Transaction Costs in Agriculture: From the Planting Decision to Selling at the Wholesale Market

A case-study on the feeder area of the Dambulla Dedicated Economic Centre in Sri Lanka

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Abstract

With the increasing concern with regards to reducing poverty in the world, lowering transaction costs within the value chain is one of the key elements to ensuring growth in agriculture which will in turn have a significant impact in reducing poverty. This paper presents the results of a study to identify the information-related transaction costs of selected small-holder farmers who sell their produce at Sri Lanka’s largest wholesale agriculture market. It then analyses the potential reduction of these costs if they were to use Information and Communication Technology (ICT) tools in obtaining such information.

This study finds that information related costs form 70 percent of the total transaction costs, which is 15 percent of the total production cost, incurred by these farmers. Therefore, it is argued that simple mobile phones can reduce these costs significantly. Such information can help farmers not only in deciding where and at what price to sell their produce, but also in reducing the high search costs associated with locating outlets that has (subsidized) fertilizer available for distribution on a given day.

Overall, it is postulated that benefits to farmers can become much greater if a phone-based ICT platform could tie the selling decision with that of the decision to grow a particular produce while incorporating information needs of the farmer throughout the value chain. It is believed that this a reasonable approach because the mobile phone is expected to reach 90 percent of the world’s population by 2010 (GSMA, 2006), including these farmers.
1. Introduction

At present, 31 percent of Sri Lanka’s labour force is engaged in agriculture contributing to 11 percent of GDP. Agricultural productivity has continued to be lower than industry and services sectors; growing at just over 1 percent annually over the last decade and a half, resulting in declining real incomes. A consequence of this trend, inter alia, is widespread agricultural poverty with rural and estate (plantation) areas registering poverty incidences of 16 and 32 percent levels respectively in 2006/07 (CBSL, 2007). In this context it is relevant to note that the World Bank (2008) claims that growth in agriculture is on average at least twice as effective in reducing poverty as growth outside agriculture. The argument is that agricultural growth reduces poverty directly, by raising farmer incomes, and indirectly, through generating employment and reducing food prices. The report contends that the objective of poverty reduction is served best if agricultural growth is centered on small-holder farmers, who are made more competitive and sustainable through institutional and technological innovations and empowered through producer organizations. At a more specific level, Pingali et al. (2005, 2008) at the Food and Agriculture Organization emphasize that the principal challenge confronting governments and the international development community is to ensure that smallholder farmers benefit from commercialization in agriculture by participating in the market. They point out that increased commercialization shifts farm households away from traditional self-sufficiency goals and toward profit and income oriented decision making. It is in this context that the argument made by Pingali et al. (2005) that increased transaction costs deter the entry of small farmers into the market becomes crucially important. Flowing from which, is that interventions aimed at reducing transaction costs would encourage increased farmer participation in competitive markets to meet the broader poverty reduction objectives.

Technological innovation in agriculture can take many forms; from generating better seed varieties, to improving planting techniques to minimizing post-harvest losses. In terms of Information Communication Technologies (ICTs), it can take the form of creating efficiencies in agricultural markets by reducing information-based transaction costs throughout the value chain; be it in the planting decision (e.g., what to grow) or when deciding on the selling price and market. Thus, if information-based transaction costs are found to be a significant proportion of the total transaction costs incurred by farmers, then reducing such costs through technology could lead to improved productivity and higher incomes to farmers.

Many studies have focused on information-based transaction costs at the selling stage of the value chain; in the output market (Jensen, 2007; Aker, 2008). Also, many ICT initiatives exist that provide necessary market information to farmers at the selling stage in many developing
countries (for example e-choupal, e-krishi in India, pakissan.com in Pakistan, agripricenepal.com in Nepal, Manobi in Senegal and Govi Gnana Seva (GGS) in Sri Lanka). Even though these initiatives have been able to reduce transaction costs by a significant proportion and have improved the livelihoods of poor farmers, it is possible that the livelihoods of these poor farmers can be improved further, This can be done by mitigating their vulnerabilities if their information needs are addressed along the whole value chain with the help of ICTs and not just at the selling stage.

Therefore, the logical starting point in understanding the total information-based transaction costs faced by the farmer is to understand the demand for information at each point of exchange by disaggregating the agricultural value chain to a series of activities. This study attempts to estimate the information-based transaction costs of a selected group of small-holder farmers from the perspective of making the decision to grow a particular type of produce to the point of selling the same at the Dambulla Dedicated Economic Centre (DDEC), Sri Lanka’s primary wholesale produce market.

