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Does the environment in which ICT-based market information services (MIS) projects operate affect their performance? Experiences from Kenya

By

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## **Does the environment in which ICT-based market information services (MIS) projects operate affect their performance? Experiences from Kenya**

### **Abstract**

*The need to provide agricultural information to farmers has led to emergence of numerous ICT-based MIS projects in developing country. These projects aim at promoting commercialization of smallholder agriculture and subsequently their welfare. This study examines the how the environment in which such ICT-based MIS affect their performance. It specifically uses the DrumNet project, an ICT-based MIS, to assess how the socio-economic, physical, political and physical environment in the project areas affected its performance. The study finds that those transaction-related problems, especially strategic default, deriving from these environmental factors greatly undermined the performance of DrumNet forcing it to relocate severally. It discusses policy implications of these findings.*

**Key words:** ICT-based MIS projects, the DrumNet model, operational environment, performance, Kenya.

## **1. INTRODUCTION**

Smallholder farmers comprise the majority of the farming community in developing countries. Yet, they continue to face significant problems in accessing production inputs and high value markets for their products. Some of these problems emanate from bad agricultural policies of the past that entrenched the patronage of the state over marketing of agricultural produce. The state dominated the provision of agricultural services (e.g., technical information, credit, and insurance) and intervened in the input market through subsidies, and controlled the marketing of agricultural products perceived to be important in meeting national food security and raising foreign exchange. The intervention by the state in production and marketing of agricultural products caused the private sector to retreat from provision of agricultural services leading to lack of supportive services and efficiency in the distribution of inputs. The smallholder farmers were the most affected.

Market liberalization policies of the 1980s and 1990s removed some of the barriers to private sector participation in the provision of agricultural services in many developing countries. The entry by the private sector into service provision was expected to address the problems facing smallholder farmers, notably poor access to input and output markets. However, most smallholder farmers have largely missed the window of opportunity opened by market liberalization. They have continued to have constrained access to markets for essential services. Their access to inputs (especially information, credit and insurance) has been dismal (Jayne and Jones, 1997). The markets for agricultural inputs has therefore tended to fail for most smallholder farmers in developing countries (Key and Runsten, 2000; Poulton, et al, 2006; Kydd and Doward, 2005).

Several factors contribute to the failure input markets for smallholder farmers. First, such farmers face high transactions costs in the input markets. Information markets fail for smallholder rural farmers due to illiteracy, distance to information sources, or absence of the type of information the farmer needs to produce the desired crop (Key and Rusnten, 2000). Yet access to market information is essential where buyer(s) have quality and safety specifications that must met by the farmer.

Credit and insurance markets also fail for smallholder farmers due to the traditional information asymmetry problems namely, moral hazard and adverse selection. In both cases the farmer uses

the exclusively available information to opportunistically benefit him/herself by blaming the negative outcome on environmental factors. The failure of formal information, credit and insurance markets lead to low investment in agricultural production. Low investment in agricultural production is the leading cause of low equilibrium trap in agriculture (Dorward et al, 2003). Low equilibrium trap is a steady state situation in which low levels of investment sustains imperfect markets and poverty (Hoff, 2001).

The desire to spur commercialization of smallholder and enable them exit the poverty trap has led to search for new models of providing agricultural services to famers. One of the strategies being adopted by both the public and private is the use of new generation ICT-tools especially the mobile phones. Hence several private sector interventions have emerged that target provision of market information services (MIS) to farmers using ICT-based technologies. The proliferation of ICT-based MIS is especially greatest in Africa where rapid penetration of cell phones has created interest in the opportunities that exist in applying ICTs in agriculture. A recent scoping study on the application of ICT in agriculture found 34 agricultural projects with ICT components in Kenya alone (Munyua, 2008). Several such ICT-based MIS projects have also been reported in Malawi, Ghana, Uganda, Benin, Madagascar (Okello et al, 2009). Projects that use new generation ICT tools to provide market information to farmers and traders have also been reported in India (Jensen, 2007), Niger (Aker, 2008) and Sri Lanka (De Silva, 2010). Examples of such projects are the Kenya Agricultural Commodity Exchange and DrumNet in Kenya, Busoga Rural Open Source and Development Initiative and FoodNet in Uganda, Malawi Agricultural Commodity Exchange in Malawi, Manobi in Senegal, TradeNet in Ghana, and Kilosa Rural Services and Electronic Communication in Tanzania. The major goal of these ICT-based projects is to facilitate farmer access to market information and help them transition from subsistence to commercial agriculture.

