

Enhancing smallholder market participation through mobile phone-enabled services: The case of *M-Farm* in Kenya

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Abstract: Many farmers in the developing world have limited access to agricultural technologies and markets. Mobile phone-enabled services that offer price information and market linkages could contribute towards bridging this gap by reducing uncertainty about expected profits, information asymmetries and market inefficiencies. This article uses the example of the price information and marketing service M-Farm in Kenya to empirically test this potential. Findings from a survey of M-Farm users confirm that m-services offering price information can help farmers plan production processes better, but also show that alternative channels, in particular the radio, can also be effective especially at the early stages of production. While evidence on the utility of the information to help farmers obtain better prices is inconclusive, resulting changes in cropping patterns and harvesting times are likely to have contributed to perceived income gains. M-Farm appears to have had limited impact on broadening market linkages, in part due to the company's focus on facilitating single contracts between farmers and buyers rather than establishing a mobile phone-enabled network of buyers.

1 Introduction¹

The agricultural sector in many developing countries is characterized by a large number of low-input, small-scale and predominantly subsistence farmers [EJZ02]. Among the obstacles to commercialization, many farmers lack information about prices and demand in different markets and contacts to potential buyers. In recent years, mobile phone-enabled services (referred to as 'm-services' here) have been developed to address these gaps. Such services can be used to transmit market information (e.g. on prices or potential buyers), connect buyers and sellers, or manage deliveries. To date, there is little empirical evidence on the effectiveness of such services. Several studies have assessed the impact of price information m-services on farmers' income [CC11; Ct13; IG10;

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LdSF11; Su11].² Evidence on the utility of m-markets and supply chain management in agriculture is largely anecdotal. No study has empirically assessed the impact of linking price and marketing m-services. Moreover, none of the studies cited here has systematically examined the role of mobile phones vis-à-vis other information channels.

To address these research gaps, this article provides empirical evidence on the impact of the price information and marketing service M-Farm in Kenya. The research tests the hypothesis that M-Farm could support market participation and the adoption of new agricultural technologies by improving production planning, raising incomes and broadening marketing options. The article is organised as follows. Section 2 outlines the role of price information and market linkages in market participation and agricultural technology adoption and reviews existing evidence on the effectiveness of m-services in this context. Section 3 provides an overview of M-Farm and describes the methods used in the research. Section 4 outlines the key findings while Section 5 assesses opportunities for scaling up M-Farm and identifies areas for further research.

2 Background

2.1 Price information

Many small-scale farmers rely on a limited number of middlemen or traders to receive price information, given that search costs for finding information elsewhere are often high [EJZ02]. This situation can affect their willingness and ability to adopt new agricultural technologies.

Uncertainty about profitability. When farmers lack information about prices they can find it difficult to assess the profitability of agricultural technologies [MPAG03]. Expected profitability, however, is one of the key factors that encourages agricultural technology adoption [BP86]. Price information could help farmers make better decisions about the mixture of crops to produce or when to harvest in response to seasonal price changes [EJZ02].

A few studies have concluded that m-services providing price information have helped farmers improve their production planning. TradeNet users in Sri Lanka [LdeS11] and farmers in Uganda felt that the information enabled them to make more informed decisions about the best harvest and selling times [FEK08]. Resulting impacts on technology adoption, productivity or income were not quantified, however. To what extent m-services have encouraged agricultural technology adoption other than changes in cropping patterns has not been empirically assessed. Anecdotal evidence suggests that information about premium prices has incentivized Ugandan farmers to invest in post-harvest technologies [FEK08].

Information asymmetries. Limited knowledge of prices in other markets can worsen farmers' bargaining position to negotiate fair prices with traders [EJZ02]. As a result,

² Some studies have also looked at services provided through other technologies, e.g. radio and mobile phones without disaggregating the data [FEK08], the radio [SY09], or internet kiosks [Go10].

they tend to establish long-term trading relationships with a few traders – a process also referred to as 'clientelization' [Ge78]. The lack of competition between traders enables them to take advantage of information asymmetries to make high profits [EJZ02].

A number of empirical studies concluded that farmers were able to obtain higher prices for the produce when using m-services to access price information. In Bangladesh, around a third of the farmers estimated their profits to have increased by 10-20% [IG10]. Similarly, users of TradeNet in Sri Lanka felt that they had earned more for their produce [LdeS11]. Both studies rely on farmers' perception rather than measurements. Similar findings also emerged from studies of price information services delivered through other ICTs, such as internet kiosks [Go10] or radio [SY09].