The DDEC, located at almost the island’s geographic center (see Appendix 1), was formally established in 1999 to accommodate the sustained organic growth of an informal market that was created in that location many years ago. Currently, nearly LKR 500 million rupees (USD 4.6 million) worth of produce is estimated to be traded every day. Also, the 12 acre market with 144 trade stalls attracts farmers (sellers) and buyers from all over the country. They arrive early in the evening on trucks and tractors and trading goes on till late night. Nearly 1,200 trucks go through the market per day during the peak season.

This rest of this paper consists of four sections: Section 2 introduces various definitions and classifications of transaction costs and studies that look at how ICTs can reduce transaction costs. The research methodology is presented in section 3 and results are presented in section 4. Finally the section 5 discusses the possible policy implications.

2. Transaction Costs

2.1 Definition of Transaction Costs

While there are many definitions of transaction costs, they are generally understood as those costs associated with the act of exchanging ownership rights of economic assets. Singh (2008) captures the essence of the complexity of the problem of transaction costs stating that there is no standard definition of the term while proposing that transaction costs is broadly interpreted as costs associated with market exchange. This is important because it was seven decades ago
that Coase (1937) introduced the concept of transaction costs associated with information, negotiation, monitoring, coordination, and enforcement of contracts. Based on these transaction costs faced by individual firms, Coase theorized the natural emergence of intermediary firms to reduce these costs. Since then, a substantive volume of literature has been applied to transaction costs in agricultural markets. Building on Coase, Hobbs (1997) has classified the components of transactions costs in relation to the transaction: information costs as arising before the transaction; negotiation costs as the costs of physically carrying out the transaction; and monitoring costs as costs of ensuring that the terms of the transaction are adhered.

From yet a different perspective, Key et al., (2000) define transactions costs as fixed and proportional [or variable] transactions costs. Here fixed transactions costs include the original search, negotiation and enforcement costs that are invariant to the volume of input as well as output. However, with respect to using ICTs, there is a need to use a narrower definition of transaction costs which provides a clear relationship with search cost. In this context, the definition by Staal, Delgado and Nicholson (1997) who classify transaction costs into observable and unobservable transaction costs is used. The observable transaction costs include marketing costs such as transport, handling, packaging, storage, spoilage etc. that are visible when a transaction takes place. Unobservable transaction costs include cost of information search, bargaining, and enforcement of contracts etc.

2.2 Recent Empirical Evidence

Jensen (2007) illustrates the role that ICTs can play in increasing efficiencies in markets where information is limited or costly. The paper presents the results of a four-year study on fishery markets in Kerala, India, where the adoption of mobile phones by fishermen and buyers resulted in a “dramatic reduction of price dispersion, the complete elimination of waste and a near perfect adherence to the Law of One Price”. This, Jensen (2007) shows, was because prior to the availability of mobile phones the cost of information was so high that agents were not able to engage in optimal arbitrage; before phones, fish was sold in home markets of the fishermen where they did not get the best possible price, whereas after phones, they found out the prices in nearby markets that enabled them to sell their fish at the market with the highest price. This improved the welfare of fishermen as well as fish consumers. More recently, Aker (2008) has shown that mobile phone use among grain sellers led to significant reductions in grain-price dispersion net of transport costs across markets in Niger.

As such, developing nations have even started introducing services especially to allow farmers to improve their bargaining powers and buy other products at lower prices. TradeNet
(http://www.tradenet.biz/) in Africa is one such example which lets farmers and customers post their goods and find each other via the web and through SMS for free.

There is also evidence that the using of ICTs to improve producer prices by reducing monopsony power and farm price dispersion is not a recent phenomenon. Bruns, Robert & Tiam-Tong (1996) state that shrimp farmers in Thailand in the early 1990’s purchased mobile phones to keep up with fluctuating market prices. In a study done on the Grameen Village Pay Phone Project, it was found that the average price of agricultural commodities especially paddy and eggs, was higher in villages with phones than in villages without phones (Bayes, von Braun & Akhter, 1999).

Farmers in the former villages also managed to negotiate better rates in foreign exchange transactions, strengthen their bargaining power and make better production decisions. The use of the phones in certain villages also helped farmers avoid losses they may have gained due to livestock disease. For example, when there was a cause to fear an outbreak of a poultry or livestock disease, farmers immediately contacted experts or extension workers in the area to get help to avert potential losses. As a result, the overall mortality rates of these animals diminished.