Recent studies suggest that these ICT-based MIS project do facilitate smallholder farmers' access to market information and hence linkage to input and commodity markets (Aker, 2008; Chigona et al, 2009; De-Silva, 2010). Examples include the use of computer-based mobile phone platform to link farmers to input and output markets in Kenya (Ashraf et al, 2009; Okello et al, 2010), the use of mobile phones to obtain real-time prices of fish in India (Jensen, 2007), use of mobile phones to synchronize production practices with export market requirements in Colombo (de Silva, 2008), and the

use of mobile phones by grain traders in Niger to obtain price information in other markets (Aker, 2008). Despite the success these projects have had in facilitating farmer access to information, many of them have faced considerable challenges in sustaining their operations. Yet to date there is, to our knowledge, no study that systematically examines the challenges these ICT-based MIS projects face. This study examines how the environment within which ICT-based MIS projects operate affects their performance in providing market information to smallholder farmers.

The study focuses on an ICT project that targeted the smallholder farmers with input and output information to facilitate their linkage to better-paying markets. The project, known as DrumNet, used mobile phones and a computer-based platform to link the various value chain actors and provide them with production and market information regarding technical specifications of producing the crop, credit, and a market for their produce. The rest of this paper is organized as follows: Section 2 presents the study context and the DrumNet model while Section 3 discusses the conceptual framework. Section 4 discusses challenges the project has faced, how they affected the performance of the DrumNet project and how the project responded to them. Section 5 concludes and provides policy implications of the findings.

## **2. STUDY CONTEXT**

### **2.1 Characterizing study areas**

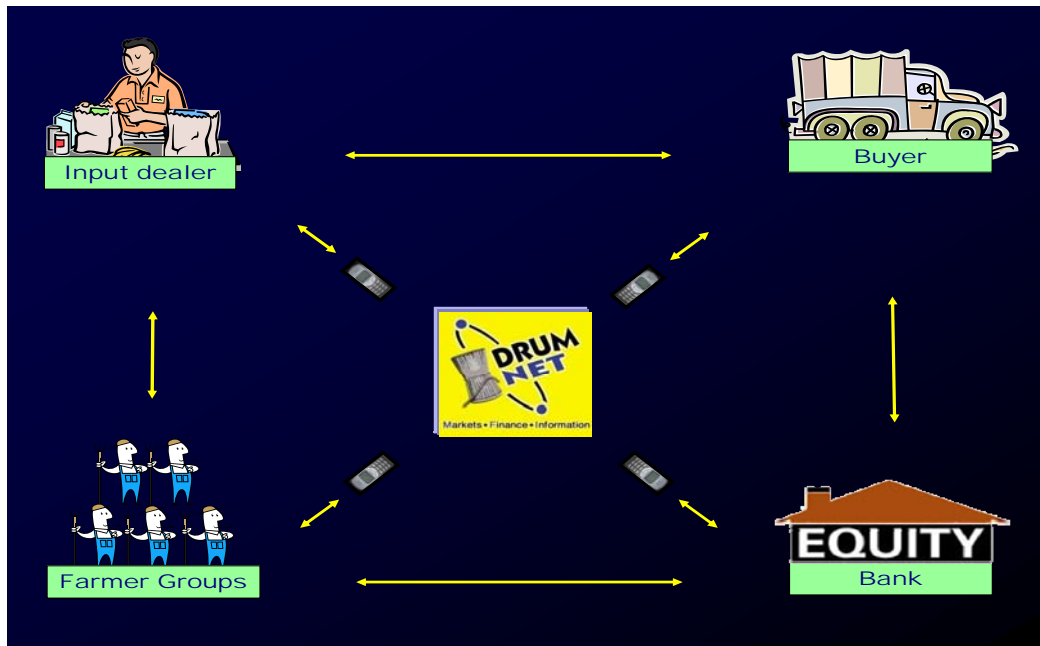
DrumNet consisted of two projects implemented in two regions of Kenya namely, Western province and Central provinces, focusing on sunflower and French bean farmers, respectively. The two project sites are similar in many respects but also offer key differences that give insight into how the different environments affect the outcome of an ICT-based MIS project. For instance the two regions have small farm size averaging less than 2 acres (Dose, 2007; Okello et al, 2009), they have dense population, and majority of farmers are smallholders. On the contrary farmers in central Kenya are more commercialized and grow a variety of fresh export crops notably French beans, baby corn, and Asian vegetables. The region also grows tomatoes for the Nairobi market. In contrast, farmers in western Kenya grow mainly food crops including maize, beans, cassava and local vegetables and sell little surpluses in local markets. A few farmers grow