In contrast, a study in Colombia concluded that farmers who accessed price information via SMS did not receive higher sales prices than those who did not [CC11]. An on-going study into the impact of the price information service Esoko on Ghanaian farmers found mixed results; users obtained higher prices for yam (11%), but not for maize, cassava, and gari (processed cassava) (CTED 2013). Another study of Esoko pointed to 10% price increases for maize and groundnuts, but could not rule out confounding effects from farmers participating in other Esoko activities [Su11].

To what extent reported price increases are due to improved bargaining with traders is unclear, however. One study concluded that price information disseminated through the radio had helped Ugandan farmers to bargain for 15% higher prices [SY09]. Another assessment of the Ugandan market information service, however, found that only 40% of farmers used the price information to bargain for better prices although 76% used the service to learn about price [FEK08].

Access to price information among farmers might also induce traders to offer better prices to discourage farmers from selling at the market directly [Je10]. One study provides support for these hypotheses. TradeNet users in Sri Lanka did not seem to use the information for bargaining, but nevertheless felt that the traders offered them better prices because they knew that farmers were aware of prices in other markets [LdeS11].

Inefficient markets. Due to limited access to price information, price signals in rural areas are often "faint or absent" [EJZ02, p5]. As a result, farmers are unable to find the most lucrative market to sell their produce and transactions tend to become localised [St61]. Moreover, lack of price information combined with limited access to alternative buyers can lead to high price dispersion [Je07; St61]. However, evidence of m-services and mobile phones in general suggests that farmers are often unable to capitalise on their knowledge of prices due to other marketing constraints (see Section 2.2).

2.2 Market linkages

Lack of information about and access to buyers can further add to uncertainties about the expected profitability of a technology [AGP99]. Moreover, limited information and market linkages constrain farmers' selling options. The consequent lack of competition between traders again enables them to offer lower prices to farmers [EJZ02].

Studies on the role of mobile phones and m-services to support market linkages indicates that even where farmers know of or can contact different buyers, other reasons often prevent them from switching traders. One study of an m-service found that TradeNet users with access to information about traders largely continued to sell to the same traders because they depended on them as a source of loans and information [LdeS11].

Among the studies that looked at the role of mobile phones in general, only a small number have found that mobile phones had induced producers to change their selling patterns [Bo07; Je07]. Most studies concluded that mobile phones have had limited effects on producer-buyer relationships due to the perceived need to build trust through direct contact, the perishable nature of the produce, limited storage facilities and lack of alternative markets [FET07; GM07; Go05; JHW07; KKG11; Mo06; Ov06].

3 Methods

M-Farm was launched in October 2010 by a small Kenyan start-up company with the aim of facilitating smallholder farmers' participation in the market by improving their bargaining position and linking them to buyers. To this end, M-Farm provides crop price information for 47 crops in five markets on six days a week through an SMS-searchable database and their website³. In addition, M-Farm assists smallholder farmers to collectively sell their produce to large buyers through contracts, and connects buyers and sellers via an internet- and mobile phone-enabled platform.

The M-Farm team had originally intended to use an SMS-based system to help farmers coordinate collective sales to buyers. In practice, the team found that structures necessary to sell collectively first needed to be in place before such a system could be deployed. Instead, sales were coordinated through phone calls to ensure timely delivery of quality products.⁴ While the SMS system is now being introduced across project sites, it will effectively function as a supply chain management system to coordinate deliveries under contracts rather than linking farmers to multiple buyers.

Qualitative and quantitative methods were used in this research. Semi-structured interviews and focus groups were held in Nairobi and the study sites between April and June 2012. In addition, a questionnaire-based survey of M-Farm users was undertaken in Rachuonyo (70 farmers) and Migori districts (45 farmers) in May 2012. In both study sites, M-Farm has partnered with the Anglican Church of Kenya Development Services (ADS) who has been working with local farmers since 2007 to improve their agribusiness capacities by setting up producer groups, establishing collection centres and conducting training. The two study sites were chosen because farmers have access to two different bundles of services, thus allowing for a comparison between the two set-ups. In Rachuonyo farmers only receive price information through M-Farm. In Migori they can access price information and also sell their passion fruits at a fixed price to East African Growers (EAG) through a contract facilitated by M-Farm and ADS.

