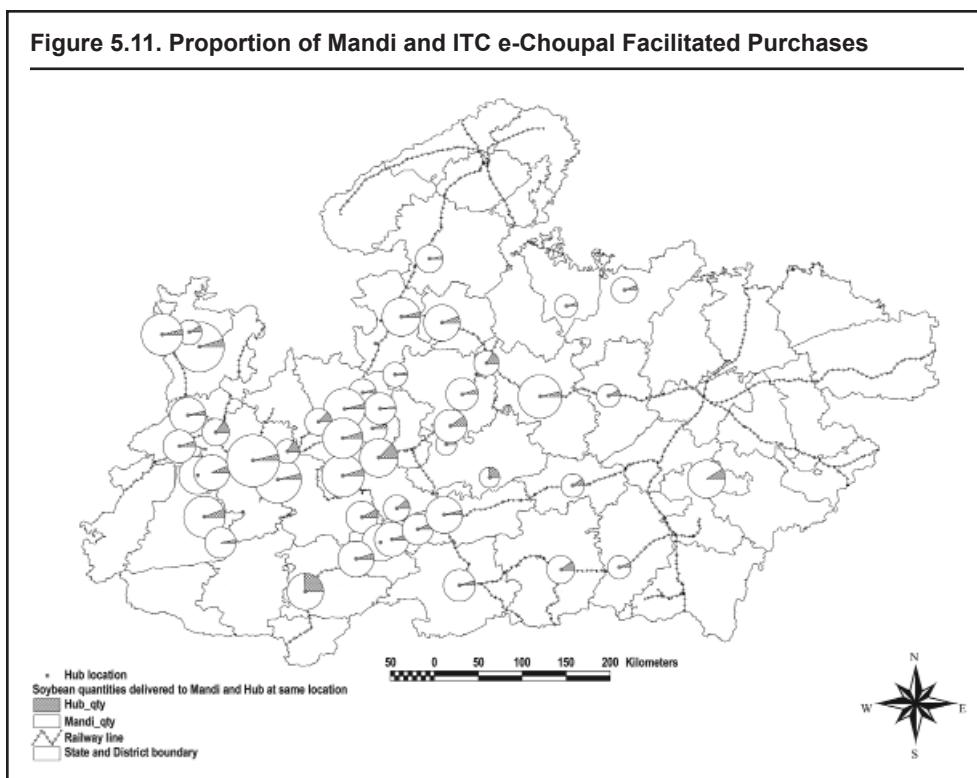
In order to overcome the problems of small-size/fragmented farms, multiple intermediaries, and poor infrastructure, the e-Choupal concept has had four important effects:

- *Facilitating market exchanges.* The intermediation is in markets that have reached a degree of efficiency, where mere transaction cost savings do not accrue easily. ITC works to improve liquidity, facilitating contract enforcement and offering better risk management tools for all the parties in a transaction.
- *Improving quality of product.* The frequency of handling of produce has been reduced, thereby improving the quality of the product that is delivered.
- *Produce traceability.* Value addition by traceability in the supply chain, where ITC uses its intermediation in supply chains to help producers obtain premium prices and final consumers to know the source of the product. This will increasingly become critical as more emphasis is placed on carbon footprint and source of products.
- *Sourcing high value products from rural areas.* An example is organically grown produce that has a specialized high-value market. This could extend to services sourced in rural areas in the future as well.

Trade Volumes

The largest proportion of ITC's soybean procurement takes place in MP, which is the largest soybean producing state in India. Figure 5.11 shows the proportion of volumes purchased by ITC as compared to those at the mandis.

Table 5.2 provides the quantum of ITC's purchases from traders (agents) at mandis. ITC ABD's share of soybean purchases in the market has been estimated to vary between 2 and 9 percent in the past three years.

Figure 5.11. Proportion of Mandi and ITC e-Choupal Facilitated Purchases

Source: Author's estimates, data from ITC ABD and MP Mandiboard.

Table 5.2. Mandi and ITC Hub Purchase Volumes of Soybean in Two Years

Procurement Category	CY 2006–07		CY 2007–08	
	Quantity, t	Rs Mill	Quantity, t	Rs Mill
ITC procurement from Traders	146,498	1,989.2	140,632	2,493.2
Percent from Traders to Total	32.53%	33.13%	34.18%	35.17%
ITC procurement from Farmers	303,805	4,014.8	270,792	4,596.8
Percent from Farmers to Total	67.47%	66.87%	65.82%	64.83%
Total ITC procurement	450,304	6,003.9	411,424	7,090.1
ITC Soybean Purchase as Share of:				
All MP Mandis	6.74%		5.34%	
57 Mandis corresponding to ITC Hubs	11.70%		9.02%	

Notes: ITC buys soybean at 57 hubs in MP. There are mandis at these locations or nearby. Mandi sales include ITC procurement at nearby hubs.

Source: ITC ABD and MP State Agricultural Marketing Board (<http://www.mpmandiboard.com/>).

Though, overall, traders account for just below 50 percent of the volumes from farmers, they sell to fewer hubs and account for high volumes at those locations. Over the 2006–7 season, the average amount purchased from farmers was 5,500 tons, whereas that

from traders was 8,100 tons. In addition, traders also receive a higher price per ton than farmers, Rs14,659.00, compared to Rs13,204.00. Purchasing from agents is practiced for several reasons, including keeping in touch with market dynamics, pricing information, and, in some periods, sufficient offers are simply not available directly from farmers—e.g., in the later periods of the purchasing season when farmers' stocks are usually low—albeit, this is not always so and some farmers hold on to produce to obtain higher prices later in the season. Within the e-Choupal network, the agents are present at hubs to provide outsourced services in the supply chain, including cash disbursement (for procured produce), bagging, transfer, and transporting produce to warehouses as required for a fixed commission.

Who Sells through e-Choupal?

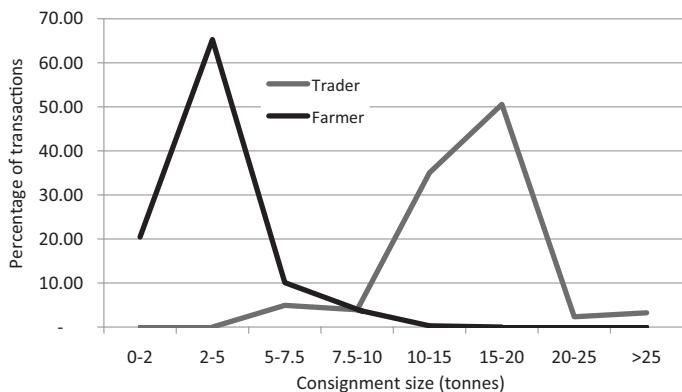
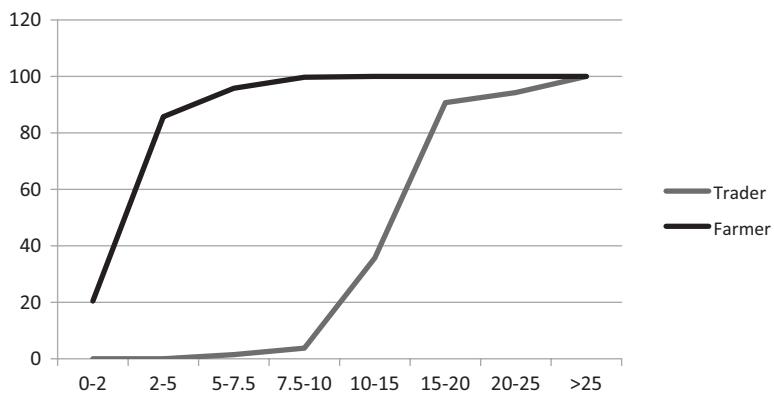
Most deliveries at specific hubs are of small quantities. Data from ITC ABD about consignment sizes is shown in table 5.3 for all soybean arrivals at seven hubs in three districts of MP in 2007–08 (table 5.3 and figure 5.12). More than 70 percent of the consignment sizes are up to 5 tons. The hubs, therefore, cater to many small farmers, who require generally small vehicles to bring in produce. On the other hand, traders who deliver to the hubs bring in larger volumes at a time, on average 15 tons. This is almost five times larger than the average consignment size brought by individual farmers. Transactions involving farmers are five times as many as those involving traders but the latter bring 80 percent of the volume delivered by farmers. This has implications on the handling costs at the hubs, which are likely higher for farmers than for traders.

