The Use of Mobile Phones for the Exchange of Information in the Chilean Agribusiness

Verena Otter, Ludwig Theuvsen

Department of Agricultural Economics and Rural Development, RTG Global Food, Georg-August University Göttingen
Platz der Göttinger Sieben 5
37073 Göttingen
verena.otter@agr.uni-goettingen.de
theuvsen@uni-goettingen.de

Abstract: The mobile phone is considered as the connection of mobility and communication in social networks and in business activities especially to people in developing and transitioning countries. With its use, farmers can reduce marketing costs, containing search and transportation costs, as well as participate more easily in markets, but also gain non-market information and access to advisory service. This study aims to investigate the impact of mobile phones on farmer’s performance by using survey data we collected from raspberry, avocado and table grape farmers in Chile in 2012. The results of our analysis indicate that farmers using mobile phones to exchange information with their trading partners have higher yields.

1 Introduction

Although the mobile phone was already invented in the 1940s, its adoption by the general public did not occur until the 1990s. Especially in industrialized countries many people started adopting the new technology rapidly. Whereas in 1985 no private person in the UK owned a mobile phone, 50% of the British population owned one in the year 2000. Today in developed countries the number of mobile phones significantly exceeds the number of inhabitants. The ownership of a mobile phone is considered as the connection of mobility and communication not only in social networks but also in business activities [LWP03]. Conversely non-ownership is associated with social and economic exclusion. This is especially true in regards to people in developing and transitioning countries suffering from poor infrastructures [Ur08]. The study by Ureta [Ur08] on the impact of mobile phone use on the mobility of poor families living in Santiago de Chile showed that mobile phone use does not significantly increase the mobility of family members, due to the high costs of mobile devices and structural constraints in the life of the families. On the other hand studies by Mittal and Tripathi [MT09], Aker and Fafchamps [AF11], Labonne and Chase [LC09], Muto and Yamano [MY09], Okello et al. [OKN12] and Odiaka [Od10] showed a positive effect of the use of mobile phones by farmers in India, Niger, the Philippines, Uganda, Kenya and
Nigeria. In Chile, the importance probably would also be higher in rural areas and in a business context, according to a greater need to overcome disadvantages due to distance and asymmetric dispersion of information [MT09] [AF11]. In this case, farmers can reduce marketing costs, containing search and transportation costs, as well as participate more easily in markets [OKN12]. Additionally, they have easier access to advisory services and non-market information (such as information on climate and weather, best agricultural practices and supply chain management) by using mobile phones. But this access has rarely been examined in research studies until now [AA12]. In this regard the main research question of this study is: How does farmers’ use of mobile phones to exchange non-market information with trading partners influence farm performance (yield)? We have chosen Chile as the country of investigation, because it is highly involved in agricultural production and export [Pe05] and one of the pioneers of high-value food exports [OT11]. At the same time Chile is the Latin American country with the greatest mobile phone penetration, which assures that farmers generally have access to the technology [Ur08].

The first part of this paper will provide a review of relevant literature. A description of our own study design and the data collection process will follow before the empirical results are presented and discussed and concluding comments given.

2 Literature review

Due to the high importance and actuality of the topic, there is a growing number of research studies in recent literature dealing with the influences of mobile phone use on farmers’ (and other micro and small enterprises’) performance in developing and transition countries. Jensen [Je07] found out that mobile phone adoption causes a high reduction of price dispersion in the Indian fishery sector and reestablishes the “Law of One Price”. Furthermore, he described how mobile phones avoid the waste of fish catch, increase the fishermen’s profits, decrease consumer prices and, thus, also increase fish consumption. Aker [Ak10], Aker [Ak08] and Aker and Fafchamps [AF11] had a very similar research objective when investigating a market of a less perishable product. These studies presented the impact of mobile phone coverage in Niger on farmgate prices the farmers in this country achieve for grain. As a result the three studies observed a reduction of price dispersion across different markets and a reduction of the intra-annual price risks farmers face [AF11]. Labonne and Chase [LC09] focused on welfare effects caused by mobile phones in the Philippines. They observed that mobile phones have a positive influence on producer prices and the marketing choice in addition to the high positive impact on the growth rate of farmers household consumption per capita [LC09]. Muto and Yamano [MY09] analyzed the impact of mobile phone coverage in Uganda on farmers’ market participation and came to the conclusion that especially farmers producing perishable products in remote areas are able to increase market participation due to mobile phone coverage. Odiaka [Od10] confirmed these results insofar as he observed differential mobile phone use among Nigerian rice farmers depending on the mobile phone coverage. Okello et al. [OKN12] investigated in more detail factors affecting farmers’ use of mobile phones for agricultural transactions. They
determined that mobile phone use is related to farmer and farm characteristics as well as location and capital endowment.