sugarcane and tobacco, the only major cash crops. Farmers in central Kenya also have, on average, better infrastructure (roads, irrigation water, electricity, etc) than those in western. In addition farmers in central practice intensive farming characterized by use of external chemical inputs (i.e., fertilizer and pesticides) and credit while those in Western practice low-input agriculture with majority not using external chemical. The use of credit is also less common in western Kenya, except in sugarcane and tobacco production. Thus in general, smallholder farmers in central province practice farming as a business unlike their counterparts in western who are largely subsistence oriented.

Social and cultural differences also exist between the farmers in western and those in Central region. For instance smallholder farmers in central tend to belong in social networks that deal with farming or other economic goals. In contrast, most farmers in western belong in social networks that deal with funerals and/or religious activities. In addition, there tends to be greater mistrust among farmers western Kenya (Wambugu, Forthcoming). Hence social capital has less importance in agricultural production than in central where community groups/organizations are mainly formed to help in production or marketing of crops. The main cultural difference between farmers in western and those in central relate to the culture of work. Farmers in central, on average, work longer hours in their fields than those in western Kenya.

Despite the differences, farming is the main economic activity in both western and central Kenya. In addition, the markets used by smallholder farmers tend to be thin and fragmented (Shiferaw, 2006). They are characterized by many intermediaries hence the value chains in which such farmers operate tend to be long. The DrumNet project was intended to shorten the value chain by proving “one-stop shop” where farmers and the buyer can transact business directly. It essentially connected the smallholder farmers with the various actors in the value chain (namely the service providers and buyers) thus forging a network of linkages (partnerships) that integrate the smallholder farmers into the value chain (see Figure 2). These linkages were aimed at resolving the idiosyncratic market failures facing smallholder farmers and ultimately enabling them to adopt “farming as a business”. As shown, mobile phone played a crucial role in networking the partners under the DrumNet project. The phone was used to mediate communication and passage of market information to farmers.

Figure 1: The DrumNet Model



Source: Okello et al, (2009)

## 2.2 The DrumNet model

The project used the mobile phone to provide market information to the various partners in the transaction. The partners included farmers organized into smallholder farmer groups averaging 30 members per group, a financial organization (namely Equity Bank), buyer and an input dealer. The farmers in western Kenya grew sunflower which was sold to Bidco Oil Ltd (as the buying partner) while farmers in central Kenya grew French beans and sold to Kenya Horticultural Exporters (KHE) Ltd, one of the leading fresh produce exporters in Kenya. In both regions market relevant information was sent via an SMS from DrumNet central platform instructing the partner what it needs to do to meet its obligations under the arrangement.