3. Research Methodology

In contrast with the earlier discussed studies on understanding price dispersion of output markets due to information costs (Jensen, 2007; Aker, 2008), the objective of the present study is to identify the information-based transaction costs faced by farmers in the initial stages of a value chain to determine the potential of ICTs in the reduction of such costs. An important assumption was that of not apportioning, ex-ante, the greatest importance to the process of selling in the (wholesale) market, but to identify the points at which information costs were the highest.

The research was conducted in the immediate feeder area to the DDEC among selected smallholder farmers. Given the large variety of vegetables sold at DDEC, the four mostly traded vegetables by volume; tomato, onion, brinjal (eggplant/aubergine) and chili were considered in the study. A questionnaire-based survey was conducted among a sample of these farmers.

LIRNEasia collaborated with the Govi Gnana Seva (GGS) or Farmer Knowledge Service, an initiative to improve efficiency in the market by capturing and disseminating price data from across the market, to carry out this study. GGS captures prices via trade-stall computers and hand-held devices and disseminates the same in real-time via display screens at the market and through mobile phones, an interactive voice recognition system, the Internet, radio and newspapers outside the market.
3.1 Research Question

The objective of this study was to estimate the search cost (of information) as a percentage of the total cost incurred by the smallholder farmers. For the purpose of this study, search cost is defined broadly as the costs including and associated with information-based transaction costs that can be reduced by using alternative sources such as ICTs for obtaining the same information. For example, farmers can reduce all the costs incurred in unsuccessful visits to purchase fertilizer if they use phones to obtain information on its availability on the day of the visit. Such costs are classified as ‘search cost’.

3.2 Sample Selection

In the first stage of sampling, 10 farmer associations out of a total 89 farmer associations in the Dambulla area were selected using a simple random sampling technique. Then from each selected farmer association, at least 30 farmers who grew either tomato, onion, brinjal (eggplant/aubergine) or chili in the previous season were selected. Measures were taken to ensure that there was an equal distribution of farmers for all the crops.

<table>
<thead>
<tr>
<th>Vegetable</th>
<th>Number of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onion</td>
<td>76</td>
</tr>
<tr>
<td>Chili</td>
<td>75</td>
</tr>
<tr>
<td>Tomato</td>
<td>78</td>
</tr>
<tr>
<td>Brinjal</td>
<td>85</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>314</strong></td>
</tr>
</tbody>
</table>

3.3 Questionnaire Design

Prior to the survey, two focus-group discussions were conducted with ten farmers to obtain an in depth understanding of the agricultural value chain in the area. Based on input from the focus groups, the initial stages of the agricultural value chain were conceptualized as being made up of six components. Note that this study is limited to the part of the value chain which stops at the wholesaler and does not include processors, packagers, supermarkets etc. further up the value chain.
Figure 2: The agricultural value chain

1. Deciding: This is the stage farmers decide on what crop to grow, how much land to allocate for each crop and also arrange financing.
2. Seeding: During this stage farmers either purchase seeds or prepare their own seeds. They might also prepare a seed bed during this stage.
3. Preparing and planting: Land preparation using labor or machines and actual planting occurs during this stage.
4. Growing: Applying fertilizer, pesticides and water occurs during this stage.
5. Harvesting, packing and storing: Finding labor for harvesting, harvesting and packing and storing are the main activities that happen during this stage.
6. Selling: In the final stage (some) farmers check prices at the market; find a method of transporting and transport the packed produce to the market and sell.

The questionnaire contained questions covering all the above stages and attempted to capture all costs (direct and transaction) incurred during the farming season in November 2007. The questionnaire was designed to ensure that costs can be categorized into direct costs, search costs and other transaction costs. Table 2 below gives some examples of search costs captured in each stage.

Interviews were conducted mostly at the homes of farmers by trained enumerators recruited from the Dambulla Agriculture Technical College and supervised by GGS staff.
Table 2: Examples of search costs at each stage

