# Smallholder Farmers Access to Market Information Systems

Southern Africa Trust 2013

# Contents

# Executive Summary

Market information systems can play a significant role in addressing these challenges and play a key role in economic development and growth as it can bridge the critical knowledge gap between stakeholders. Given the rise of information and communication technologies (ICTs), MIS has become more accessible by these marginalised communities (smallholder farmers and traders). The application of ICT in agriculture is based around two issues market services and knowledge creation. ICTs represent a medium through which marketing exchange can take place, by providing marketing through the dissemination of market information such as prices, location of produce, and bidding for stock ICT allows for processing of knowledge as well as provide platform for information dissemination especially through the provision of extension services. ICT revolution encompasses new ways of capturing, processing, storing and displaying information and is capable of increasing productivity and competiveness of smallholder farmers. The advent of market information system (MIS) has been instrumental assisting farmers in accessing data on agricultural market. The emergence of cell phone and internet access has eased the availability of information by farmers. Data transmitted includes prices of products, contact details of buyers and sellers, advice on production, transaction opportunities and policy regulations. It is expected that MIS will be able to provide more services to farmers including opportunities for credit access, storage infrastructure, currency exchanges etc.

ICT platforms in agriculture can be described in four categories, Voice Information Delivery Services, Radio: Dial-up (Agricultural Information on Demand) and Regular Radio Broadcasts, Extension Services Based on Mobile Phone and Database Monitoring and e-Learning for Basic Skills, Agricultural Education and Video-Based Approaches 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. Southern Africa is lagging behind West and East Africa with respect to penetration of ICT technologies among smallholder farmers. Despite this the use of ICT based market information system is on the rise technologies. These systems are being applied to solve a range of challenges faced by smallholder farmers in the region especially improving smallholder farmers' access to markets and agricultural credit and empowering farmers to negotiate better prices.

The discussion in this paper illustrates the use of ICT based Market information systems in improving livelihoods of smallholder farmers through reducing transaction costs incurred in market exchange, however much more impact can be achieved if the following recommendations are considered

## General recommendations

The proliferation of ICT technologies requires democratisation of the information industry, restrictive laws with respect to dissemination and access remains a stumbling block with regards to the impact of ICT on rural development.

There is need to promote open access to information to allow for dissemination of knowledge to address information asymmetry bedevilling development in rural societies. There is a tendency by both corporates and states to limit amount information available for public consumption. This is done in the name of national security (for the state) and maintaining competitive (for the private sector).

The design of ICT innovations for agriculture requires mind-shift interventions, it is vital to bear in mind that "access" refers not only to the physical proximity and accessibility of ICT infrastructure, tools, and services but also to their affordability, use, and usage models that are appropriate for the local physical, environmental, and cultural constraints.

**Public sector recommendations**

There is need for designing relevant policies and legislation to drive ICT revolution in developing in countries. There is lack of knowledge among policymakers on the appropriate policies which can the use of ICT in mainstreaming smallholder farmers in the mainstream economy.
Decision makers in Africa need to invest in infrastructure to allow for universal access of ICT services by the majority of the rural population.

Governments should provide
- a sound, market-oriented regulatory framework;
- universal access regulations and mechanisms that motivate operators to serve regions where it is economically infeasible but socially desirable for them to do so;
- incentives such as a sound business and taxation environment to encourage investor and donor involvement in ICT infrastructure development in Africa;
- the preconditions for inter-African collaboration through, for example, the introduction of common

**Private sector recommendations**

The responsibility of developing the ICT sector should not the public sector prerogative alone, the private sector need to join hands with government in designing and implementation of appropriate policies for supporting the role of ICT in driving rural development.

The private sector should
- be aware of the socioeconomic dimension of activities related to the ICT sector;
- take advantage of the lessons learned from franchise systems that have been successful business models in many developing countries, including Senegal, Gambia, and Bangladesh; and
- aim toward the stepwise extension of phone shops to more sophisticated telecenters using knowledge transfer, capital availability, and, if need be, ICT infrastructure support schemes, such as universal access funds compensating for potential losses.

## 1. Introduction

Smallholder farmers in Africa tend to be poor in terms of access to agricultural production and market information services (Okello, 2010). Information-poverty is responsible for low levels of agricultural commercialization among the smallholder (Barrett, 2008). Information poverty traps farmers in subsistence farming, thus preventing them from adopting profitable production alternatives and also keeps them supplying low-paying marketing outlets (Ashraf et al, 2006). Information increases the transaction costs making the costs of doing business unaffordable to majority of smallholder farmers (Shiferaw et al, 2007). Smallholder farmers respond to the high costs of agricultural exchange by being autarkic or by selling their produce at the farm gate rather than travelling to the market where they could get better prices (Fafchamps and Hill, 2005). Such village markets however tend to offer low prices and are characterized by significant price variation (Gabre Madhin and Fafchamps, 2006). Information poverty stifles progress in smallholder farm sector because of a number of factors. In the absence of market information, opportunistic behavior (by traders and other market actors) tends to develop. 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 poverty (Munyua, 2008).