Most of the deliveries of soybean are in September to January, which is the core of the selling season (figure 5.13). There is a gap over the year when farmers and traders do no deliver, though this occurs at different times. It is striking that traders start delivering soybean before farmers, suggesting that, very early in the selling season, traders will already start purchasing produce to supply to the markets. On the other hand, there are very small quantities that are delivered by farmers during the off season, presumably residual harvest.

Table 5.3. Distribution of Transaction Sizes at Hubs in Three MP Districts (2007–8)

Consignment size in tons	Farmers			Traders		
	No. of Transactions	Weight, tons	Average weight of transaction, tons	No. of Transactions	Weight, tons	Average weight of transaction, tons
0–2	3,280	3,444	1.05	0	0	0
2–5	10,470	36,238	3.46	0	0	0
5–7.5	1,618	9,648	5.96	142	644.59	4.539331
7.5–10	625	5,207	8.33	113	1,009.44	8.933106
10–15	45	493	10.95	1,009	14,037.48	13.91226
15–20				1,456	24,159.67	16.59318
20–25				67	1,573.99	23.4924
>25				93	2,501.84	26.90147
Total	16,038	55,030	3.43	2,880.00	43,926.99	15.25243

Source: Author, data from ITC ABD.

Figure 5.12. Farmer and Trader Deliveries to Three Hubs, 2007–8**Figure 5.13. Timing of Deliveries to One Major Hub**

Source: Author's estimates, data from ITC ABD.

Distances and Mode of Transport

The modes of transport commonly used for soybean are bullock carts, tractor-trailers, and trucks (figure 5.14). These have carrying capacities of approximately two tons, four to five tons, and seven tons, respectively. Trucks larger than that are only used if the village has access to a state or national highway. Farmers can get together and consolidate a load for a larger vehicle if they find it convenient (In such cases, the sale at the ITC hub would continue to be according to the sauda parchis that have been issued by the sanchalak to each farmer). Quantities delivered generally decline with distance from a hub (figure 5.15).

The average distance was 23.1 kilometers from villages to ITC hubs. The approximate distance limit for a round trip to be made by a bullock cart in a day could be considered to be 10–15 kilometers. About 14 percent of the e-Choupals were 10 kilometers or less from a hub and fall in this category. Some farmers at these locations with consignments to sell of two tons or less might use this mode. For locations beyond this limit, the

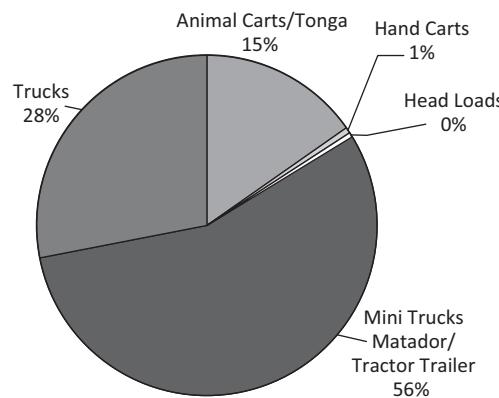
use of bullock carts would be unattractive. Farmers are more likely to transport produce with some form of motorized transport, provided the roads are reasonable.

The vehicle generally used by farmers is the tractor-trailer. The cost of transportation by this mode is less than that of a four to five ton pickup vehicle.⁸ Taking the tractor-trailer cost to be about Rs300.00–400.00⁹ to carry 4 tons, with the average distance of farm to hub of about 30 kilometers, the cost for the loaded journey is estimated to be about Rs2.50–3.40 per ton kilometer (tkm), discounting any potential return loads of inputs from the hub location to the village.

Farmers use various modes of transport to reach the ITC hubs the next day depending on several factors including:

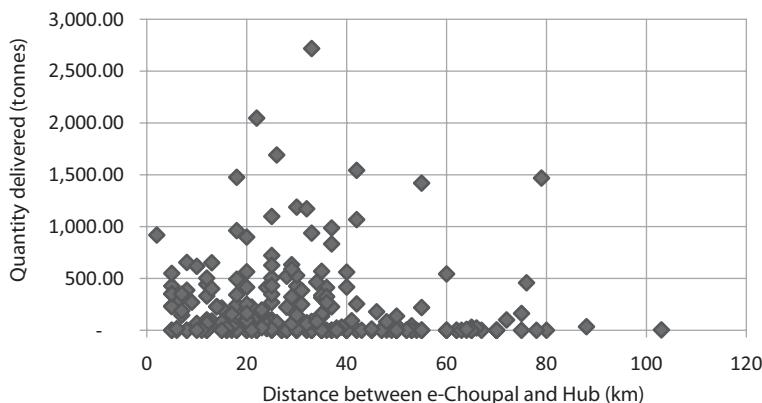
- The quantities they have produced in the growing season and the surpluses available for sale.

Figure 5.14. Mode of Transport Used to Transport Soybeans to Market



Source: Data: NIAM Survey (2005).

Figure 5.15. Soybean Quantity Delivered from e-Choupals in Three Districts



Source: Author's estimates, data from ITC ABD.

- The quantities they decide to sell at a particular time after gathering the crop.
- The farmer's judgment on when the best price would prevail and whether or not one should wait for it. Generally speaking, if they had staying power, farmers could benefit from higher prices later in a crop year.
- The above is linked, to a large extent, to each individual's financial circumstances, e.g. their level of indebtedness, whether they need to sell everything immediately to pay off farming loans (from whichever source) or other debts, or the need to raise funds for family expenses, etc.

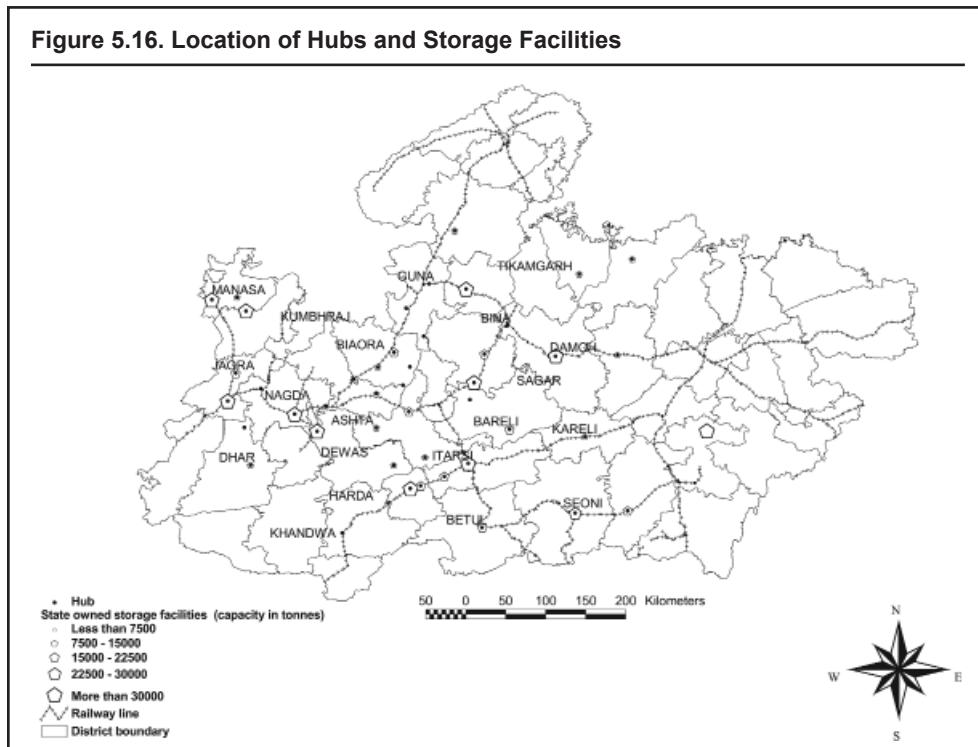
Storage Facilities

There are public and private storage facilities at nearly all locations where there is a hub or a mandi (figure 5.16).