But there are also studies considering a more critical point of view regarding the impact of mobile phones on farmers and rural households in developing and transition countries. Molony [Mo06], for instance, analyzed the importance of trust in trade relations in comparison to information and communication technology by using case studies of three different business subsectors, i.a. perishable food, in Tanzania. He concluded that mobile phones can simplify farmers’ access to market information, but this is highly depending on the level of trust between the trading partners. Furthermore, Molony [Mo06] emphasized that his results do not show any positive influence of mobile phones on the trust between farmers and their trading partners. Jagun et al. [JHW08] also found i.a. trust issues as a limitation on the influence of mobile phones on business activities of Nigerian micro-enterprises in the cloth-weaving sector. Goodman [Go05] investigated the relation between mobile phone use and social capital by analyzing survey data from South Africa and Tanzania. He assumed that “mobile phones are used to mediate contact between different people, and so are likely to have an effect on the size, number and nature of social networks that people participate in. This in turn may affect levels of trust” [Go05]. As a result Goodman [Go05] found out that mobile phones are used for both social and business relationships, but do not have a significant influence on trust. Another study by Frempong [Fr11] focused on the impact of mobile phones on the development of Ghanaian micro and small enterprises in different business sectors by using a simple impact model. In total the findings show a positive impact, but Frempong [Fr11] also identifies many current and emerging problematic issues regarding the use of mobile phones for business activities in developing countries, such as costs and quality of service and the changing needs of the customers requiring more innovative service offers. Mittal and Tripathi [MT09] analyzed the influence of mobile phones on farm productivity in India. They found that the use of mobile phones can increase agricultural productivity and, therefore, rural income. But this highly depends on aspects of quality, actuality and trustworthiness regarding the exchanged information [MT09].

Overall, recent studies on the impact of mobile phones on farmers and rural households in developing and transition countries show positive results in most cases with regard to the access to market information. Furthermore, the impact of mobile phones seems to be higher for farmers living in remote areas and producing perishable products such as fresh fruits and vegetables [MY09] [AA12]. But also limitations are discussed, on the one hand regarding the exchanged information indicating that the influence is highly dependent on aspects of quality, actuality and trustworthiness regarding the exchanged information [MT09] [JHW08]. On the other hand, in connection with the service provided, for instance costs, quality and availability of service and the changing needs of the customers requiring more innovative service offers [Fr11].

3 Study design and data collection

The data collection was conducted in Chile between September and November 2012 among Chilean farmers who grow raspberries, avocados and table grapes for export.
This allowed a comparison of three high-value food chains with very different characteristics. The raspberry farmers were interviewed in the Región del Maule, the table grape farmers in the Región de O’Higgins and the avocado farmers in the Región de Valparaíso. These regions were chosen because they have the largest surface area planted with these particular products in Chile [Ch10] [Si12]. The total data set consists of 81 raspberry producers, 80 avocado producers and 80 table grape producers.

A standardized questionnaire including several indicators for exchange of information and transparency was used to conduct the data collection. Performance indicators such as gross margins and yields were also part of the questionnaire. The questionnaire was tested in discussion with Chilean researchers and through pre-test interviews with producers of the three farmer groups previous to its implementation for data collection.

### 4 Results

To analyze the data set a simple t-test was conducted by using SPSS version 20. As seen in table 1, the smallholder raspberry farmers use mobile phones less frequently to exchange information with their trading partners and at the same time have less consistent gross margins than the other two groups of farmers which have bigger farm sizes. The results are statistically significant on a confidence level of 95%. The raspberry farms are on average 8.4 years old and cultivate 0.52 hectares (standard deviation 0.71) with a mean yield of 12.03 tons/ha. The smallest raspberry farm in the sample is 0.03 ha and the largest one 4.5 ha. The raspberry farmers sell their products to on average 1.27...
trading partners (minimum 1, maximum 3). These results indicate that the raspberry farmers are smallholders with very few trading partners.