This paper presents the state of marketing information systems in Southern Africa; it provides a platform for policy dialogue on the role of ICT in promoting mainstreaming of smallholder in agricultural economies in the region.

The paper seeks to address the following objectives

- Analyse the status of Market information systems in Southern Africa
- Presentation of successful models on the use of ICT in driving smallholder development in Southern Africa
- Discuss opportunities and failures of financing and market access model in Southern Africa
- Presentation of the role of ICT in supporting smallholder farmers for increased agricultural production.
- Participants will propose policy recommendations for governments to increase financing for farmers
- Review the organisation and coordination of farmer groups in southern Africa

The paper presented in five sections

- ICT In Southern Africa
- ICT tools and usage
- ICT Technologies and applications in Agriculture

## 2. ICT in Southern Africa

Table 1 shows access to ICT platforms by households in Southern Africa, South Africa has more than 100% penetration with respect to cell phone ownership, with Malawi with the lowest cellphone ownership in the region. South Africa has the highest density of fixed lines in the region with Zimbabwe being a distant second. South Africa is also the leader with internet penetration; Malawi likewise has the least penetration with respect to internet.

**Table 1; ICT in Southern Africa**

|  | Mobile ownership per 100 | telephone per 100 | broadband internet per 100 | internet users per 100 |
|---|---|---|---|---|
| Angola | 46.69 | 1.59 | 0.10 | 3.16 |
| Botswana | 46.80 | 0.39 | 0.01 | 11.00 |
| Lesotho | 45.48 | 1.78 | 0.02 | 3.86 |
| Malawi | 20.92 | 1.02 | 0.05 | 2.26 |
| Mozambique | 30.88 | 0.38 | 0.06 | 4.17 |
| South Africa | 100.48 | 8.43 | 1.48 | 12.33 |
| Zambia | 41.62 | 0.69 | 0.08 | 10.13 |
| Zimbabwe | 61.25 | 3.01 | 0.26 | 11.50 |

*Source ITU 2013*

Figure 1 shows trend in the use of mobile phones per hundred people across countries in Southern Africa, all the countries in the region are experiencing exponential increase with respect to mobile-phone ownership. South Africa has the highest cellphone ownership rate, Zimbabwe despite starting slower than its regional counterparts; it has overtaken them in 2009 to be second after South Africa.

**Figure 1: Trend on mobile phone users (per 100 persons) in Southern Africa**
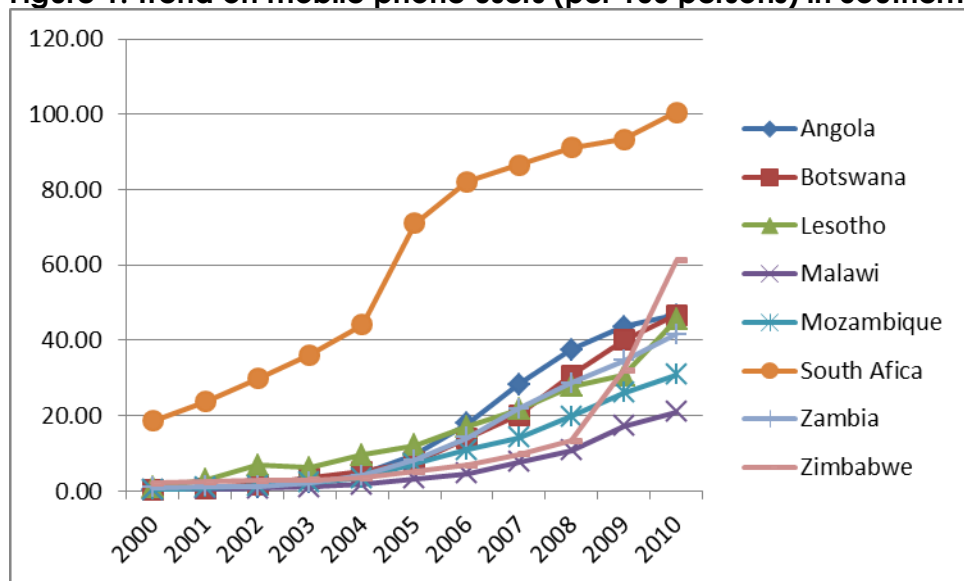


*Source: World Bank 2012*

Figure 2 shows trend in the use of the internet per hundred people across countries in Southern Africa, all the countries in the region are experiencing exponential increase with respect to mobile phone ownership. South Africa has the largest growth with respect to the use of internet by its population, however all countries are experiencing exponential increase since 2001. Angola, Botswana and Zimbabwe have the greatest gains with respect to internet use between 2001 and 2010.