At the outset, the partners signed contracts with DrumNet as the market information service provider. DrumNet therefore signed a formal contract with farmer groups involved in the project specifying the obligations of each partner and fees the farmers were to pay to DrumNet as a provider of MIS. The fees were to be recovered upon the sale of beans (in central Kenya) or

sunflower (western Kenya). Hence the project used an interlinked credit scheme to recover the costs of providing MIS to farmers. The farmers also had signed contracts with the bank through which they were paid. Once the produce was collected by the participating buyer and payment processed, the money was transferred to the Bank. The bank had instructions on the amount of commission to recover from each group. The commission was 5% and 3% of the value of sales in central and western Kenya, respectively. The value of sales was computed based on group sales. The group leaders and project field staff then distributed the fee across individual member sales.

Farmers within a group were required to monitor each other in order to ensure that all members paid their dues. Each group had a leader called the transaction agent (TA) who intermediated correspondence between DrumNet and its members. The TA was required to have a mobile phone and acted as the information hub. That is, DrumNet system would send information to the TA via short messaging system (SMS) and the TA was expected to relay it to members and let respond. The response was in form of a SMS sent back to the DrumNet system. The TAs were to be paid by some 3% of the group sales. However, the mode of payment differed. In Central Kenya, the TAs were to paid by the group itself. However, in some parts of western Kenya, DrumNet project was to directly pay the TAs.

### **3. CONCEPTUAL AND EMPIRICAN METHODS**

The problem of access to market information can be analyzed using the transaction cost and contract theories. Transaction cost theory posits that transactions between any two agents in the value chain entail a cost. These costs arise from the need to i) search and screen a transaction partner, ii) negotiate the terms of transaction/exchange, iii) monitor the terms of exchange, iv) enforce the terms of agreement, and v) renegotiate the terms of exchange should changes in the market/physical environment demand. It is because of these costs that various forms of governance of exchange evolve between the buyers and sellers (farmers in our case).

Transaction costs are exacerbated by lack of information between buyers and sellers, a situation called information asymmetry. Asymmetry of information encourages opportunistic behavior by the more informed transaction partner and is itself worsened by uncertainty, presence of assets that find use only under the transaction relationship, and when transactions are frequent (Williamson, 2005). Opportunistic behavior poses a serious problem in many exchange relationships. It is also one of the major reasons why markets for agricultural inputs fail for smallholder farmers and why such farmers tend to have difficulty being linked to markets (Omamo, 1998; Kydd and Doward, 2004). In an MIS project where verification of facts is not easy, opportunistic behavior can take occur when the farmers fails to respond to a message instructing certain action, and later insist that the message was not received.

One of the strategies for governing transactions between exchange partners is through contracting (Martinetz, 2005). Contracting helps resolve farmer-specific (idiosyncratic) market failure such as lack of certain needed skills, poor access to information necessary for producing contracted crop, and market insurance (Key and Runsten, 1999; Bagetoft and Olesen, 2004). The missing information can then be provided under contracting arrangement. In the context of the relationship between a farmer and an MIS provider contracting can take of the form of periodic subscription. Two types of subscription can be identified in this case. The first is where the client (farmer) pays up the fees for using the MIS service. This type of subscription however requires clients that are financially endowed and hence able to afford the fee, which is usually not the case with smallholder farmers. The second type of subscription to the service involves allowing the farmer to use the service in the production of a specified contracted crop later recovering the fees directly from farmers sales (also referred to as interlinked credit scheme). This type of contracting works where the contracted crop is sold through the MIS provider. They are very common in many developing countries and in many contractual relations both in crop and livestock production under contract (Bagetoft and Olesen, 2004).