<table>
<thead>
<tr>
<th>Stage</th>
<th>Examples of search costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deciding</td>
<td>• Cost of visits to meet farmer association officials to decide on a crop</td>
</tr>
<tr>
<td></td>
<td>• Cost of phone calls to agriculture officers to find information about the crops</td>
</tr>
<tr>
<td>Seeding</td>
<td>• Cost of finding information about a particular type of seed</td>
</tr>
<tr>
<td></td>
<td>• Cost of traveling to purchase seeds if the seeds were not available</td>
</tr>
<tr>
<td>Preparing land and planting</td>
<td>• Cost of finding labour</td>
</tr>
<tr>
<td></td>
<td>• Cost finding machines to prepare the land</td>
</tr>
<tr>
<td>Growing</td>
<td>• Cost of finding fertilizer, pesticides, weedicides etc</td>
</tr>
<tr>
<td></td>
<td>• Cost of traveling to purchase fertilizer, pesticides, weedicides etc if those were not available</td>
</tr>
<tr>
<td>Harvesting, packing and storing</td>
<td>• Cost of finding market prices</td>
</tr>
<tr>
<td></td>
<td>• Cost of finding labour</td>
</tr>
<tr>
<td></td>
<td>• Cost of finding storage, packing materials etc</td>
</tr>
<tr>
<td>Selling</td>
<td>• Costs of comparing prices of different traders</td>
</tr>
<tr>
<td></td>
<td>• Costs of finding transport</td>
</tr>
</tbody>
</table>

3.4 Incurred Cost Classification

The costs incurred by farmers throughout the process were categorized in to two exclusive groups; transaction costs and direct costs. Transaction costs were then segmented to search costs and transaction costs unrelated to information. The first component; search costs, are costs that can be reduced by using alternative, cheaper means of obtaining the same information. For example; cost of finding availability of fertilizer by telephone as opposed to going to the fertilizer distributor to find out the same information. The second component is costs that are unrelated to information: These are the costs of facilitating transactions, e.g., cost of transporting produce to market etc. Outside of transaction costs are direct costs; the costs that are unavoidable and directly associated with the farming process, e.g., cost of fertilizer, labour, seeds, etc.
4. Results

It is estimated that about 8,000 farmers belong to the 89 farmer associations in the area; therefore, the sampling error for this study is 5.4 percent.

4.1 Transaction Costs

The study found that for smallholder farmers growing tomatoes, onions, brinjals and chilies, transaction costs (including search cost) were 15.2 percent of the total cost incurred by them during entire chain spanning the six components.

4.2 Search costs

The search costs amounts to 69.8 percent of total transaction costs, or 11 percent of the total cost of production incurred by the farmers as illustrated in Figure 3.

Figure 3: Transaction costs and search cost

Another striking finding is that the search cost is relatively fixed; i.e. the cost incurred on obtaining information is not necessarily associated with the total cost incurred by the smallholder farmers on their crop during the chain. Therefore it is a larger proportion of total costs for smaller farmers, as shown below in Figure 4.
When the total search cost in different stages of the agricultural value chain is considered, the highest percentage of search cost is incurred during the growth stage (53%), followed by the deciding stage (24%) and selling stage (9%).

In terms of proportion of search cost in each stage in the agricultural value chain, the deciding stage comes first with a search cost to total cost ratio of 3:1 and the selling stage has a search cost to total cost ratio of 1:5 as can be seen in Figure 6.
4.3 Use of Phones

The smallholders surveyed for this study hardly used phones to find information related to their crop. The costs incurred on phone calls were found to be negligible at only 0.2 percent of the total search cost. Farmers traveled mostly to shops to obtain fertilizer or to markets to get a good price for their produce because they did not have prior accurate and timely information.¹

The study found that on average a farmer made 24 visits during the stages of the agricultural value chain studied, incurring an average cost LKR 195 [≈USD 2] per visit. This cost includes traveling costs, food costs and other related costs that they incur during travel. Thus on average the total search cost for a farmer was LKR 5,571 [≈USD 52] of which LKR 4,680 [≈USD 44] was cost of traveling. If 12 visits out of these 24 (that is 50%) visits could be replaced with phone calls and assuming a phone call costs LKR 40² [≈USD 0.37], the total search cost would reduce to LKR 3,714 [≈USD 35]. This is a 33 percent reduction in the search cost without even accounting for time saved.

¹ Some argue that it is not possible to estimate the cost of information accurately since farmers do other things or do multiple things when they travel to town. Special attention was paid to this possibility in the survey and only the costs incurred during visits that are primarily related to the farming process were included.

² Price of an average 8 minute call from a mobile phone
5. Discussion

This study finds that there are significant search costs, and hence transaction costs, associated with almost all the steps of the agricultural value chain. The high percentage of search costs during the growing stage can be largely attributed to an idiosyncratic government procedure on distributing subsidized fertilizer to farmers in that area. As a result, farmers are required to visit the distribution centre multiple times before purchasing the subsidized fertilizer. It is expected the growing stage to be less pertinent in countries without inefficient fertilizer subsidy policies and hence it is not discussed further in this paper. Excluding the growth stage the relative proportion of search cost is highest in the deciding stages and selling stages in Sri Lanka. Therefore, as demonstrated in section 4.3, if farmers had used a phone at various points in the agricultural value chain their search costs could have been reduced significantly.