Pricing

The link to mandi prices means the e-Choupal daily price varies for the produce in a state depending on the hub. Goyal (2007) established that there were price differences of about 5 percent between larger and smaller mandis for soybean in MP, perhaps owing to lower volumes traded, accessibility, etc.¹⁰ Hence, the prices at corresponding hubs would also vary accordingly. Goyal found also that there were significant, though small, reductions in spatial price dispersion between mandis wherever e-Choupals were established. On average, the mandi price of soybean increased by 1 to 5 percent after the

Figure 5.16. Location of Hubs and Storage Facilities



Source: Author's estimates.

establishment of e-Choupals in the vicinity leading to transfer of surpluses from traders to farmers and resulting in some reduction of their traditional local monopsony power.

Table 5.4 provides a comparison between the costs of procurement through the traditional channel and the electronic intermediation provided by ITC ABD. The e-Choupal system results in cost savings of 3.8 percent of the MSP and, therefore, a significant benefit to the rural economy. The implication is that the benefits of this kind of corporate activity in rural logistics chains are not a transitory phenomenon. Further, as mentioned earlier, Goyal (2007) showed that the introduction of procurement of soybean through e-Choupals had the general beneficial economic impact of enhancing prices received by the farming community for soybean even at mandis near e-Choupals, as well as increases in the area under soybean cultivation.

With greater information and understanding of prices, farmers have become more aware of what they can receive for their crops. When farmers sell to ITC through the e-Choupal, prices are 2.5 percent higher on average than if sold at the mandis (Annamalai and Rao 2003). Even though ITC is paying more for the produce and compensating farmers for transport, ITC is paying less than before (Prahalaad and Hammond 2002). Because ITC cut out the intermediaries, the mark up paid by ITC has decreased from 5 to 2.5 percent.

Export Logistics

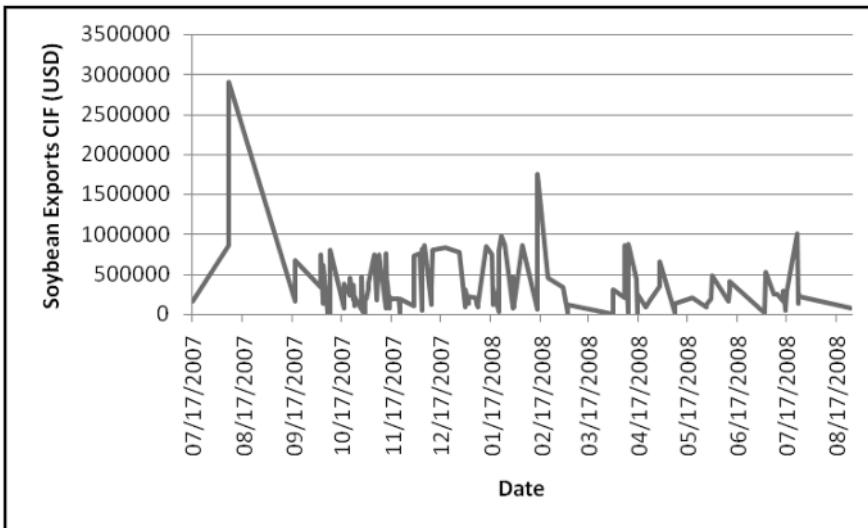
Close to half of the purchases by ITC-ABD are export driven, meaning that the e-Choupal intervention has increased the participation of small-scale farmers in international trade. Most of the company's DOC exports are presently not containerized. DOC, as break-bulk cargo, is loaded on pallets from Kandla port in Gujarat. Mumbai¹¹ is generally used if the product is containerized. The FOB value of DOC is such that road transport to

Table 5.4. Comparison of Mandi and e-Choupal Wheat Procurement in Rs/t

Transaction	CY 2005–6 Supply Chain Costs				CY 2008–9 Supply Chain Costs			
	Mandi Supply Chain		e-Choupal		Mandi Supply Chain		e-Choupal	
	Farmer	ITC	Farmer	ITC	Farmer	ITC	Farmer	ITC
Freight	120	120	120	0	100	100	100	0
Labor/Handling	50	40	0	40	50	50	0	50
Commission	150	100	0	50	270	180	0	50
Handling Loss	50		0		90		0	0
Bagging	-	75	-	75	-	75	-	75
Cash Disbursement Costs	-	-	-	50	-	-	-	87
Totals for farmer and ITC	370	335	120	215	510	405	100	262
Total for the Supply Chain	705		335		915		362	
MSP for Wheat			7,000				10,800	
Farmer's Savings as % of MSP			3.57%				3.80%	

Source: Anupindi and Sivakumar (2006), ITC ABD, RBI (2009a) and author's estimates.

Figure 5.17. Soybean Cake Export Volumes per Month, July 2007–August 2008



Source: Author's estimates, data from ITC ABD.

ports¹² cannot be used and the preferred mode is, therefore, rail for the relatively long haul to Kandla or Mumbai. The main rail loading locations, where there are hubs and processing units that ITC ABD uses as well, are Indore (Dhakachiya), Biora (Bhopal), Khandwa and Sagar in MP, and Kota¹³ in Rajasthan.

Figure 5.17 shows that the peak in exports occurs at the start of the purchasing season, largely coinciding with large deliveries from traders. This suggests traders, in fact, are able to respond much faster and are more reliable in terms of getting product from farmers to the major purchasers and processors.

Based on a review of some export transactions of DOC over a three year period, the average margins in the case of these exports varied between 10–18 percent of purchase price and 3.8–4.9 percent in the case of the domestic sales.

Local Distribution

ITC ABD uses its infrastructure network to improve productivity and facilitate local distribution as well. This is a major activity leveraging local knowledge through sanchalaks and samyojaks to provide rural extensions for third-party marketing networks of goods and services and matching these to specific farmers or points of distribution in villages. The extension services include improved techniques in farming, water management, etc. to help farmers enhance farm productivity by adopting the best agricultural practices.

In addition to extension services, ITC ABD has also developed large rural sales points called "Choupal Sagars" that are located at some of its purchasing hubs. These supply a large range of products, including agricultural equipment, motor vehicles, etc. produced by third parties. ITC's role is to facilitate contracts between samyojaks with suppliers and product distributors located at or near the hub. It organizes the supply chain, provides overall supervision of the consolidation and distribution tasks that samyojaks undertake daily, receives commissions, and distributes them. The Samyojak

Table 5.5. Soybean Local to Global Supply Chain

Cost Item in Logistics Chain	Details	CY 2008–09
At e-Choupal and Hub		
Samyojak commission	Not at a Choupal Sagar	1.60%
	At Choupal Sagars	0.60%
Sanchalak commission	per ton	50
Mandi cess	On purchase price	2.20%
Hub to Storage		
Transport (Purchase point to storage point)	per ton	350
Labor handling charges	4 Rs per bag @11 bags per ton	44
Storage rental	Per month per ton	40
Fumigation	45 days	11
Hub/Storage to Port		
Transport (Storage to Rail head)	per ton	150
Transport (Rail head to port)	per ton	800
C&F Costs	Bulk shipment (per ton)	300
Moisture loss (for soybean)	Per month	0.25%
Transit loss (For DOC, plant to port)	On the dispatched quantity	0.75%
Handling loss (for DOC, at port)	On the quantity received at port	0.50%
Specifically for DOC container shipments, Dhakachiya to Mumbai		
Transport from Plant to Port		
Plant to Rail head	per ton	170
Rail head to port	per ton	740
Transit loss	0.75%	135
C&F costs at Port		
Freight, average	per ton	703
Surveyor	per ton	33
Fumigation	per ton	12
Terminal handling and documentation charges	per ton	330
Price reductions for quality (average post survey)	1.25% per ton	236

Source: Author's estimates, data from ITC ABD.

receives orders for goods through sanchalaks, collects the products from the local wholesalers who have been contracted, consolidates these, and distributes them to about 20 villages per day. The cycle of village visits is repeated every fortnight. The sanchalak at the e-Choupal markets the benefits of the concept to village shops that, using this method to stock supplies of products, avoids their organizing the last mile logistics chain themselves. The sanchalak is also involved in case there are any distribution problems or for other dispute resolutions.

Total commissions paid in the case of consumer goods and agro inputs are about 5–6 percent, of which ITC, the samyojak, and the sanchalak receive about 4–4.5 percent together; the rest is that of the final sale outlet. ITC gets about 2 percent, of which 1 percent is paid to the samyojak for distribution costs; the samyojak gets a further 0.8 percent as his straight commission and the sanchalak gets 1 percent.