³ www.mfarm.co.ke

⁴ Vincent Orwa Alila, ADS, pers. comm. 21 May 2012

4 Findings

Two caveats need to be born in mind when interpreting the data. M-Farm was introduced as part of the wider ADS project to facilitate agricultural commercialization and farmers do not necessarily separate between the two organizations. Thus, impacts attributed to M-Farm may in fact be a result of the ADS project. Moreover, in Migori respondents do not always distinguish between the impact of price information and group selling even when they are asked about the two services separately.

4.1 Planning

Farmers use the M-Farm price information service at different stages of production. While most price information requests are sent when the product is ready for sale (58% of enquiries), 28% are sent prior to harvesting while 13% are sent during planting.

Regarding the relative role of price information when farmers decide what and how much to grow and who to sell to, price information is particularly important at the selling stage, but also among the top four types of information when choosing what and how much to grow. However, information about the demand for the produce is more widely used for decision-making at all three stages. Other important decision factors in the pre-selling stages include the soil suitability and training.

M-Farm is by far the main source of information when deciding who to sell to (especially in Migori), but also among the most important sources when deciding which crops to grow (along with radio and the farmers' group). The main types of information obtained from M-Farm during the two stages differ, however. Thus, at the sales stage, farmers rely on M-Farm as a source of price and demand information. At the growing stage M-Farm is particularly important as a source of demand information while the radio is cited as the main source of price information (see also Section 4.4).

Involvement with M-Farm has encouraged farmers to expand certain crops, but less to introduce new crops. Most farmers said that they had increased production of one or more crops due to M-Farm (89% in Rachuonyo and 62% in Migori). While 45% of Migori farmers had introduced a new crop (passion fruit) (Table 1), this decision was likely motivated by the EAG contract rather than price information. Only 5% of Rachuonyo farmers had introduced a new crop. The price information does not seem to have encouraged farmers to adopt other agricultural technologies to a great extent.

	increased production/sale	started growing new crop	better price	sell at right time	change where to sell
Rachuonyo	70	5	11	3	9
Migori	53	45	0	0	45

Note: The table shows the share of respondents who had stated in the previous question that M-Farm had changed the way they sell their products.

Table 1: Selling changes attributed to M-Farm

In Migori a smaller share of farmers had increased production (mostly passion fruit) as a result of their participation in M-Farm than in Rachuonyo. Moreover, a smaller share had expanded cultivation of the main commercial crops such as maize and beans. This suggests that offering market connections in the form of contracts (rather than facilitating marketing linkages in general) may in fact reduce the impact of price information on production decisions because farmers focus their attention on servicing the contract.

4.2 Income gains

During interviews and focus groups many M-Farm users reported that since using M-Farm they were able to obtain better prices for their produce. Results from the survey on this question are somewhat contradictory. When asked whether they had changed the way they sold their crops, only 11% of farmers in Rachuonyo said that they received a better price and none in Migori. However, when asked later in the survey whether the price information had helped them sell at a better price, almost all respondents agreed. The differences could be due to the fact that the first was an open while the second was a multiple choice (yes/no) question. These findings highlight the limitations of asking farmers to evaluate the impact of using an m-service on price increases.

Income gains can also result from changes in cropping patterns and harvesting times in response to price signals. While it is difficult to quantify these impacts, the above-cited findings provide an indication where M-Farm users are likely to have benefitted. Thus, a sizeable share of farmers in both districts stated that they had expanded production of certain crops in response to the price information, presumably because they expected higher returns. Moreover, several farmers also enquired about prices before harvesting which would enable them to determine the most lucrative time to harvest.

4.3 Marketing choices

Many farmers cite price and demand information from M-Farm as important when deciding on potential buyers. However, this information seems to have had limited impacts on sales patterns overall. While around 90% of respondents in both districts stated that they had changed the way they sell their produce because of M-Farm, only 9% of those in Rachuonyo had changed where they sold their produce, mostly because they were now able to sell their sweet potatoes to the collection centre (Table 1). In Migori, a larger share of farmers (45%) said that participation in M-Farm had changed where they sell their produce, but mainly because they now take their produce to collection centres (44%) and/or sell to EAG (39%). Thus, these changes are mainly due to the broader ADS project and the newly established contract with EAG.