Exactly the opposite is true for the table grape farmers. They have a mean size of 37.39 ha (minimum 1.5 ha, maximum 210 ha; standard deviation 40.38) and are on average 25.6 years old. In the harvest season 2011/12 they produced a mean yield of 30.37 tons/ha. The table grape farmers are selling their products to on average 2.16 (minimum 1, maximum 5) trading partners. Thus, the table grape producers are mainly big producers with high yields and consistent gross margins selling their products in most cases to different trading partners.

The third group of farmers in the sample consists of avocado farmers. This group is characterized by a mixture of small, medium and large scale producers. This group has the highest mean acreage size of the three groups (37.51 ha; minimum 0.5 ha, maximum 300 ha) but also the highest standard deviation (48.57 regarding size). They have a mean yield of 11.18 tons/ha and sell their products to an average of 1.61 buyers. The results lead to the assumption that the group of avocado producers is more diverse regarding farm characteristics in comparison to the other two groups.

The use of mobile phones to exchange information with trading partners among the three different groups is as different as the producer groups themselves. Only 33% of the raspberry producers use a mobile phone to communicate with trading partners, whereas 89% of avocado producers and 100% of the table grape producers do so. A similar result reveals the mean frequency of mobile phone use for business activities (scale: 1=never 2=rarely 3=sometimes 4=often 5=always): The smallholder rarely use a mobile phone (mean 2.02; standard deviation 1.6), while the other two groups use it almost often with means of 3.74 (standard deviation 0.95) in case of the table grape farmers and 3.81 (standard deviation 1.38) in case of the avocado farmers.

The avocado farmers have the highest mean gross margin compared to the other groups. They receive 0.54 US$/kg with a standard deviation of 0.25. The gross margin of the raspberry farmers is the second highest with a mean of 0.42 US$/kg. However, in this group the mean gross margin ranges from -0.5 US$/kg to 0.92 US$/kg with a standard

<table>
<thead>
<tr>
<th></th>
<th>Raspberry producer (N=81)</th>
<th>Avocado producer (N=80)</th>
<th>Table grape producer (N=80)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>8.4</td>
<td>21.24</td>
<td>25.56</td>
</tr>
<tr>
<td>Size (ha)</td>
<td>0.52</td>
<td>37.39</td>
<td>37.51</td>
</tr>
<tr>
<td>Yield (tons/ha)</td>
<td>12.03</td>
<td>11.18</td>
<td>30.37</td>
</tr>
<tr>
<td>Gross margin (US$/kg)</td>
<td>0.42</td>
<td>0.54</td>
<td>0.40</td>
</tr>
<tr>
<td>Number of trading partners</td>
<td>1.27</td>
<td>1.61</td>
<td>2.16</td>
</tr>
<tr>
<td>Frequency of mobile phone use</td>
<td>2.02</td>
<td>3.81</td>
<td>3.74</td>
</tr>
</tbody>
</table>

Table 1: Average farm characteristics (scale of „Frequency of mobile phone use“: 1=never 2=rarely 3=sometimes 4=often 5=always)
deviation of 0.28. Thus, the raspberry producers are the only group of producers in this sample that includes farmers receiving a negative gross margin. At the same time this is the group with the highest standard deviation. The mean gross margin of the table grape producers (0.40 US$/kg) is the lowest compared to the other two groups but also the one with the lowest standard deviation (0.15).

To analyze how farmers’ use of mobile phones to exchange non-market information with trading partners influences farm performance, we conducted a regression analysis based on a semi-logarithmic regression model by using SPSS version 20. To make sure that influences of market information are excluded, we have chosen farm yield as the dependent variable. Since the increase of yield is limited by external biological restrictions, such as the morphology and genetic potential of production plants, we calculated the logarithm of the dependent variable farm yield. To measure the influence of easier access to advisory services and non-market information (such as information on climate and weather, best agricultural practices and supply chain management) by using mobile phones, we included a variable describing farmers’ “frequency of mobile phone use” to be in contact with trading partners. Additionally, a dummy variable describing whether a farmer uses a mobile phone for contact with trading partners or not (“mobile phone use (dummy)”) was part of the regression model. The contact to trading partners was chosen, because in the case of Chile buyers predominantly provide advisory services and non-market information to the farmers they are trading with. The results of the regression analysis are shown in table 2.