Other services provided by ITC ABD are part of the company's corporate social responsibility thrust. These are not commercial activities and e-Choupal is not directly involved, except that the local knowledge, staff presence, and farmers' data base are of use in structuring activities and ensuring that they are successful. These include social and farm forestry, women's empowerment, livestock development, and primary education.

Notes

1. Information from the Soybean Processors Association of India (SOPA) and AgMarket (Department of Agriculture and Co-operation, GoI).
2. A Commission for Agriculture Costs and Prices recommends the MSP after a detailed study each year and, invariably, the government declares a support price that is slightly higher for the forthcoming purchase season.
3. Data from GoI Ministry of Agriculture, quoted in Ganesh-Kumar et al. (2007) indicates that on March 31, 2005, 24 percent of 72 million tons of covered storage was privately owned nationally. Many private persons and entities have also participated in NABARD, and National Cooperatives Development Corporation operated schemes wherein the Central Government provided construction cost subsidies for better quality rural warehouses (Gramin Bhandaran Yojana), the majority of which are 5,000-ton capacity or smaller.
4. Tiwari (2009).
5. Agriculture output data from RBI (2009b).
6. All e-Choupals have very small aperture terminal links for telecommunications. Present costs of an e-Choupal would be about Rs125,000.00—it was about Rs160,000.00 in 2001. Current annual maintenance costs are about Rs10,500.00 per installation. Source: ITC ABD.
7. When e-Choupal started, there were also favourable comments on the contrast in the waiting areas provided for farmers at the ITC hubs and the dignity with which they were treated, unlike practices prevalent at mandis. This has had the beneficial impact of improving the way farmers are treated at mandis as well.
8. If it was more, farmers would use four- to five-ton pickups available for hire to bring their produce to ITC hubs, instead of tractor-trailers.
9. Based on current hire charges for a rural area, five-ton van of Rs500.00 per day. Source: ITC ABD.
10. And, in consequence, farmers preferred to sell at larger mandis if possible.
11. Jawaharlal Nehru Port Trust (JNPT) at Navi Mumbai.
12. The company would use road services if they were under pressure to meet a sailing at port and unable to get railway wagons or, when there was a sudden supply of back-haul, low-road trucks that charge less than the rail freight.
13. The processing plant at Kota is closed presently.

CHAPTER 6

Role of Logistics Intermediaries in Lagging Regions

Introduction

The function of each intermediary and the role it plays has an important influence in how logistics costs are shared, especially transport and storage costs. Table 6.1 presents a summary of the roles of the main intermediaries in logistics in lagging regions. The following two sections use case studies to explore in some detail how logistics intermediation works in two typical lagging regions.

It is always difficult to extrapolate from specific case studies, such as those used here, to derive some general patterns with wide application. However, there are several stylized facts that can be determined about the role of intermediaries in facilitating trade in lagging regions. Granted, there is no one size fits all solution to improving logistics performance to the gateway infrastructure. The different roles taken together contribute to improving the performance of supply chains (table 6.1).

There are six main roles that intermediaries play in logistics in lagging regions:

- Consolidation of buyer demand or seller products to achieve economies of scale or scope and reduce bargaining asymmetry
- Become an agent of trust by protecting buyers and sellers from the opportunistic behavior of other participants in a market
- Facilitate the market by reducing operating costs
- Match buyers and sellers
- Managing risks associated with trading
- Quality assurance
- Facilitating payments

Consolidation of Volumes

Large producers generally have the option and ability to provide all logistics services in-house, something that small producers often lack the expertise and capacity to do. Typically, areas with high volumes have regular traffic, which, in turn, attracts sophisticated global intermediaries. The situation is different for small-scale producers. Each producer has only a small quantity and, even then, over a short period during the year. Consequently, an intermediary can aggregate the products of many sellers instead of each seller negotiating terms with individual buyers. This offers benefits in reduced

Table 6.1. Market and Supply-Chain Function of Different Intermediaries

Intermediary	Market function	Supply chain effects
Itinerant trader		
	Reduce search costs	Variable integration
	Consolidation to achieve economies of scale	
	Build trust and relationships through repeated interactions	
	Payment on delivery	Poor price discovery
	Risk management	
	Compromises quality	Poor information flows
Cooperatives		
	Consolidation to achieve economies of scale	Consolidation of physical volumes
	Relationships between producers and buyers	Enhanced vertical integration
	Facilitation of market exchanges	Reduced search costs
	Payment to producers	Inefficient payment systems
	Quality improvements	
	Risk management by providing a large pool of suppliers	Non-transparent working arrangements and capture by few dominant players
Electronic intermediation		
	Price discovery	Upstream disintermediation of traditional players
	Network development	Hub and spoke network structure
	Facilitation of market exchanges	Efficient information flows
Contract arrangements		
	Networking between contract suppliers and buyers	Long term logistics arrangements
	Price set in advance, payment guaranteed	Predictable flows
	Legal basis for market exchanges	
	Risk minimization in finding market	
	Quality improvements	
	Risk minimization through guaranteed supply	
	Financing through provision of credit	Chain financing

Source: Author.

transaction costs, taking advantage of economies of scale and reducing asymmetries in the bargaining power of suppliers.

Cultivating Relationships and Networks

Commercial exchange involving small-scale producers is characterized by repeated transactions and cooperation between agents amidst high levels of asset specificity, chances for opportunistic behavior, and other known hazards. Trust is the main problem sellers and buyers face. How can each side be sure that the other side will not cheat? Raballand (2009) explores the coordination problems using game theory to describe how interactions between individual farmers can result in a sub-optimal equilibrium that

undermines trade and transactions between local producers and more dynamic external markets. If the game is played only once, then each side has an incentive to cheat; however, if it is played repeatedly, it will lead to better cooperation and market equilibrium. Trust can be obtained through embedding the market exchange in a network of social relationships based on ethnic or other links. In a sense, the lack of market integration is due to a lack of information on who is trustworthy and who is not. The provision of information on the reputations of the parties becomes important. However, as the size of the group grows, the information requirements also increase. So, this mode of sharing information will work only for relatively small communities or regions. In this environment, trust operates as a self-enforcing safeguard that could be a more effective, less complex, and less costly alternative to both explicit contracts and vertical integration (Uzzi 1997). It could also serve as a complement for more formal contract-based relationships (Poppo and Zenger 2002).

Networks also have direct effects on buyer-seller relationships and farmers' marketing behavior. In the presence of networks, business transactions are more likely informal and relationship-based, rather than formal contract-based (Lu et al. 2007). Furthermore, participation in networks has been shown to increase opportunities for smallholder vegetable farmers in China to participate in supermarket and international market outlets, even when the quality of their products is below conventional standards. (Lu et al. 2007)

Intermediaries can prevent parties to a transaction from behaving opportunistically. Parties know they may have to deal with each other again in the future and are, therefore, less inclined to take advantage of each other. Also, intermediaries are involved in more transactions than individual suppliers and can enjoy economies of scale in their investments. Additionally, trust, relationships and networks can help explain arrangements along the supply chain that cannot be explained by pure economic theory. For example, the selection of trucking service companies by small Mexican pineapple exporters seems to be influenced by trust factors and not only by price (Martner 2004).

Facilitation of Market Exchanges

Information asymmetry is a major source of rents for intermediaries. Usually, farmers do not possess information on prices, quality requirements, or market location; the fact that it is costly to capture this information prevents them from having a stronger position when negotiating with intermediaries who negotiate with more complete information. Where they choose to, intermediaries reduce the costs of information exchange. They often are better at matching sellers and buyers and providing price-discovery services.

Information-gathering costs and social networks also affect the choice of the market channel used by farmers. Poor communication and access to information sources in rural areas usually prevent information from reaching farmers in an adequate way. In the Ethiopian grain market, small farmers identify where to trade and then decide on whether to use a broker to search for price information and sell their produce on their behalf. The interaction between information costs and social networks affect the mechanism used. Thus, high information costs are linked to increased broker usage because farmers would otherwise spend time searching for information on markets and prices. Where farmers had better information on prices and markets, because of social networks, broker use is significantly less (Gabre-Madhin 2001).