The success of interlinked credit scheme however tends to be undermined by a number of factors. First, where there are several buyers, there tends to be a problem of side-selling (Jaffee, 1985). This problem occurs when a farmer gets input loan (i.e., loan of MIS) from a service provider but sells the produce upon harvest to another buyer rather than through the right

channel hence avoiding paying the loan altogether. The side-selling problem is usually acute where several buyers compete for produce from the same group of farmers. Hence common sanctions such as threat of suspension or contract termination (i.e., refusal to collect defaulters produce) do not work. Second, there are farmers that join the contract mainly for the purpose of getting credit yet having no intention of repaying the loan. This kind of behavior is referred to as strategic default. The literature identifies this problem as major cause of market failure. At its worst, it is characterized by the unraveling of a credit market whereby bad (dishonest) borrowers chasing away from the market the good (honest) making it unprofitable for lenders to lend in such market and ultimately forcing lenders to shut down (Robinson, 1998). In many of the cases of strategic default, the defaulter will blame some not-easy-to-verify environmental factors for the default.

Several factors fuel the transaction-related problems discussed above. These problems usually related to the socio-economic, physical, political, and legal financial environment in which the MIS is deployed. The socio-economic environment relate to the culture of the people and economic status of the clients (farmers). Cultures that promote honesty (truth-telling) will promote compliance with contractual agreements and encourage trust-based transactions (Williamson, 1985). On the other hand, poor economic status of the transaction partner (i.e., farmer) can result in problems of default. The need to meet urgent household cash or food needs can, for instance, encourage farmers to side-sell or engage in strategic default. The physical environment, in the context of agriculture relates to problems that arise from lack or unreliability of rain, pest and disease outbreak and poor soil fertility conditions. These are perhaps the most well-known excuses given by defaulting transaction partners (Hueth, 1999; Okello and Swinton, 2007). The political environment relates to the influence of the ruling elite of the implementation and operations of the project. Jaffee and Binten (1985) for instance document the interferences by the local leaders in French bean growing contracts between smallholder farmers and a canning company in western Kenya. Finally, the legal environment relates to the rules that govern contracts and also business rules and regulations that exist in the country. Transaction related problems discussed above are likely to be prevalent where rules governing contracting are not enforceable or can only be enforced at high cost. On the other hand, rigidity of the business regulations can stifle the flexible needed to respond to other environmental challenges in an MIS project.

The literature offers some theoretical solutions for dealing with transaction related problems such as the above (Williamson, 1985; Besley, 1998; Hueth, 1999; Bagetoft and Olesen, 2004). These include instituting a system of monitoring the behavior of the farmer to verify claims used to justify default (Hueth, 1999), using local individuals with good knowledge of local farmers to screen out the dishonest (would be strategic defaulters) (Besley, 1998), and structuring the payment system to provide incentive for the client to be truthful (or to comply with contractual requirements) (Williamson, 1985; Bagetoft and Olesen, 2004).

In Section 4 below, we discuss how socio-economic, physical, political and legal environments in the project area affected the DrumNet project and how it responded to those challenges. The analysis is based on detailed case-study interviews with various stakeholders of the project. The interviews were conducted between September 2009 and February, 2010. The stakeholders interviewed included Project staff including those based in the field and in the head office, farmers, produce buyers, the commercial bank involved, local key informants and opinion leaders, and local government agricultural staff. The interviews were complemented with focus group discussions (FGDs) with farmers in the different project areas. The interviews and FGDs were used to triangulate the evidence presented in this paper.

#### **4.0 OPERATIONAL ENVIRONMENT AND ITS IMPACT ON PERFORMANCE**

In this section we assess the various challenges associated with environment in which the DrumNet model was implemented and how they affected the operations and performance of the project. We address these environmental factors under four categories namely, socioeconomic, physical, and legal. We drop the political factors because their effect on DrumNet was not discernable in both project areas.