4.4 Relative role of mobile phones in delivering price information

Prior to using M-Farm, middlemen, buyers in the market and the radio were the main sources of price information. The importance of market buyers has dropped considerably with the introduction of M-Farm. Middlemen continue to be a source of price information for 23% of the farmers (compared to 50% before M-Farm), but are generally

seen as worse than M-Farm. The TV and newspaper are often judged to be equally good sources of information, but are not commonly used.

The survey data suggests that the radio offers a viable alternative to disseminating price information to M-Farm. A third of the farmers still obtains price information from the radio (compared to 42% before) which they regard as comparable to M-Farm in quality. The radio is seen as a good source of information in particular in the early stages of production while M-Farm becomes more important closer to the selling stage.⁵

In the early stages of production, when price information is less time-sensitive, farmers may be prepared to wait for updates that they can receive for free via the radio. When selling crops, the timeliness of the information becomes more important and farmers may be more willing to pay for information on demand from M-Farm. Also, farmers are able to store the SMS from M-Farm. This hypothesis was supported during interviews when some farmers said that M-Farm was particularly useful because they could obtain the information when needed and did not have to wait for the radio programme.

5 Discussion

The findings indicate that price information can help farmer plan production processes better when deciding what to grow and when to harvest. Many farmers changed their cropping patterns although they mainly expanded existing rather than grew new crops. However, the main utility of M-Farm's price information service appears to be at the sales stage, as farmers can also obtain the price information from the radio at earlier stages. Moreover, information about demand is often seen as more important for decision-making. The evidence on whether knowledge of prices had helped farmers obtain better produce prices is inconclusive. Perceived income gains may be attributable to changes in cropping patterns and harvesting times.

The price information does not seem to have induced farmers to change traders on a large scale (other than selling to EAG). In Migori, where both price information and marketing services were offered, engaging in contract farming may in fact have provided a disincentive for farmers to adjust their cropping pattern to price signals because farmers focused more attention on servicing the contract. Thus, if M-Farm's aim of enabling farmers to use the price information by linking them to buyers is to be achieved, more emphasis needs to be placed on broadening marketing options.

M-Farm has greatly benefited from its collaboration with the local partner ADS who has been organizing and training farmers. Previous research indicates that farmers are more likely to be able to take advantage of price information if they sell collectively "as the group provides a stronger platform to negotiate for better prices" [FEK08, 10]. Findings from this research also suggest that farmers often attributed the perceived benefits of M-Farm to the package of services offered, not only the price information.

⁵ Farmers tend to cite either radio or M-Farm as their source of price information, but rarely both.

To move from start-up to a fully-fledged company, M-Farm will need to scale up its services. The price information service has the potential for significant expansion within and outside Kenya. The main challenge is likely to be marketing. In the early stages, M-Farm had to undertake extensive personal marketing through local partners. In addition to initial awareness-raising, repeated training sessions, are likely to be needed.⁶

Scaling up the current selling service will be challenging given that the contractual arrangements need constant and extensive support from the M-Farm team. Alternatively, M-Farm could focus on expanding the mobile phone-enabled network of buyers to improve marketing choices. To date, the M-Farm SMS-based trading function through the website is mostly used by near-city farmers. In rural areas, the SMS system is mainly used to manage supplies under individual contracts. Building trust between buyers and sellers is likely to be one of the key challenges of setting up such a network, given that trading partners often prefer establishing contact and trust through face-to-face interaction first [Mo06; Ov06]. Experience with the m-market place Cellbazaar in Bangladesh also showed that engaging farmers is likely to take some form of human mediation [QM09]. In addition, such a network will require a critical mass of buyers and sellers within locations where trade is geographically practicable.

The current set-up of the M-Farm selling arrangement (i.e. contracts) has not made it possible to assess the impact of combining price information with marketing choices. Further research in this area is needed. Quantitative assessments (rather than farmers' perceptions) of price gains due to access to price information would also be useful. In addition, impact studies of m-services could benefit from a distinction between income and social groups to better understand how impacts differ between these groups. Combined with further research into the design of m-services, such evidence could help to develop services that are adjusted to the needs and capacities of different users.

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⁶ The survey showed that several of the M-Farm users were in fact not aware of the exact crops and markets that they could enquire prices for.

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