

**An Analysis of the Impact of the Use of Mobile
Communication Technologies by Farmers in
Zimbabwe. A Case Study of Esoko and EcoFarmer
Platforms.**

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Research paper

**submitted for presentation at the AIS SIG GlobDev 2015 Pre-
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ABSTRACT

This paper through focus group discussions and in-depth interviews with farmers and service providers, tried to find answers concerning the impact of mobile phone based information systems on farmers production practices, marketing activities, income and any other aspect of the farm business and farmers livelihood that has been impacted either positively or negatively through the use of mobile phone based information systems. . The study is limited to two mobile communication platforms that have become popular with the Zimbabwean farmers, the Esoko platform and the Eco farmer platform. Both platforms uses the Short Message Services (SMS) to disseminate information on prices, daily weather, new market and farming tips, credit ratings, financial linkages and other important information to guide farmers in their decision making. Findings show that although, mobile phones are useful in improving productivity and incomes, other factors come into play and can hinder the expected increase in productivity and income coming to fruition. There are existing constraints that restricts the ability of the farming community to realize full-potential gains. The constraints which include access to finance, risk attitude of farmers and others were also identified and discussed. The study also looked at the experiences of the service providers since they started operations and recommendations were made on how they can improve the SMS platforms in ways that are better appreciated by the farmers and agribusinesses as well as ways to ensure that the platforms are sustainable in the long run.

Key Words

- Market linkages
- Information
- Market access
- Transaction costs
- Agricultural productivity
- Mobile communication technologies
- Prices
- Socio-economic Welfare

INTRODUCTION

The relatively new farmers in Zimbabwe, majority of which are small holders continue to face marketing challenges which has hindered their growth over the years since the land reform program. Information assymetry is often cited as one of the major challenges facing small farmers and agribusinesses in Zimbabwe (Sibjenga 2012). This also seems to be the case in many other countries. Svensson and Yanangizawa (2010), argues that situations of information assymetry still prevail in most developing countries.

According to Mukhebi et al. (2007), in the absence of market information and market linkage mechanisms, it is common to find situations of artificial food scarcities, as food surplus areas co-exist with areas of food deficits. It can therefore be agreed that the need for an interactive marketing vehicle such as those provided through the use of mobile-based information communication technologies cannot be undermined. Market information is needed for farmers to choose what commodities to produce, what technologies to apply for production, when to produce, for whom to produce, when and at what price to sell (Kizito 2010).

Market information also empowers the farmer with bargaining power for a better price in the market place. Without this, the farmer is greatly disadvantaged against middlemen and traders who often have better access to market information (Sibjenga 2012). The lack of market information represents a serious impediment to market access especially for smallholders as most of their problems actually stem from not having the basic information needed for them to increase the level of their productivity in order to escape the poverty in which many of them find themselves trapped in (Siamachira 2011).

Revolution in information and communication technology in developing countries like Zimbabwe has given rise to an increased anticipation of improved marketing efficiency in the agri-business sector (Sibjenja, 2012). This anticipation is often linked to the potentials offered by ICT tools in solving problems of accessing market information often faced by players in the country's agricultural sector. Research carried out by SNV zimbabwe (2012) suggest that the widespread use of mobile phones and internet improves farmer linkage to input and output

markets by improving access to information. Question however is, does this stronger market linkage translate to improved farmer welfare?

The mobile subscription rate to the three networks in Zimbabwe has been on the rise since the dollarisation of the zimbabwean economy. The latest figures are presented in the table below.

Service providers	Subscription rate as at 3rd quarter 2014
Econet	6 472 382
NetOne	2 223 724
Telecel	2 707 642
Total	11 403 788

Table 1: Mobile subscription rate in Zimbabwe. Source: Postal and Telecommunication Regulatory Authority of Zimbabwe (Potraz), (2015)

Farmers in previously remote and excluded villages in Zimbabwe now have opportunities to access information with the help of mobile telephony. Different organizations in zimbabwe have come up with Mobile-based ICT projects as a solution to the problem of information asymmetry with the aim of improving overall performance among smallholder farmers. Such projects in Zimbabwe include: AgriMobi, ZIMACE, Esoko, eMkambo and more recently Eco-Farmer.