Additionally, the absence of effective information flows within the chain inhibits any feedback from the market apart from average price information. Thus, farmers are left blind on quality requirements, requirements for certification, or produce rejection rates and can do little to improve their production or handling techniques. In the Republic of Yemen, coffee farmers have for years suffered from declining incomes because they are not getting feedback from the market on changing quality preferences in export markets. Where middlemen perpetuate the information asymmetry to their advantage and again offer sellers lower prices, it can easily lead to declining incomes for all parties. Intermediaries also enable small producers to test their market potential in foreign markets. They can then use the knowledge to determine if it would be worthwhile to export directly.

Providing Credit

Small, rural farmers need access to credit in order to meet working capital needs and invest in new farm assets, technology, and, in some cases, equipment for processing and post-harvest activities. The main issue with credit in rural areas is that banks desire collateral that is easy to sell; often, the collateral that farmers and traders can offer is of little use to banks, as they are unable to sell it. Even in instances where credit is available, banks sometimes impose a fixed repayment schedule that does not reflect cash flows and risks in agricultural production. As was shown, produce is marketed only during limited periods of the year.

In the situations when farmers cannot get credit, they are forced to sell their products even if they know that market conditions are not favorable. These low prices generate little surplus and low investment in the next production cycle. Efforts to tackle this problem have focused on microcredit schemes that are designed to attack the credit issues or price information systems developed to address the asymmetric information flows. However, in recent years, spurred by the wide availability of information and communications technologies, new hybrid models have emerged to deal with these issues. These modern models tend to offer services in a variety of areas, providing services in a one-stop shop and reducing costs for farmers and SMEs by not having to deal with different actors or programs for information on prices, extension, credit, quality requirements, inputs, etc.

Facilitating Payments

Delays in making payments to small-scale farmers and other enterprises have a significant influence on where products are sold. For instance, in China Gong et al. (2007)¹ found that an individual cattle farmer is likely to face payment delay if he sells to a processor who has the power to set the price and timing of payment. Generally, producers who decide to sell directly to the market face delays in receiving payment while those who sell to intermediaries are paid immediately. Payment delay, therefore, can influence farmers' choice of marketing channel.

Part of the success for Madzarov, Ltd., in Bulgaria of building a reliable milk procurement system has to do with the high frequency of payment to its small-scale suppliers, which, in the case of the smallest farmers, goes as far as advancing payment. Access to this source of timely and reliable financing is considered by the small-scale farmers to be of greater importance than the price received for their milk (Berdegué et al. 2008).

However, in Kenya, for instance, it has been observed in some markets that, although intermediaries can pay producers on the spot, the prices that are offered are lower than in the final market. Again, this has been shown to be the case in the two case study areas.

Managing Risks

Dealing with small-scale producers in lagging regions has numerous risks that have to be managed. Several of the risks are more pronounced in agro-logistics supply chains. These include poor infrastructure; poor yields and product availability; price and weather changes; market support systems, such as poor handling and storage facilities; and inconsistencies in the policy framework. For commodities that are exported, international prices may not always make it worthwhile to procure produce for processing and export. Domestic prices could be disconnected from international prices owing to different drivers and could be weather related.

The risks related to poor transportation and other logistics problems in supply chains do not always receive sufficient attention. However, a survey conducted by McKinsey² indicated that in Brazil, where agro, food, and other supply chains for super markets are reasonably developed, and India, where the supply chains are more rudimentary, managers ranked reliability of supply-chain infrastructure and reliability of suppliers as major concerns. Brazilian respondents to the survey sought to mitigate these risks with greater emphasis on performance contracts with suppliers and service providers.

Market intermediaries can absorb some of the manageable risk that the more traditional commercial players may decide not to take. Abni (2004) found that wholesalers would rather pay more at their premises than venture out to the farms because of the high costs of maintaining a vehicle and the frequency of malfunctions as a result of poor roads. This risk avoidance is the key element for the participation of intermediaries who assume the risk of having to pay for truck repairs that were avoided by the wholesaler. Similarly, big horticulture producers who are integrated to large national or regional markets do not buy from small producers because of risk of rejection (middlemen, theoretically, perform this selection function and assume the risks). Reardon and Berdegué (2006) argue that in instances where small farmers do not have the assets, for instance, to meet the requirements of international supply chains, it is common for the proximate intermediary to assist with training, credit, etc. They call for policy interventions to support this group so that they can better participate in such agro supply chains.

The other major systemic risk relates to instability in the policy framework for trading domestically and overseas for corporate entities. For instance, in India, orders have been issued by state governments banning corporate procurement activities and limiting the storage of essential commodities to short periods related to business turnover periods.³ The primary reason for the series of bans on trading was the rise in food prices internationally in 2006–8 and the concern of the central and state governments that traders would corner existing stocks, hoard them, and make a profit later in the year when prices rose further. Meanwhile, prices of staple foods would increase and take them out of the reach of a large section of the populace.

Clearly, providing a stable policy framework for corporate activities in agriculture procurement and logistics is important. In addition, subsidy and incentive regimes could also be modified to enhance economies of scale through voluntary association of farmers' groups in projects.

Enhancing Quality Assurance

There is a role for middlemen when the technology for quality assessment has increasing returns to scale. The quality of an intermediary's goods is more predictable than the quality of a producer's goods. Middlemen purchase goods in large quantities, so they are better able to employ quality control methods. In fact, middlemen can threaten to drop producers supplying low-quality goods. So, intermediaries help to deal with the moral hazard problem posed by producers supplying poor quality goods to consumers.

The Downside of Intermediation

Despite the several positive aspects of intermediation highlighted above, development projects typically try to get rid of intermediaries. This is because of the various costs that they also impose on small traders, including the potential for arbitrage and other gambling behavior.

Notes

1. Gong, Parton, Cox, and Zhou (2007) *Management Research News*, Vol. 30 No. 1, 2007, pp. 47–56.
2. *Understanding Supply Chain Risk: A Global Survey* (2006), McKinsey and Co.; Krishnan, Parente, and Shulman (2007) *Understanding Latin America's Supply Chain Risks*, McKinsey and Co.
3. As low as one month—and even fifteen days in some cases.

CHAPTER 7

Conclusions and Lessons for Low-Income Countries

Introduction

The two case studies show that fragmented supply chains have higher costs than those that are more integrated, whether or not the integration is physical or virtual. Fragmented chains have higher costs due to small mark-ups at each stage. Each segment is designed to maximize returns and minimize risks for the parties involved, which can result in sub-optimal systems when the whole chain is taken into consideration. Consequently, where producers have no market power, as is often the case, the overall returns can be too low to permit trade at any significant volume.

Logistics patterns in lagging regions are the product of a complex interaction influenced by geography and the decisions of numerous producers, consumers, transport and other service providers, and governments. The interactions, if properly designed, can lead to distinct spatial patterns that can extend the reach of locally produced commodities. On the other hand, when they occur in an ad hoc manner, the interactions between producers and intermediaries can curtail access to global supply networks and higher value markets. The foregoing case studies show that instead of competition between producers of a single homogeneous good, it can be mutually beneficial to cooperate. There is more than one model of cooperation, and it need not be designed as a social experiment. Cooperation can be influenced by careful selection of the sites to provide logistics infrastructure, the commercial decisions of independent traders, interventions by corporate entities, or producers coming together in cooperative arrangements.

Logistics services in lagging regions are mainly connected to supply chains in the agricultural economy. However, several of the lessons are as relevant to rural economies as they are to SMEs in urban areas. The strategies can be simple consolidation services provided by traders or highly developed forms of vertical integration. These would be relevant in most low-income countries that are developing a few core trade corridors but are faced with the challenge of connecting corridor hinterlands to regional or global chains.

On the simplest level, goods can be consolidated by intermediaries and transported to more developed area markets for consumption or further processing. Whether or not the processing entity itself consolidates the goods through a logistics service or leaves this to farmers and others with a nodal delivery point at the agro-industry's premises is decided by varying market and economic framework factors. The efficiency of intermediaries depends on their ability to provide third-party logistics services in a timely

manner and at the lowest possible cost. Intermediaries link supply-chain players and facilitate market access for exporters. They allow firms and producers to enter foreign markets without specific operational expertise to do so.