##### **4.1. Socioeconomic factors**

Farmers in most the areas where DrumNet operated, but especially in western Kenya, had limited income. For the majority, the major income sources were the sale of surpluses from food crops and remittances from family members in towns. Due to shortage of income, many farmers were not able to meet household needs. This shortage of cash for family needs created a strong

incentive for the farmers under the project to default on the in-kind loans (inform of fees for MIS services) they received. The DrumNet project was based a grameen bank concept was required that farmers monitor one another's repayment of the loan received. However, this scheme did not provide a strong deterrence against default on loans. Farmers developed ingenious ways of avoiding the repayment of MIS loans resulting in high default rate of up to 30%.

Farmers used variety of strategies to avoid paying loans. In many of the groups, farmers turned up for loans knowing full well that they will not repay, a phenomenon known as strategic default. After receiving the MIS services from the project, the farmers sold the crop outside the project to other intermediaries. This way, the defaulting farmers avoided repaying the loan altogether. In less severe cases, the defaulters sold only part of the crop outside the project retaining some little to take to the project. The defaulting farmers would then blame blames some environmental factor(s) to which they obviously have no control but whose occurrence the lender cannot perfectly ascertain. In majority of the cases, the farmers blamed bad weather, pest outbreak, poor and disease.

Project farmers were often easily influenced to engage in strategic default because of the prices other intermediaries offered. Okello et al (2010) for instance argues that project farmers were often enticed side-sell by brokers who offered prices that were way above the project price. This good price offer was especially irresistible to farmers were had serious cash needs. Majority of such farmers ended up selling their crop outside the contract. The problem of side-selling widespread in both western Kenya and central Kenya, indicating that the nature of the crop (whether export oriented or not) did not affect project farmers decision to cheat on the contract.

The problem of strategic default led to collapse or dissolution of many project groups. In majority of such cases the collapse was caused by the sudden exit of defaulting members. That is, some members took the in-kind loan and then left the group. Since the loan is given to the group, the project deducted its commission (the MIS fee) from the group regardless of whether or not some defaulters have already left. That is, even those whose produce sale was enough to cover their share of the loan ended up paying more than they needed to. This discouraged the remaining farmers and caused some cheat in the next season after realizing that their counterparts were not punished. In all of the cases, the group pressure intended to push them to repay was ineffective for two reasons: i) the self help groups are non-legal entities and hence cannot sue a

defaulting member and ii) the group does not inflict sufficient reputational damage on the defaulter to deter others.

The problem of strategic default can be reduced through close monitoring of project farmers. However, DrumNet did not have a strong team of field staff to do so. The inability of the project farmers exacerbated the opportunistic behavior. So what did the project do? In central Kenya, it attempted to recover the lost cash in form of loan defaults through legal recourse but was unable.

There was also a problem of dishonesty by the project field staff especially in central Kenya. Some of the project staff colluded with farmer leaders to cheat unsuspecting members. In majority of the cases, they inflated the sales volumes in the project record and distributed money in a way that made farmers receive less pay for their crop than they needed to. This problem was fueled by the weak monitoring of the project field staff. The dishonest field staff at the same shielded the head office from the farmers thus making it easy for them conceal their “cooked records”.

DrumNet head office was however able to detect the dishonesty after farmers boycotted the sale of the crop (French beans) in Kirinyaga. It responded by sacking the suspected staff. However, the project never sued the sacked staff nor sought to recover the stolen money. This seemed to have only fuelled the culture of dishonesty among the field staff. One staff thus said:

“ He stole a lot of money and was only fired. He left with so much money that he immediately set up a good business. It was as though the project told him to put his stolen money to use. We all need money. If all that will be done to me is be relieved of my duty, then why should I sit here and watch my opportunity to get rich pass by?”