In theory, the use of ICT-based MIS is expected to reduce the costs of agricultural exchange and spur commercialization thus improving the welfare of the farming communities. Such gains are expected to be greatest among the smallholder farmers who tend to be most constrained by information asymmetry. The contribution of ICT- based MIS to the socio-economic development of smallholder agricultural communities needs to be explicitly known in reality. In Zimbabwe, although there have been rigorous efforts by the government and development partners to enhance application of ICT-based services, there are no known studies that have examined the impact on smallholders. This paper therefore makes a socio -economic impact analysis of the effects of the use of Mobile-based ICT on smallholders in Zimbabwe taking different variables into consideration.

This study uses two mobile ICT platforms in Zimbabwe, the Esoko and the EcoFarmer platforms to analyze the impacts of ICT-based market information systems on farmers and agri-business

wellbeing. Both platforms uses mobile phone based MIS to link up the various players in the Zimbabwean agribusiness sector.

1.1 Background information on Esoko mobile platform

The Esoko mobile platform started its operations in Zimbabwe in 2012. They currently service 17 fresh produce markets scattered across Zimbabwe and they cover 33 commodities. They provide services to over 170,000 small holders' farmers. Esoko uses a number of NGOs and contractors to push out their services to farmers. Services offered by the Esoko platform include the following:

- Sms Push and Pull which allows interactive communication with recipients
- Bids and offers to facilitate trading of agricultural commodities between farmers and buyers
- Polls and surveys through short sms questionnaires sent to targeted respondents , with results and analysis presented in a chosen format
- Profiling of sms recipients using such criteria as age, gender, ward, and crop.

1.2 Background information on the EcoFarmer platform

The EcoFarmer platform, a farming insurance initiative being offered by Zimbabwe foremost mobile network provider Econet Wireless started operations in 2013. It is a revolutionary way of farming using mobile technology. The EcoFarmer platform offers Zimbabwe's first Micro Insurance product designed to insure inputs and Crops against drought or excessive rainfall. The platform goes further to provide subscribed farmers who with information on farming tips, market prices and available markets, weather information and agronomic advices. Farmers are required to pay subscriptions of either \$2.50 or \$10 to be eligible for insurance cover. EcoCash a payment instrument which is facilitated through the use of the mobile phone also goes a long way in assisting smallholder farmers to make and receive payments. When fully registered and paid daily subscription the farmer will get:

- Daily weather data from a weather station linked to your field
- Farming and market tips

- Daily rainfall advice
- Weekly best farming prices
- Weekly crop data
- Monthly market pricing requests
- Crop information
- Credit rating
- Adverts and marketing links

The organizations behind the Esoko platform and EcoFarmer platform both see the mobile phone as an information and communication tool with the potential to extend agriculture extension services to underserved markets. They do this with the aim that through the use of the mobile phone, access to technical and market information can contribute to increased yields and income of smallholder farmers and other players in the agricultural value chains.

The objectives of the study are defined candidly with focus on efficiencies relating to input and market linkages and the socio-economic result thereof. The objectives are:

- a) To determine smallholder farmers degree of exposure to diversified markets as a result of mobile-based ICTs.
- b) To determine how farmers transaction costs have been affected by the utilization mobile-based MIS platforms.
- c) To determine the extent to which productivity levels and incomes have improved per farming household in rural Zimbabwe as a result of ICT's usage.
- d) To identify factors that pose as hindrances to the utilization of ICT's by smallholder farmers and agribusinesses in processing their agribusiness transactions.
- e) To proffer recommendation on how the use of ICT's by smallholder farmers can be further encouraged in Zimbabwe.

2. LITERATURE REVIEW

According to Mukhebi et al (2007), modern ICTs offer unprecedented potential to deliver information to smallholder farmers in rural communities and link them to remunerative markets,

and thus contribute to alleviating food insecurity, poverty and transforming social and economic conditions traders. Lack of information on prices and technologies, lack of linkages between farmers, processors, traders and retailers, distortions or absence of input and output markets, and credit constraints often make it difficult for small farmers to take advantage of market opportunities (Fafchamps and Vargas-Hill, 2005). Recent development interventions have been promoting information transfer through ICT-based innovations to reduce the asymmetric information among the market players and create linkages between the actors in the chain that eventually benefit small scale farmers (Tollens, 2006; Aker, 2008; Adegbidi, 2012).