The range of intermediary activities depends on the characteristics of the supply chain and the country's broader economic framework. For a buyer or producer of a product, there could be more than one intermediary in the supply chain as their activities can be specific and specialized. The services provided by intermediaries are generally oriented towards facilitating solutions for the specific needs of an existing situation—in information provision, price discovery, procurement, value-added product processing, transportation, financing, storage, handling, communication, sharing of risks, and other facets of the supply chain.

Develop Core Logistics Infrastructure

It is abundantly clear that the typical shipment originating in rural areas in developing countries starts at the farm level, is transported to a storage facility, and from there to the buying points or to local and regional markets. Roads and, indeed, mechanical transport modes are not always available nor necessarily suited to these first few steps of the chain. Rather, these early steps, often a more costly and difficult part of the journey, consist of a combination of on-farm and local transport frequently conducted on infrastructure with no clear ownership structure. Rural freight transport ends for the farmer at the buying point near the road side or at rural hubs, both serving for intermodal transfer of cargos. Rural Hubs may have a special function, crucial for the development of the whole area. The average agricultural production in LDC amounts to roughly half a ton per capita, which has to be transported from the field. In regions where most of the produce is used for subsistence, this type of on-farm transport is most important.

There is an important nexus between transport and storage infrastructure that is often ignored in rural projects and studies. The location of storage facilities, which serve also as consolidation points, needs not be overemphasized, inasmuch as it influences the ability of small-scale producers to connect to global supply chains. As already argued above, a certain level of infrastructure development is often necessary to provide the foundation for improvements in the quality of logistics services.

Government interventions are also normally necessary to establish logistics infrastructure, but the framework should strongly encourage PSP in logistics service provision. Under the right circumstances, the above could lead to improvements in logistics (ICDs, 3PL, and 4PL services) in lagging regions of large middle-income countries like China and India. The development of clusters in lagging regions also contributes to concentrating demand and aiding the development of core infrastructure. One of the reasons why APAEB is able to manage the supply chain is because of a cluster of sisal industries in the traditional sisal area of Brazil. However, it has also to be underscored that there is likely a critical mass of basic infrastructure that is needed before private firms would even consider taking on the coordination and value-added activities (e.g., processing, packaging) to improve the quality of logistics services. Understanding this type of time-order relationship is important to the sequencing of needed public investment.

Promote Cost Sharing

While the scale of the current set of problems in developing countries clearly requires government institutions to take the lead in mitigating and developing activities, all

additional initiatives should be welcomed and encouraged. Governments have a key role in ensuring market-friendly policy frameworks with equitable arrangements to include smallholders. Policies have to be driven by what the key objective is, whether it is to improve quality and traceability, scale up supply in response to market needs, better packaging, adoption of new technology, or investment in shared infrastructure (e.g., processing and branding), etc. Unfortunately, the delivery of services by government agencies is not always efficient owing to structural problems in governance and rent-seeking tendencies in many areas. It is here that the PPP approaches to agro-supply chains should be given recognition as a way to help alleviate current problems and a concerted effort should be made to reduce the risks of their participation in this sector.

The mitigating policy actions that are required should include:

- Creating an enabling environment for the private sector to play a role
- Providing a stable policy framework for corporate activities in agriculture procurement and logistics. A major risk faced in low-income countries is inconsistencies in the policy framework. These lead to larger, systemic risks related to trading domestically and overseas for corporate entities
- Restoring futures trading in commodities at the exchanges since this provides price signals to all participants, including farmers, and reduces price risks and market volatility in the trading of commodities through hedging options
- Improving enabling regulations for corporate PSP activities, such as standard farmer-centric formats for contract farming that can ensure avoidance of worst case scenarios like small farmers being alienated from their land

Exploit New Technologies

Logistics intermediation at the local level of global supply chains is different but complementary to what happens in international chains. The India case study showed that the benefits of electronic intermediation to achieve virtual integration of supply chains can have as significant an impact as physical integration. As there are physical flows of goods down a chain, there is need to have efficient flows of information in the opposite direction. The main benefits to the buyer and seller arise from reductions in transaction costs. The e-Choupal initiative may be a replicable model in some circumstances using price discovery and reduction of transaction costs to achieve better returns for farmers in supply chains in developing countries.

Ready access to information has two primary effects on producers:

- It reduces information asymmetry and enhances farmers' ability to negotiate higher prices even with market intermediaries
- Farmers can decide when the time is best to sell their produce. However, this can be countered by high storage costs if the right facilities are not available
- Farmers can switch to alternative markets that would require that they have the means of transport and ability to change destination

Telecommunications is a natural platform for reducing information asymmetry. Depending on the coverage of ICT and its penetration within a country, access can be enhanced in rural areas for (almost) real-time data related to agriculture, such as weather, price discovery of commodities and inputs, advice on farming problems, etc.

However, the rural poor in developing countries tend to get left out of this process. Of late, there has been considerable awareness of the need to extend such services and facilities at affordable prices to persons at the bottom of the economic pyramid. In addition, innovations in financial intermediation using ICT with payments made using mobile phones have taken place in a number of developing countries in the past decade. These could target the lowest economic segments of the population, particularly those without access to formal banking institutions.

An example of the above is the work of the Grameen Foundation in Uganda, where it has partnered with one of the mobile service providers to develop a network of 10,000 community phones in villages across the country. Building on this base, the Application Laboratory Partnership (AppLab) was formed between the Grameen Foundation, MTN Uganda, and Google to design content and information relevant to Uganda that needs to be disseminated in its rural areas for enhancing economic development and to arrange for its delivery through mobile telephones targeting access by the rural poor. The first four applications were launched in June 2009 after 18 months of development and testing. Content has been created for AppLab by several public and civil society agencies operating in Uganda. The services are designed to meet the farmer and small-holder community's needs through a Google SMS platform that provides answers to queries by SMS in a manner that could be considered similar to using the Google search engine on the internet, but in more focused way. The trader's platform is of particular interest as a method of making simple deals in a virtual market place by registering and placing their offers for sale or purchase requirements.¹ This could evolve into a major market development for farmers who did not, hitherto, have access to price discovery for produce that is nearly at real time.

Across several low-income countries, there has also been the development of payment systems based on mobile phones. There are a large number of developing and developed countries that now have such systems in place. In east Africa, the first successful,² branchless banking platform, M-Pesa, was started in Kenya in 2007³ by Safaricom, a mobile services provider. There are two kinds of systems in use, classified according to who leads the arrangements—led by commercial banks or by mobile service providers. Both types of branchless systems are different from banking transaction arrangements that allow mobile payments and transactions by account holders of a bank, since the latter is only a modest enhancement of traditional, branch-based banking. Further, in the

Box 2. How AppLab Functions

The partners and their roles bring together their expertise and experience in the following areas:

- The Grameen Foundation leads AppLabs, particularly in needs assessment, identification of applications, discussions with content providers, customizing, pilot testing applications, launch, and scaling up.
- Google offers resources to develop application solutions.
- MTN Uganda provides the communications infrastructure, marketing support, and distribution network to ensure rural awareness.
- Google.org contributes to the focus on rural community development and impact assessment.

branchless mobile payments systems, the activities depend largely on retail outlets that process financial transactions on behalf of the mobile service company or banks. Generally, the bank-led system is regulated under the banking payment laws of a country and the mobile services-led arrangements may or may not be so regulated.⁴ These systems make it easier and faster to pay farmers without them having to travel long distances to collect payment.

Social Systems Also Have a Role to Play

However, not all coordination and cooperation mechanisms need to be based on sophisticated technologies. The social structures rooted in the cooperative movement can provide a solid basis for cost sharing. Outside of the cooperative arrangement, the sisal supply chain in Bahia is largely disintegrated in its structure. On the other hand, the APAEB chain is better coordinated and elongated with an ability to manage goods, information, and cash across borders through the distribution center that was established in Europe. Alternatively, contract arrangements between small-scale producers and entities in leading regions are important. Studies have shown that contract farming is beneficial to smallholders as compared to independent production. The likely risks involved can be managed through carefully designed performance contracts between the parties. In order for both of these strategies to work, there is need for training of the supplier organizations. This is a role that could be played by civil society.