However, farmers hardly made use of mobile phones for market information purposes. This is in line with the finding of the study conducted by de Silva & Zainudeen (2007) in five Asian countries which showed that Sri Lanka’s bottom of the pyramid (BOP) barely realized the economic benefits of using phones. It was found that they also felt that the ability to earn or save was not affected significantly by having access to a phone. The figure below shows how the BOP respondents in five of the developing countries in Asian region ranked the impact of direct access to a phone on their ability to earn (indirect benefit; as opposed to selling phone services) or save. The lowest ranking was seen in Sri Lanka with a quarter of the sample feeling that direct access had in fact worsened their ability to earn or save.

One possible explanation for this difference could be that at the time of the survey, farmers in Sri Lanka had not been exposed to methods by which ICTs can contribute to improve a person’s...
economic situation. In contrast, in other countries such as India, the existence of Telecenters such as E-Choupal (ITC, 2007) and more recently e-Krishi in Kerala, India that provided farmers with information with regards to price and advice over the Internet at the time, allowed them to improve their incomes by accessing ICTs on a regular basis.

Farmers can also benefit economically from using ICTs in other ways. As illustrated in the Grameen Village Pay Phone project, farmers were able to avoid losses of livestock by contacting experts for advice during the early stages of a detected disease to ensure the animals’ survival (Bayes, von Braun & Akhter, 1999). This is similar to the study conducted LIRNEasia (2007) which examined the usefulness of receiving information from the whole sale buyer to the farmer on the quality of the daily gherkin produce by farmers. As such, through an ICT based traceability system, each batch of gherkins was traced from the plot of land to the factory where it was taken for quality testing before being sent to various importers. If a problem was detected, the farmers were instantly notified via SMS through the system. This enabled them to act immediately to correct problems due to issues such as lack of water and to avoid potential diseases such as melon flies. Through this tracking system, it was shown that 40% of the rejected gherkins were due to problems that could have been prevented with accurate and timely information (Soysa, 2008).

The above evidence indicates that a system that allows farmers and buyers to communicate with each other directly with regards to price and quality information will be beneficial to the farmer. Not only will the interactions allow them to identify the correct market to transport their goods to, but the feedback received from the whole sale buyer will also allow them to improve upon the quality of the produce and reduce post harvest loss.

As discussed previously, Tradenet (www. Tradenet.biz) in Africa allows farmers to post their products and find other suppliers/ distributors via the web and SMS so that they can get the best prices for their produce. De Silva (forthcoming), taking dozens of examples in the South Asia region, provides a detailed discussion on the appropriate use of ICT in agriculture specifically focusing on the importance of choice of technology in ensuring relevant information is made available to farmers when they need it. A classic example is a project in Maharashtra, India named “Warana Unwired” where the transfer of small but relevant pieces of information to sugarcane farmers via text messages on mobile phones [as opposed to the original “Warana Wired” project which attempted to use PC kiosks to do the same thing but failed] have created a significant change in the incomes of the sugar cane farmers in the area. This indicates that such systems can be made for mobile phones and are more likely to be in favor with farmers than systems over the Internet. This is also in line with the findings by Galpaya, Samarajiva & Soysa...
(2007) who showed that even though telecenters exist in numbers to help citizens (including farmers) with information services around South Asia, mobile phones which are more accessible to people at the BOP, are a better way to reach the citizens of these countries.

As such, with a growth rate of over 50% over the last five years in Sri Lanka and research indicating that up to 67% of the BOP population in Sri Lanka expected to own a mobile phone by mid 2008 (de Silva & Zainudeen, 2007), a platform for basic agriculture services over the mobile phone is ideal. When comparing this with the alternative of running the system over the Internet, which barely 4% of the country uses, the mobile phone is indeed the most reasonable approach (ITU, 2008) for this purpose.

Therefore it is plausible to suggest an integrated system using a mobile phone platform that addresses the total information needs from the deciding stage to the selling stage of agricultural produce to help farmers significantly reduce search costs and thus transaction costs associated with the agriculture value chain whereby improving the livelihoods of poor farmers by mitigating the vulnerability. Even though it is not supported by the survey findings it is also envisaged linking of the deciding stage with the selling stage possibly through forward sales contracts would help to address the current high variations in prices which will not be solved by a disjoint system that provides information at different stages of the agriculture value chain.
6. References


7. Appendix
Appendix 1: Location of the Dambulla Dedicated Economic Center