Labonne and Chase (2009) in a World Bank study carried out in the Philippines found strong evidence that purchasing a mobile phone is associated with higher growth rates of incomes, in the range of 11–17 percent, as measured through consumption. One reason for this finding is that farmers equipped with information have a stronger bargaining position within existing trade relationships, in addition to being able to seek out other markets. Meuleman (2007) in a study of the impact of the MILS (KACE) in Kenya, concluded that the proportion of smallholder farmers and traders that say their income has increased and their bargaining positions have improved is very high (75% farmers and 60% commodity traders). Furthermore, Meuleman (2007) concluded that it was clear that during the years in which the KACE MILS has been operational in Kenya, market integration improved for two commodities studied (i.e. maize and beans).

The use of ICT-based market information services in developing countries allows small-scale farmers to get linked to the other actors of the supply chain and thus improve the farmers' access to markets (CTA, 2008). This is in line with Muto and Yamano (2009) findings in a study from Uganda that market participation rose with mobile phone access. Other studies have confirmed this effect. A study by Aker (2010a) confirmed that Niger has seen important effects on agricultural markets from mobile phone diffusion. As mobile networks have expanded, grain price differences have decreased by 20 percent, traders' search costs have decreased by 50 percent, scarce resources have been better allocated, and consumers paid, on average, 3.5 percent less for grain, which is equivalent to 5–10 days of grain consumption annually (Aker 2010a). A small study in Morocco by Ilahiane (2007) found that farmers with mobile phones increasingly dealt directly with wholesalers or larger-scale intermediaries than smaller intermediaries. Although better market access can be a powerful means of alleviating poverty, Muto and

Yamano (2009) found that market participation still depended on what producers had to sell: Perishable bananas were more likely to be sold commercially than less-perishable maize.

Studies have also shown that the use of mobile phones reduces information costs, price dispersion across markets, and price fluctuations within the same markets and improves market knowledge, transaction process characteristics, and trade (Abraham, 2007; Aker, 2008; Jagun et al., 2007; Adegbi, 2012). Time savings are important for agricultural households, because many crops have extremely time-sensitive and labor-intensive production cycles. Farmers who use mobiles can also save on transport costs (Overa 2006)—an effect that is stronger the more rural the area (Muto and Yamano 2009). According to Mukhebi et al (2007), the presence of institutions providing reliable and timely market information and market linkage services targeted at smallholder farmers will improve the efficiency of agricultural markets, and enhance the bargaining power of smallholder farmers in the market place for better prices, resulting in higher farm-gate prices and farm incomes. With higher incomes, farmers will afford to invest in modern technologies to increase productivity. With higher productivity at better prices, smallholder farmers will further increase their incomes, thus creating wealth and escaping the vicious cycle of poverty that they currently find themselves trapped in

3. KEY STUDY VARIABLES

In theory, it is expected that farmers who subscribe to ICT-based MIS will use the information provided to adopt better production techniques and access better markets thereby improving their over all bottom line. The above variables were chosen as independent variables for this study because they directly affect the rate at which the smallholders' farmers' socio-economic wellbeing will improve from the use of mobile-based MIS.

Information access: Okello (2010) states that in small farm situation, asymmetric information arises when either the farmer or the buyer lacks essential information relating to the exchange. The more informed of the parties therefore takes advantage of the exclusively available information to benefit itself, a situation referred to as opportunism (Williamson, 1985; Miller, 2005). In the Zimbabwean agricultural markets, smallholder farmers are mostly less informed than the buyers. This therefore causes buyers to use the exclusively available information (about

price, supply condition, or quality) to their benefit which often reflects in lower farm gate prices for farmers. The presence of institution providing farmers with real time information therefore should reduce the opportunistic behavior of buyers and increase farmers' knowledge of markets that offer higher prices for their product.

Transaction costs: One of the factors impeding the magnitude of returns smallholder farmers make from their produce is the high transaction costs. Transaction cost in this case is the cost of doing business or cost of exchange between farmers and buyers. Lack of information between the farmer and the buyer makes trade more costly (Okello et al, 2012). In a study that compared transaction costs throughout an extended period, 15.2 percent of the total cost of farming was transactional, and of that, 70 percent was informational (De Silva and Ratnadiwakara 2008). It is therefore easy to understand how mobile phones can reduce farmers' transaction costs. Time costs, search and screening costs for buyers and transport costs of farmers are also reduced. ICT-based MIS is expected reduce these transactions costs by reducing the asymmetry of information and uncertainty related to trade.