Rethink Development Model

There is need to rethink the trade and transport model based on road density. Efforts to improve market access for low-income areas typically concentrate on building transport infrastructure, especially roads. The findings of this study show that while this may be a necessary foundation, it is equally, if not more important, to nurture the provision of appropriate logistics services. Small volumes of demand spread over large areas in both spatial and temporal space require cooperation and coordination of producers if costs are to be minimized. It becomes imperative that the development of transport infrastructure takes into consideration the distribution of demand, producer cooperation structures, and the location of storage or intermediate processing centers. Increased access to real-time information at low cost offers great potential to better design transport and storage networks better suited to products in low-income areas. Carefully calibrated provision of information can be used to influence logistics flows that can lead to better provision and utilization of infrastructure and services. It cannot be assumed that services will follow physical infrastructure. Deliberate measures have to be taken to reduce transaction costs and to open up national and global markets to small-scale producers. For this to happen, development and assistance strategies have to be sensitive to the needs of different commodities but also, importantly, different regions within a country.

This study offers some valuable lessons on the design of projects to reduce transaction costs for small-scale producers. The organizational aspects of logistics can be just as important, if not more important than providing infrastructure. At the very least, they should help inform the decision making on the type of infrastructure to provide. The infrastructure should be developed taking account of the organizational aspects of how logistics services are provided.

However, more analysis is necessary to further understand the impact of new technologies in particular. This study is therefore being extended to explore the impact that mobile phones have had on logistics in Uganda.

Notes

1. Subject to program policies on language, content, objectionable products, technical security, etc.
2. Morawczynski and Pickens (2009) say that, in August 2009, M-Pesa had 7 million customers transferring 150 million KSh (US\$2 million) a day in small transactions averaging about 1,500 KSh (US\$20). The system has handled over 130 billion KSh (US\$1.7 billion) since 2007.
3. It was initially launched in 2003 to allow borrowers to repay loans with airtime, using the network of Safaricom airtime resellers. Mobile phone customers put it to various other uses, and it was re-launched as a branchless bank service with limits on transactions and credit holdings. The second launch was supported by DFID and Vodafone (40 percent shareholder of Safaricom) and the telecom consultancy firm Sagentia.
4. In the Philippines, “G-Cash” was regulated, but “Smart Money” was not. Since March 2009, both systems have been regulated by the Central Bank, Bangko Sentral ng Pilipinas. In Kenya, M-Pesa presently operates under a no-objection certificate of the Central Bank of Kenya; i.e., it is not regulated.

References

- Abni, H. (2004) *The Influence of Rural Logistics and Rural Transport Costs on Farm Income and Poverty in Kenya: The case of Kisumu and Nyandarua Districts, Kenya*. Washington, D.C.: World Bank.
- Abraham, R. (2007) Mobile phones and economic development: Evidence from the fishing industry. *India Information Technologies and International Development*, Volume 4, Number 1, Fall 2007, pp. 5–17.
- Ackello-Ogutu, C., and P. Echessah (1998) *Unrecorded Cross-Border Trade Between Tanzania and her Neighbours—Implications for Food Security*. USAID Africa Bureau.
- ADB (2008) *The Railways of the People's Republic of China: An Agenda for Action*. ADB Manila.
- Ahn, J., A. Khandelwal, and S. Wei (2010) The role of intermediaries in facilitating trade. (Draft research paper.)
- Aliguma, L., D. Magala, and S. Lwasa (2007) *Uganda: Connecting Small-scale Producers to Markets: The Case of the Nyabyumba United Farmers Group in Kabale District*. Regoverning Markets Innovative Practice series, IIED, London.
- Alves, M.O., E.G. Santiago, and L.A. Renan (2005) *Diagnóstico socioeconómico do setor sisalero do Nordeste brasileiro*. Fortaleza: Banco do Nordeste do Brasil.
- Amiot, F., and O. Salama (1996) Logistical constraints on international trade in the Maghreb. World Bank Policy Research Working Paper 1598.
- Annamalai, K., and S. Rao (2003) *ITC's e-Choupal and Profitable Rural Transformation*. Michigan Business School and World Resources Institute.
- Associação dos Pequenos Agricultores do Município de Valente (Small Farmers' Association of the Municipality of Valente). Information from <http://www.gsb.stanford.edu/pmp/docs/Brazil%20Write%20up%20-%20APAEB%204%2013%2006.doc>.
- Bailey, J.P., and Y. Bakos (1997) An exploratory study of the emerging role of electronic intermediaries. *International Journal of Electronic Commerce*, 1 (3), pp. 7–20.
- Banomyong, R. (2007) *Logistics Development Study of the Greater Mekong Sub-region North-South Economic Corridor*. Asian Development Bank.
- Berdegué, J.A., E. Biénabe, and L. Peppelenbos (2008) *Keys to Inclusion of Small-Scale Producers in Dynamic Markets—Innovative Practice in Connecting Small-Scale Producers with Dynamic Markets*. Regoverning Markets Innovative Practice series, IIED, London.
- Birthal, P.S., K. Awadhesh, M. Tiongco Marites, and C. Narrod (2008) *Improving Farm-to-Market Linkages through Contract Farming*. Discussion Paper 00814. IFPRI.
- Birthal, P.S., P.K. Joshi, and A. Gulati (2005) *Vertical Coordination in High-Value Food Commodities: Implications for Smallholders*. Markets, Trade, and Institutions Division Discussion Paper No. 85. Washington, D.C., IFPRI.
- CARANA Corporation (2003) The role of transportation and logistics in international trade: The developing country context.

- Chakra Infrastructure Consultants and China Academy of Railway Sciences (2008) TA-4701-PRC *Railway Passenger and Freight Policy Reform Final Report*. ADB, Manila.
- Coase, R.H. (1937) The nature of the firm. *Economica*, 4(16), pp. 386–405.
- CPCS Transcom, China Academy of transportation Sciences, and Meyrick and associates (2005) *PRC: Policy Reform in Road Transport*. ADB, Manila.
- da Hora, D.P., D. Ramos, E. Imbiruss, et al. (2008) Serviço de apoio micro e pequenas empresas no estado da Bahia: Projeto alternativas para o desenvolvimento da lavoura do sisal no estado da Bahia. Universidade Estadual de Feira de Santana.
- Devlin, J., and P. Yee (2005) Trade logistics in developing countries: The case of the Middle East and North Africa. *The World Economy*, Vol. 28, No. 3, pp. 435–456, March 2005.
- Fabbe-Costes, N., and M. Jahre (2008) Supply chain integration and performance: A review of the literature. *International Journal of Logistics Management*, 19(2), pp. 130–154.
- Fafchamps, M., and R. Hill (2004) *Selling at the Farm-gate or Traveling to Markets*. CSAE WPS/2004–30, Economics and Social Research Council UK.
- Fafchamps, M., and R. Hill (2008) Price transmission and trader entry in domestic commodity markets. *Economics of Development and Cultural Change*, 56 (4), pp. 729–766.
- Fafchamps, M., and R. Hill (2005) *Price Transmission and Trader Entry in Domestic Commodity Markets*. GPRG WPS-038, Economics and Social Research Council UK.
- Faisal, M.N., D.K. Banwet, and R. Shankar (2007) An approach to measure supply chain agility. *International Journal of Industrial Systems and Engineering*, 2(1), 79–98.
- Faminow, M.D., and B. Benson (1990) Integration of spatial markets. *American Journal of Agricultural Economics*, 72(1), 49–62.
- FAO (2000) Alternative applications for sisal and henequen. Technical Paper No 14. Rome, 13 December 2000.
- FAO (2009) *Jute, Kenaf, Sisal, Abaca, Coir and Allied Fibers Statistic—June 2009*. Rome: FAO.
- Fujita, M., P. Krugman, and A. Venables (1999) *The Spatial Economy: Cities, Regions and International Trade*. Cambridge, MA: MIT Press.
- Gabre-Madhin, E. (2001) Market institutions, transaction costs, and social capital in the Ethiopian grain market. *IFPRI Research Report* 124.
- Gallup, J., J. Sachs, and A. Mellinger (1998) *Geography and Economic Development*. NBER Working Paper W6849, Cambridge, MA.
- Gellman, R. (1996) Disintermediation and the internet. *Government Information Quarterly*, 13(1), pp. 1–8.
- Gibbon, P. (2001) Upgrading primary production: A GCC approach. *World Development*, 29 (2), pp. 345–363.
- Gonzales, J., J. Guasch, and T. Serebrisky (2008) Improving logistics costs for transport and trade facilitation. *The World Bank Policy Research Working Paper* 4558.
- Goyal, A. (2010) Information, direct access to farmers, and rural market performance in central India. *American Economic Journal: Applied Economics*, Vol. 2, No. 3, July, pp. 22–45.
- Ghayur, A., and D. Verma (2007) *India: Connecting Small-scale Producers to Markets. A Case Study of a Successful Supply Chain in Uttarakhand, India*. Regoverning Markets Innovative Practice series, IIED, London.