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>p</th>
<th>Tolerance</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>-0.001</td>
<td>0.623</td>
<td>0.746</td>
<td>1.340</td>
</tr>
<tr>
<td>Size (ha)</td>
<td>0.000</td>
<td>0.799</td>
<td>0.762</td>
<td>1.312</td>
</tr>
<tr>
<td>Grape production (dummy)</td>
<td>0.448</td>
<td>0.000</td>
<td>0.355</td>
<td>2.815</td>
</tr>
<tr>
<td>Avocado production (dummy)</td>
<td>-0.016</td>
<td>0.752</td>
<td>0.432</td>
<td>2.315</td>
</tr>
<tr>
<td>Number of trading partners</td>
<td>-0.052</td>
<td>0.014</td>
<td>0.730</td>
<td>1.370</td>
</tr>
<tr>
<td>Mobile phone use (dummy)</td>
<td>0.228</td>
<td>0.002</td>
<td>0.231</td>
<td>4.336</td>
</tr>
<tr>
<td>Frequency of mobile phone use</td>
<td>-0.030</td>
<td>0.120</td>
<td>0.277</td>
<td>3.610</td>
</tr>
</tbody>
</table>

Table 2: The impact of mobile phone use on farm yield (dependent variable: log yield tons/ha, korr. R² = 0.482, R² = 0.498, F = 30.652***, ***p ≤ 0.001; **p ≤ 0.01; p ≤ 0.05, scale of „Frequency of mobile phone use“: 1=never 2=rarely 3=sometimes 4=often 5=always)

The results of the regression analysis show that the model explains 49.8% (R² = 0.498) of the influence of mobile phone use on farm yield. The variable with highest influence on a very high level of significance is the dummy variable “grape production”. Thus, if farmers are producing table grapes instead of the other two products, the yield increases by 44.8%. The dummy variable “mobile phone use” increases farm yield by 22.8% on a high level of significance, while the “frequency of mobile phone use” does not have a significant influence. Additionally the “number of trading partners” has a significantly negative impact on farmer’s yield. Even if the combination of independent variables could lead to the assumption that results might be influenced by multi-collinearity issues, the control-values (tolerance and VIF) do not support this assumption.
5 Discussion and Outlook

The emergence of information technology, in particular mobile phones, is of growing importance for the business activities of farmers in developing and transitioning countries due to its ability to reduce marketing costs and enable easier market access [OKN12]. Especially for Chilean farmers, mobile phones are considered as a great opportunity since Chile is highly involved in agricultural production and exports to a global market [Pe05]. At the same time, Chile is the Latin American country with the highest mobile phone penetration, which secures that farmers generally have access to this technology [Ur08]. The positive effects on farmers, especially on smallholders, in developing and transition countries have been observed in several studies in recent literature, but mostly in connection to the exchange of market information [MT09] [AF11] [LC09] [MY09] [OKN12] [Od10]. Our analysis also shows that farmers using mobile phones for business activities enjoy a higher performance, but due to the exchange of non-market information. According to the result of the regression analysis, yield increases by 44.8% if farmers produce table grapes, by 22.8% if farmers use mobile phones for business activities and decreases by 5.2% with every additional trading partner. Most likely the high increase of yield due to table grape production can be explained by product characteristics, since the t-test also showed much higher yields per hectare for table grape production. The decrease of yields due to higher numbers of trading partners indicates that fewer trading relations tend to be closer and more information is provided. The positive impact of the mobile phone use confirms the assumption that the access to knowledge and non-market information is improved and, therefore, farmers obtain higher yields [AA12]. Additionally, the results of the t-test conducted support the assumption that (Chilean) farmers using mobile phones are more successful. Thus, the smallholder raspberry farmers are using mobile phones less frequently to exchange information with their trading partners and at the same time have less consistent gross margins than the other two groups of farmers with bigger farm sizes.

Further research is needed to address the specific nature of the positive impacts the use of mobile phone provides, specifically in regard to kind, quality, actuality and trustworthiness of the exchanged information. In addition, the analysis of other information technologies such as the internet in general, but also email use and social networks, can reveal the effects of modern information technology on farmers in developing and transition countries.

Acknowledgement

We would like to thank the Deutsche Forschungsgemeinschaft (DFG) for their financial support of this research project and Prof. Alejandra Engler of the University of Talca, Chile, for her academic expertise.
References