Market Access: application of ICT-based MIS in agricultural marketing provides better access to markets through enhanced information flow among users (Katengeza et al 2013). Several studies have shown that compared to farmers participating in traditional markets, farmers participating in high-value or modern markets show higher earnings per hectare or per kilogram marketed (Reardon, Barrett, Berdegúe & Swinnen, 2008:5). In accessing high-value markets, smallholder farmers need real time information on markets and prices. Through the Information provided by the mobile platforms, farmers are able to know which markets to take their products to for better prices which will ultimately reflect in their profit levels. ICT interventions attract attention because they are more effective in communicating knowledge to farmers in rural areas and they facilitate access to markets. Farmers with more access to markets receive high output price, pay low input price, receive higher incomes and realize high gross margins than those with poor access to agricultural markets

Agricultural productivity gains: Given that the future of food depends to such a great extent on smallholder farming, governments and development partners are focusing on how to increase productivity in sustainable ways through new technologies that smallholders can use. Irrigation

management, biotechnologies, pest control and eradication, soil valuation, improved nutrient and land management, improved market access, and innovative storage facilities are all strategies for increasing smallholders' agricultural productivity and improving their access to markets, but the challenge lies in ensuring that smallholders can obtain and use them. ICT provides an incredible opportunity to reach farmers with the technical information they require to increase yields.

Income improvement: Harsha and Dimuthu (2008) states that a number of recent studies have shown robust positive results between use of ICT [mainly mobile phones] for information search and increased income among farmers. The farmers' incomes are expected to increase with the farmers access to real time information made available by the mobile platforms. This is because farmers can make better decisions due to their knowledge of prevailing prices, available markets, and there increased bargaining power. All these should reflect in increased income