- Hausman, W., H. Lee and U. Subramanian (2005). "Global Logistics Indicators, Supply Chain Metrics and Bilateral Trade Patterns." World Bank Policy Research working Paper No. 3773, Washington, DC.
- Hausmann, R. (2001) "Prisoners of Geography." In *Foreign Policy*, 122 (January/February), pp. 44–53.
- Hesse, M., and J-P. Rodrigue (2004) The transport geography of logistics and freight distribution. *Journal of Transport Geography*, 12, pp. 171–184.
- Hines, P. (1994) Internationalization and localization of the Kyoryoku Kai: The spread of best practice supplier development. *The International Journal of Logistics Management*, 5(1), pp. 62–72.
- Hotelling, H. (1929) Stability in competition. *The Economics Journal*, 39 (153), pp. 41–57.
- ITC. e-Choupal. <http://www.itcportal.com/rural-development/echoupal.htm>.
- ITC. e-Choupal. <http://www.itcportal.com/rural-development/choupal-saagar.htm>.
- Krishnan, M., E. Parente, and J.A. Shulman (2007) *Understanding Latin America's Supply Chain Risks*, McKinsey and Co.
- Krugman, P. (1991) *Geography and Trade*, Leuven University Press, Belgium.
- Lall, S., C. Timmins, and S. Yu (2009) *Connecting Lagging and Leading Regions: The Role of Labor Mobility*. Policy Research Working Paper 4843, World Bank, Washington DC.
- Lazzarini, S., F.R. Chaddad, and M.L. Cook (2001) Integrating supply chain and network analysis: The study of netchains. *Journal on Chain and Network Science* 1 (1), pp. 7–22
- Lei, X., and D. Hu (2009) *Contracts, Trust and Market Environment in Farmer–Buyer Relationships*. International Association of Agricultural Economists, Beijing, China.
- Limao, N., and A. Venables (2001) Infrastructure, geographical disadvantage and transport cost. *World Bank Economic Review*, 15 (3), Washington, D.C.
- Lu, H., J. Trienekens, and O. Omta (2007) Does traditional Guanxi matter for smallholders in modern markets? A structural equation modeling. Seventeenth Annual World Food and Agribusiness Forum and Symposium. June 23–26, Parma, Italy.
- Machado, G.B. (2006) Pobreza e desenvolvimento no sistema agrário do sisal região semi-arida do Brasil. VII Congreso Latinoamericano de Sociología Rural, Quito, Ecuador.
- Mackellar, L., A. Woergoetter, and J. Woerz (2000) *Economic Development Problems of Landlocked Countries*. IHS Working Paper Number 14, Vienna.
- Martner, C. (2006) Cadenas logísticas de exportación de frutas y desarrollo local en el sureste de México. *Revista eure*, Santiago de Chile, (Vol. XXXII, No. 97), pp. 63–80.
- Muthu, K., P. Eduardo, and S. Jeffrey (2007) *Understanding Latin America's Supply Chain Risks*. McKinsey and Co.
- Raballand, G. (2003) The Determinants of the negative impact of landlockedness on trade: An empirical investigation through the Central Asian case. In *Comparative Economic Studies*, World Bank, Washington, D.C.
- Poppo, L., and T. Zenger (2002) Do formal contracts and relational governance function as substitutes or complements? *Strategic Management Journal*, 23, pp. 707–725.
- Raballand, G., P. Macchi, and C. Petracco (2010) *Rural Road Investment Efficiency: Lessons from Burkina Faso, Cameroon and Uganda*. World Bank, Washington, D.C.
- Radelet, S., and J. Sachs (1998) Shipping costs, manufactured exports and economic growth. Mimeo.

- Raman, V. (2003) *Public Transport and APSRTC*. Government of Andhra Pradesh, and Adam Smith International.
- Raman, V. (2006) *Transport and Trade Facilitation in Uganda*. Background paper for the Uganda Diagnostic Trade Integration Study, the World Bank, Washington, D.C.
- Reardon, T., and J.A. Berdegué (2006) *The Retail-Led Transformation of Agrifood Systems and its Implications for Development Policies*. Rimisp—Latin American Center for Rural Development.
- Smart, M. (2008) Transport demand and spatial equilibrium. *Journal of Transport Economics and Policy*, 42(2), pp. 323–343.
- Sverrisson, A. (2004) Local and global commodity chains. In C. Pietrobelli and A. Sverrisson (eds.), *Linking Local and Global Economies: The Ties that Bind*, Routledge, pp. 17–55.
- Takayama, T., and G.G. Judge (1964) Equilibrium among spatially separated markets: A reformulation. *Econometrica*, 32(4), pp. 510–524.
- Teravaninthorn, S. and G. F. Raballand (2008) *Transport Prices and Costs in Africa: A Review of the International Corridors*. World Bank, Washington D.C.
- Torgerson, R.E. (1977) Farmer cooperatives. *Annals of the American Academy of Political and Social Science*, Vol. 429, *The New Rural America* (Jan. 1977), pp. 91–102.
- Understanding Supply Chain Risk: A McKinsey Global Survey. (2006) McKinsey and Co.
- Uzzi, B. (1997) Social structure and competition in inter-firm networks: The paradox of embeddedness. *Administrative Science Quarterly*, 42, pp. 35–67.
- Vale, L., V. Barros, M. Quieroga, and O. Ribeiro (1998) Levantamento de situacao da cultura do sisal em microrregioes dos Estados da Paraiba e Bahia. *Agropecuaria Tecnica* 19(1), pp. 37–59.
- Vitasek, V. (2006) Terms and Glossary. *Supply Chain Visions*, Bellevue, Washington (originally from the Council of Logistics Management, 1998), accessed at www.scvvisions.com.
- Voelkhl, B., and R. Noe (2008) The influence of social structure on the propagation of social information in artificial primate groups: A graph-based simulation approach. *Journal of Theoretical Biology*, 252, pp. 77–86.
- Wagner, S.M., and N. Neshat (2009) Assessing the vulnerability of supply chains using graph theory. *International Journal of Production Economics*, pp. 1–9.
- Wei, S., D. Adar, E. Woods, and H. Suheri (2003) *Improved Marketing of Mandarins for East Nusa Tenggara in Indonesia*.
- Williamson, S. (1987) Transactions, costs, inflation, and the variety of intermediation services. *Journal of Money, Credit and Banking*, 19, 484–98.
- World Bank (2008) *World Development Report 2009*. World Bank, Washington D.C.
- Zhang, M., and R.J. Sexton (2000) Captive supplies and the cash market price: A spatial markets approach. *Journal of Agricultural Research Economics*, 25(1), 88–108.
- Zhang, M., and R.J. Sexton (2001) Free-on-board and uniform delivered price: A strategic choice and welfare effects. *Journal of Industrial Economics*, 49(2), 197–221.

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Small-scale agricultural producers in developing countries lack easy access to efficient logistics services. Using case studies of sisal and soybean supply chains in Brazil and India respectively, this study explores the role and impact of intermediaries in facilitating trade in lagging regions and assesses the horizontal relationships between small-scale farmers and the vertical connections between different tiers of the same supply chains. The study also analyzes the traditional approach to linking producers through cooperatives and itinerant traders and the relatively newer innovations using information communication technology. The study finds that farmers linked through the different mechanisms are more integrated to international supply chains or are able to better manage supply chains longer than would otherwise be the case. Intermediaries play several roles including providing transport services and facilitating market exchanges, payments, risk sharing, and quality improvements. This study is part of an ongoing endeavor to identify the evolving role of intermediaries in low-income regions and recommend how development agencies, civil society, and the private sector can design strategies to reduce logistics costs in low-income regions.

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