The strategic default and dishonesty in Kirinyaga was however not biggest problem for the project in central. The project crop (French beans) was sold in the UK superramet where demands for compliance with GlobalGAP had reached its climax. The buyer KHE Ltd wanted the farmer groups to upgrade their grading and holding facilities to meet the GlobalGAP quality conditions. However, the farmers resisted this demand. They found the costs of upgrading the facilities too high and asked for help from the exporter. However, the exporter refused to offer help. A dispute arose. DrumNet was unable to offer help either. When the dispute over upgrading the facilities to meet GlobalGAP conditions could not be resolved, KHE Ltd stopped buying

from crop. The project advised the farmers to find their own buyer. Thus following the problems of strategic default, dishonesty of the field staff and lack of market, the project wound up in Kirinyaga and shifted to western Kenya with a different crop (sunflower).

#### **4.2 Physical environment**

The key factors relating to the physical environment in which the project operated were bad weather (i.e., lack or unreliability of rain) and pests. Bad weather was a major problem in western Kenya where farmers had not access to irrigation water. It resulted in poor germination of seeds and eventually in poor crop. In terms of pests, the key problem farmers faced was bird attack especially at the milk stage of the sunflower stage. Farmers incurred huge losses due to bird attack. In some cases, losses of up to 50% were caused by the birds.

Most project farmers often used the weather and bird problems to explain their inability to repay the loan even when they side-sold. This is not uncommon. Literature on moral hazard argues that agents (farmers) use environmental factors such as these to justify default. So how did project deal with the environmental problems. As expected, it did very little mainly because it had to modify environmental factors. However, it advised farmers to chase birds from the sunflower crop. This advice did not work because only a few farmers were growing the crop. Hence the bird population and hence destruction always tended to be huge.

#### **4.3 Legal environment**

DrumNet project worked with smallholder farmers organized as groups. These groups were registered by under the ministry of culture and social services rather than the ministry of cooperatives. The registration under ministry of culture meant that the farmer organization (groups) were not legal entities and therefore could be sued in case of breach of terms of the contract. Indeed, the project upon realizing this legal challenge signed separate contracts with individual farmers and then collectively with a group. Never the less, the signing of the contracts with individual farmers did not help the project at all when it faced serious problems of default in central Kenya. This is because suing individual farmers when they defaulted was not cost-effective. Even if the project was to win such as suit, it would take the sued farmers many years

to repay and the court would rule in favor of small payments due to economic condition of the farmer. Hence the project never resorted to law suits even when it could do so.

The second major legal challenge the project faced was with regards to business regulations relating to banking. The project signed a contract with the farmers to pay them within 48 hours of the collection of their produce. The arrangement was that the project would send a mobile phone text message alerting the bank to process the pay. The text message was to act as an invoice. However, when the project was implemented, the bank refused to act based on text messages sent by the project. It argued that it needed a signed paper invoice in order to process the payments because banking laws did not recognize text messages as legal documents. This forced the project to project paper invoices which usually cause lengthy delays and eroded the trust the farmers had on the project.

## **5. CONCLUSIONS AND RECOMMENDATIONS**

Several projects have emerged in Africa that use new generation ICT tools such as mobile phones to provide market information to farmers. Studies have shown that such projects have benefits to farmers in that they link such farmers to better markets. Others studies have suggested that ICT-based MIS facilitate trade and improve the efficiency of agricultural markets. However, there have not been studies that systematically assess how the environments in which such project operate affect how they perform. This paper examines how the socioeconomic, physical, and legal environment within ICT-based MIS projects operate affect their performance. The study used detailed case methods. The study focuses on the DrumNet project implemented in central and western Kenya. It argues that the poor economic status of the farmers encourage them engage in opportunistic behaviors that affects the projects' ability to function well. The culture of dishonesty also affects the level of trust in the project. The study further indicates that the physical environment reinforces the tendency of project farmers to behave opportunistically thus further affecting the project's ability to recover its loans and performance. In addition, inflexible business regulations or lack of enforceable legal framework work against the performance of ICT-based MIS projects. The implication of these finds is that ICT-based MIS

projects require good socio-economic environment and supporting legal framework. It also requires investment in insurance to overcome the challenges of the physical environment.

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