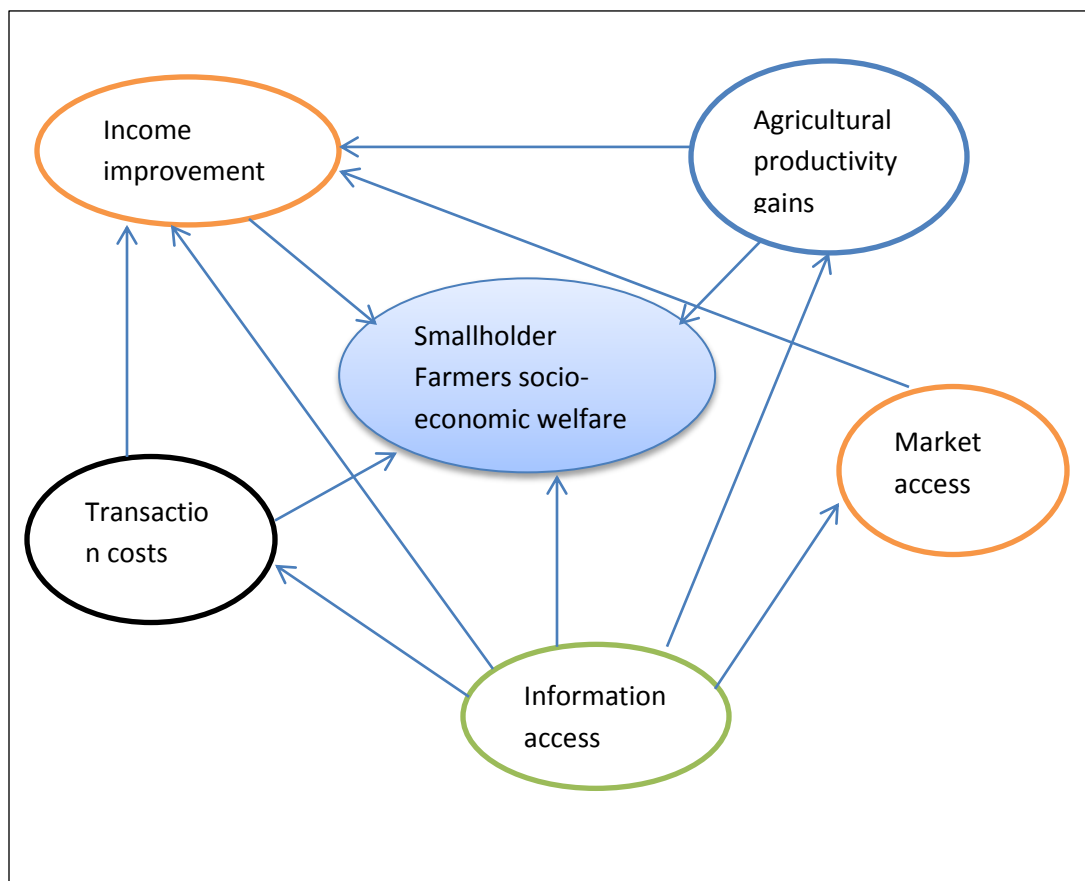


Figure 1: study variables

ICT-based MIS is expected to reduce transaction costs by reducing the asymmetry of information and uncertainty related to trade (Okello, 2010). Reduction in transaction costs is expected to increase net incomes earned by farmers (Shiferaw et al, 2007; Stienen et al, 2007; Okello 2010). Increase in income, on the other hand, is expected to contribute to greater household commercialization (Shepherd, 1997; Wambugu et al 2004; Okello 2010). Thus the household is able to produce enough for household food needs (which contributes to food security) and have surplus to sell. Increased revenue (from sales) and hence income can be used by households for short-term investment in agriculture (e.g., in the form of increased use of fertilizers, improved seed) or medium to long-term investments (e.g., accumulation of productive assets including human, physical, financial and natural assets which increase productivity. The increased productivity is in turn expected to provide greater incentives to smallholder farmers to participate in the market. Smallholder integration into the market economy directly affects the welfare of such farmers (Okello, 2010).

There are several ways in which the welfare effect can occur. First, increased involvement in the market economy increases household net incomes which contributes to greater access to food (hence makes the household food secure). Second, increased income boosts household savings which are used to smooth future shocks (Fafchamps and Quisumbing, 1999; Okello 2010). Third, improvement in household income can also be invested in education (especially payment of school and college fees) thus resulting in increased stocks of future human capital in the household (Fafchamps and Minten, 1998; Okello 2010). All these reflect in improves socio-economic welfare of the farming communities.

4. METHODOLOGY

This is a qualitative study and as such, the data for this study was collected through focus group interviews with farmers carried out at the district level of four provinces. Non-probability sampling techniques were used in the selection of respondents used in this study due to the nature of the study which requires first hand information drawn from the experiences of farmers and contractors that subscribe to mobile platforms. Judgemental sampling was used on mobile platform managers while both convenient and judgmental sampling was used for farmers. Only farmers who subscribe to both or one of the platforms and who were willing to participate in the

study were interviewed. The team conducted 12 focus groups interviews (with 6-8 small holder farmer in each group, 82 farmers in total) and 5 personal interviews with contractors, and representatives of the mobile platform service providers. There was no intention to cover all of Zimbabwe in this study or to be fully representative of rural Zimbabwe. The focus was on few selected survey locations. Farmers were drawn from different districts in four provinces namely Mashonaland West, Mashonaland East, and Harare Metropolitan respectively.

Province	Districts
Mashonaland West	Ckikombo, Goromonzi, Marondera, Mutuko, Hwedza
Mashonaland East	Chegutu, Kadoma, Zvimba, Hurungwe
Harare Metropolitan	Chitungwiza, Norton, Epworth

Table 2: Sample Areas

The above mentioned districts were chosen because of their proximity to Harare, the capital of Zimbabwe and the hub of business operations. This gives the farmers' potential to take advantage of and tap into high value markets in and around the capital and contribute positively to the agricultural sector in Zimbabwe. The areas due to their climatic and geographic profiles are suitable for intensive farming, of different crops: horticulture, tobacco, maize, sugar beans, potatoes, paprika, soya beans and small grains (sorghum, millet and rapoko) (GRDC, 1996 cited in Njaya, 2010). These farmers involved in this study cultivated a wide variety of crops, including staple and cash crops, and perishables and non-perishables. A large proportion of the farmers interviewed were involved in cultivating horticultural crops and the distinctive market characteristics of these crops might have played a part in the informed impacts. Wholesalers in fresh produce markets were also interviewed as well as contractors who subscribe to the mobile platforms.

Data collection instrument in the form of an interview guide was used to collect data. The interview guide was kept flexible to allow the capturing of rich qualitative data in an effort to understand the extent to which mobile phone based ICTs are used to provide information and market linkages to smallholder farmers in Zimbabwe.

5. RESEARCH CONTRIBUTIONS AND LIMITATIONS

In light of developing the Zimbabwean agricultural sector and turning it into a highly competitive sector of the economy, the smallholder farmers who make up more than 70% of the Zimbabwean farmers have a very big role to play. The study will in essence ascertain if and to what extent the Zimbabwean smallholder farmers' socio economic welfare has been improved through the use of mobile-based ICTs in their production and marketing activities. Improved socio-economic welfare for the small holder farmers will further improve investment and development in the agricultural sector of the economy and will lead to greater food sufficiency for the country. As stated earlier, very minimal research has been done in this area in Zimbabwe. The findings and recommendations of this study will therefore provide an insight to other small holders, service providers and policy makers on the effects of ICTs on farmers' welfare which in turn will enable them to come up with policies aimed at ensuring that the effects are sustainable in the long run. The major limitation for this study was finances. The researchers took up the research on their own without funding from any source. This greatly limited the number of respondents used in this study therefore the findings can in no way be generalised as applicable to all of Zimbabwe. In addition to limited finances, finding respondents who were willing to be part of the study was not easy therefore the researchers engaged willing respondents at places convenient to them and used communication means which they were comfortable with.

6 KEY FINDINGS

6.1 Information Access

All conducted interviews revealed that farmers' access to information has exponentially increased. It can be concluded that the most apparent way the use of the mobile phone MIS platforms has impacted farmers in Zimbabwe is by improving their access to information and making it inexpensive to access. Though it can be argued that simply having more information is not enough to make useful decisions (other resources may be needed to implement them), it is an essential step toward access to knowledge. The farmers interviewed agreed that prior to subscribing to the platforms, access to reliable information concerning prices and markets were limited, expensive and time consuming. Often then, farmers had to rely on intuition, experience

and guesswork to make decisions. The interviewed farmers stated that the mobile platform is not their only source of information as they still access information through the traditional media especially Newspapers. However, they agreed that they find the information coming from the mobile platforms more useful to them because they are in real time which makes decision taking on actions very easy for them.

The interviewed farmer prioritized information on prices and markets as the most important to them, followed by information on daily weather forecast during the growing seasons and technical know-how's. The table below ranked the information types received by the farmers on their mobile phones from Esoko and EcoFarmer platforms.

Ranking	EcoFarmer	Esoko
1	Inputs availability (seeds and fertilizers)	Prices
2	Weekly Prices	Markets/Buyers
3	Farming tips	Inputs
	Weather updates	Others
4	Plant protection	

Table 3: Types of information received via mobile phones

6.2 Transaction costs

For the purpose of this study, the farmers' transaction costs were divided into two categories: Fixed transaction costs, and proportional transaction costs using the same perspective as Key et al (2000). The fixed transactions costs include the information search costs, screening and negotiation costs and enforcement costs that are the same irrespective of the volume of input as well as output, as a farmer would incur the same cost to sell either one ton or ten tons of produce. Proportional transactions costs on the other hand, include costs of transferring the input or produce being traded, such as transportation costs which is a per-unit cost of accessing markets.

The interviewed farmers stated that the use of their mobile phones as an alternative source of obtaining information has greatly reduced their information search costs. Farmers gave examples of situations where they only made visits to purchase inputs like seeds and fertilizers based on the information received through their mobile phones that the inputs are available on certain dates, at a certain place. This reduces costs that would have previously been incurred from unsuccessful visits to purchase the inputs without adequate information goes a long way in

reducing their total costs. Both the fixed (information search costs) and proportional (transport costs) are reduced in the above scenario as farmers only had to make the trip once, unlike before. The farmers also witnessed a decrease in other transaction costs. Screening and negotiation costs with buyers/contractors are reduced as farmers depend mostly on the use of the mobile phones. Farmers advertise their products through the mobile platform, interested buyers contact farmers and most of the agreement are reached through phone calls. Farmers also follow up on payment from contractors and buyers through phone calls as opposed to constant travelling as used to be the case.

The farmers reported benefits in terms of greater convenience in time saving from using mobile phones and also testified to some increase in expediency and cost savings by using their mobile phones as basic communication devices. The costs that used to be incurred by farmers relating to time spent and financial outlays in searching for information, searching for buyers, and screening, negotiating, monitoring, and ensuring enforcement from buyers as well as reduced travel costs to markets for inputs have been greatly reduced through their subscription to the mobile based platforms.

6.3 Agricultural Productivity gains:

The interviewed farmers pointed out that knowledge on yield-enhancing technologies aimed at improving output levels are limited. Farmers usually can access these technologies, but often times, they do not know how to use them to address the production challenges they face (for example, maize yields were badly affected two years ago because of drought and the farmers made a huge loss because they lacked knowledge of and how to use drought resistant seeds). Mobile-based ICT is currently being used to solve this problem. Mobile phones in addition to other ICTs give farmers information on how to use biophysical technologies appropriately. Farmers get information on optimal planting dates, how to apply fertilizers and the correct dose, how to use and manage water, improved seeds that are available, how to use pesticides, harvesting techniques and other agronomic strategies aimed at improving their yield levels. The use of ICT therefore increases the viability of agriculture, decreases transaction costs, aids climate change adaptation, and improves livelihoods for the rural poor.

Contractors and small dealers as a segment makes daily use of their mobile phones and believe that the use of the mobile phone platforms is improving the overall market efficiency.

Outside basic communication, however, it was discovered that differences abound in the rate at which the mobile phones are utilized by farmers across the different districts. Farmers in Mashonaland East are found to make greater use of their mobile phones to access information due to the large presence of contractors and small agro dealers in the area. These farmers cited varied sets of benefits amassing from the use of the mobile phones which include increase in yield, increase in farm prices, and higher revenues from their ability to adjust supply to market demand better.

6.4 Market access

Farmers agreed that markets that were beyond their reach before are being increasingly accessible as they currently receive real time information on markets and interested buyers as well as the prevailing prices. It was discovered that prior to the use of the mobile platform, farmers have little information on available markets where demand for their produce were higher and better prices were offered. By using the mobile-based sms platforms, farmers get information on where they can sell for better price and agro traders get information on what goods are available, where, and what price. Farmers agreed that they are increasingly dealing directly with wholesalers than trying to sell on their own thereby making the market more efficient. Proliferation of middleman is gradually reducing due to farmer's possession of market happenings. Farmers are now more empowered with bargaining information in negotiation. The mobile platforms were valuable in integrating participating farmers to high value markets by reducing their transaction costs of exchange. As a result, smallholder farmers substantially increased their margin. It can be concluded that Zimbabwe has seen significant effects on agricultural market from the use of these platforms.

6.5 Income improvement

A greater percentage of the farmers interviewed agreed that they have witnessed an increase in income from the use of the mobile phone platforms. They were however quick to point out that

this increase is not very high. The average income for most of the farmers interviewed for this study increased by less than 15%.

The farmers cited being able to access real time information which therefore strengthens their bargaining position as well as their being able to access other markets through the platforms as the reason for the marginal increase in income. While access to better markets is a good way of increasing farmers' income, the study discovered that farmer's ability to sell in a given market depends on the product available for sale. Farmers stated that horticultural products that are perishable by nature were more likely to be sold in any available market than durable products like maize and soya beans. Aside from being able to access more markets, the slight improvement in farmers' income was also attributed to higher yields. Farmers also acknowledged that the use of the mobile phones messaging to issue early warning signs to farmers on weather patterns by EcoFarmer also goes a long way in mitigating the production risks associated with weather and therefore helps farmers make good decisions that aims at safeguarding their income.

6. Socio-Economic Welfare

A general belief by both farmers and service providers interviewed is that there have been little or no changes on their socio-economic welfare. Farmers agreed that they do not take advantage of all the opportunities offered by the mobile MIS platforms mostly because of liquidity challenges. For the few farmers with liquidity, welfare has slightly improved as they know where the good prices but they are also quick to state that the improvements may be offset by other costs such demurrage costs which accumulate overtime and enforcement costs in getting buyers/contractors to keep to their promises.

Reasons why there have been little changes in farmers' welfare were attributed to:

- **Lack of access to finances:** The small holder farmers lack the collateral needed to access loans from banks and other credit institutions available. Access to finances was reported by majority of the farmers as a constraint limiting their ability to take proper advantage of opportunities being offered through the use of the mobile platforms. The lack of finances prevents the farmers from purchasing vital inputs and it also reduces the farmer's chances

of getting the best price because of restrictions (explicit or implicit) on where they can sell their crop. The farmers stated that they are mostly unable to take advantage of the price disparities existing between markets due to lack of finances to transport their commodities. This mostly results in their selling to middlemen or speculators in the market at lower prices. It was discovered that farmers are forced to succumb to farm visiting merchants as they are desperate to access hard cash to pay school fees and other survival necessities. The middlemen therefore become the price setters in the marketing system and reap the extra profits that would have accrued to the farmers.

- **Ability to take risk:** For information to drive agricultural productivity, farmers must be willing to try new approaches which may include new farming techniques, use of new varieties, accessing new markets and others. It was discovered that only a small number of farmers made changes based on the information they received via their mobile phones, there were many who expressed reluctance to try new approaches even when they had access to relevant information. Other reasons cited include
- **Indiscipline:** some farmers lack the discipline to follow through on processes that will bring about change in their status.
- **Lack of incentives and support from government:** there is no active support from government aimed at enhancing the farmers' capacity to take advantage of the opportunities being offered by the use of ICT in agricultural marketing.

One noted change, however, that was reported by the service providers as experienced in most communities using the mobile phone based ICT to trade is the emergence of collective trading and increased appreciation to technology especially money transfers by the farmers.

6.8 Hindrances to the utilization of ICTs by smallholder farmers and agribusinesses

The factors identified as reason why some small holder farmers and agribusinesses are not embracing the use of ICTs for farming are: the low level of computer literacy among farmers, poor ICT infrastructures in the country, lack of network coverage in very remote areas, mobile network disruptions, lack of support and initiative by both government and the private sector and the high cost of some of the gadgets needed to access these services. It was also discovered

that the above mentioned factors also double as challenges for the organizations using ICTs to provide information services in addition to liquidity challenges, network disruptions, power cuts, and fluctuating market prices.

Other factors cited by the mobile phone platform service providers are

- The general difficult economic conditions in the country which have placed many companies in a survival mode, unable to finance MIS projects
- Poverty which makes the service unaffordable to the majority of smallholder farmers
- Technophobia which makes some smallholder farmers unwilling/ unable to embrace SMS technology
- SMS technology has its own technical limitations in that the message can only go up to 160 characters.
- Competition from Mobile Network Operators who also want to offer the same services.
- Non-profiled database which makes it difficult to send targeted messages
- Some farmers prefer phoning rather than texting because it is more expressive, interactive and conclusive, but offering such service is expensive.

7. EXPERIENCES OF SERVICE PROVIDERS

7.1 Experience of the Esoko platform service providers

Esoko started offering the mobile phone based SMS service in 2012 and their experiences in the field and lessons learned are summarized below:

- Majority of the subscribers are in Mashonaland East and Manicaland. This can be attributed to the large presence of NGOs and contractors who partner with Esoko.
- Tips / alerts and market price information are the most popular services being demanded by subscribers.
- Farmers see great value in market information services but the majority of them are not willing to pay for the service.
- There is need for trainings, which should be cascaded downwards from network managers, to team leaders and peers as it is vital for the uptake of MIS

- Profiling of the subscribers is very important in ensuring targeted messaging to avoid unintended ‘irritation’ of service subscribers
- The corporate sector is more interested a profiled database to effectively target their intended audience.
- Offering the Mobile based information service is a serious numbers game and requires high volumes for very little margins.

7.2 Experiences of EcoFarmer service providers

- Farmers were not quick to take up the insurance services and subscription fees were often cited as the reason why
- Farmers do not really see the need to insure against drought and are also generally discouraged by friends and families.
- The EcoCash payment service was embraced largely by most farmers for ease of financial transactions
- Farmers were more interested in information relating to market prices
- Farmers are generally not willing to pay for services.

8 RECOMMENDATIONS

- Esoko and EcoFarmer should initiate more ICT usage training for AREX officers who will in turn train farmers.
- Consideration should be given to launching a gadget subsidy scheme which will see computers and relevant phones being available to the farmers.
- Profiling of customers once they subscribe to the services should be done to avoid random messaging and enhance targeted messaging.
- Establishment of call centers to cater for those that prefer calling instead texting is necessary and should be considered and developed if funds permit.
- Partnerships and collaborations with contractors and NGOs should not be done away with and efforts should be made to engage with more private institutions.
- Subsidizing of subscription fees for smallholder farmers by social investors for the farmers to get a taste of MIS before they become self-funding

- Farmer should be encouraged to take the other information being proffered by the sms platform service providers seriously not just the prices and markets. Also they should be encouraged to adopt new methods.

9 CONCLUSION

The study aimed at analyzing the impact of the uses of mobile-based ICT MIS on farmers' general socio-economic welfare. From the study one can conclusively say that the ability of ICTs to increase small holder farmer's market activities by raising the quantity and quality of available information reduces uncertainty, lowers transaction costs and enhances market efficiency. The overall reduction of costs and the increase in market efficiency can have huge impact on the development of sustainable food markets and on food security in developing countries like Zimbabwe. Although the use of mobile phones is not the only solution needed, their common availability and flexibility places the technology as a necessary element of sustainable improvements in agriculture. Further research on the impact of ICT on farmers in Zimbabwe is however highly recommended, and should involve more participants drawn from different provinces and focus should be on a particular aspect of the farm community socio-economic welfare, especially on education and health.

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