**Figure 2: Trend on internet users (per 100 persons) in Southern Africa**
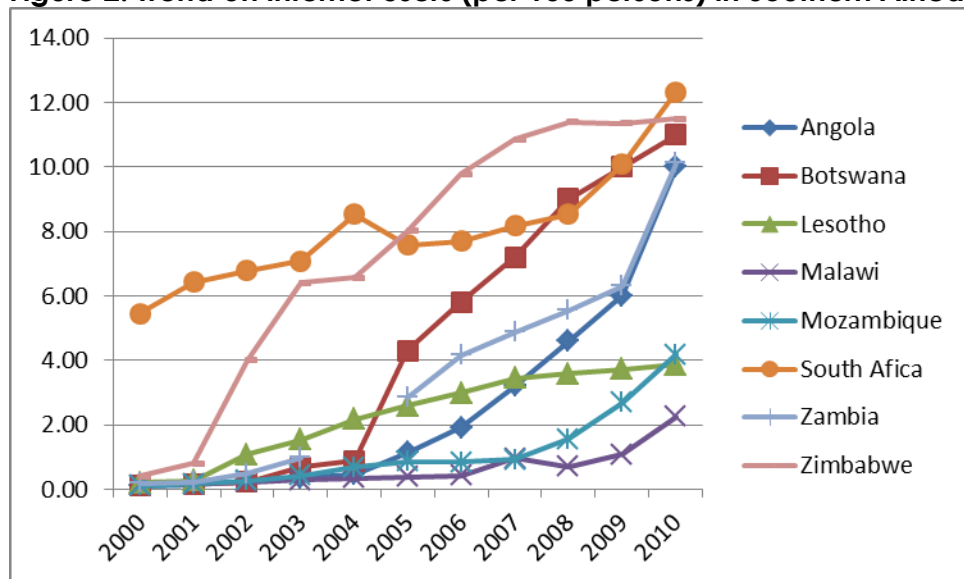


*Source: World Bank 2012*

Figure 3 shows trend in the use of fixed telephone lines across countries in Southern Africa, all the countries in the region are experiencing exponential increase with respect to mobile phone ownership. South Africa fixed lines coverage is dropping whereas the rest of the region is stagnating. Angola and Botswana have the greatest gains with respect to fixed telephone lines coverage between 2001 and 2010.

**Figure 3: Trend on use of fixed lines telephones (per 100 person) in Southern Africa**
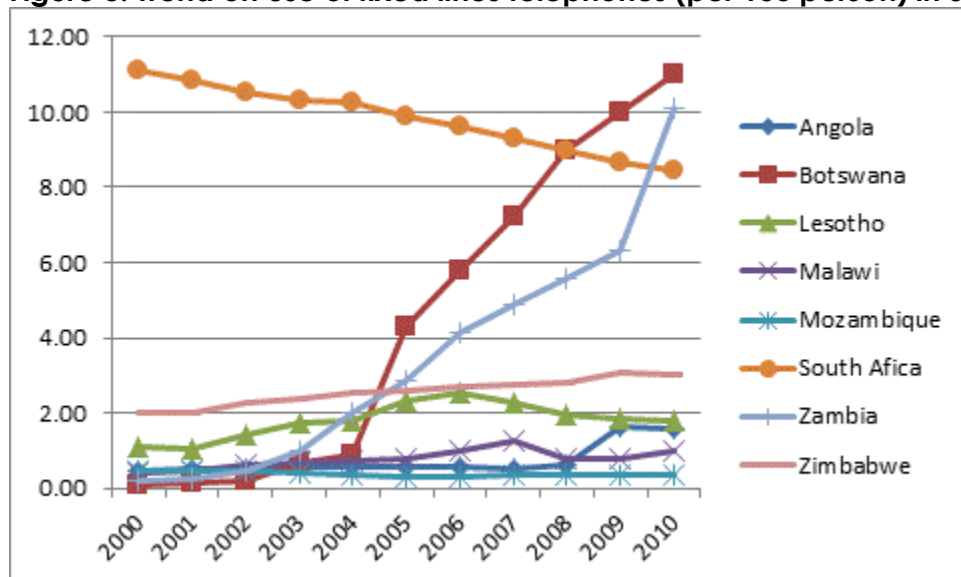


*Source: World Bank 2012*

## 3. Market Information Systems and ICT tools applications

ICT platforms in agriculture can be described in four categories, Voice Information Delivery Services, Radio: Dial-up (Agricultural Information on Demand) and Regular Radio Broadcasts, Extension Services Based on Mobile Phone and Database Monitoring and e-Learning for Basic Skills, Agricultural Education and Video-Based Approaches (see inventory in ANNEX 1)

### 3.1 Voice Information Delivery Services

This includes a telephone-based information delivery service that provides advice on farming methods and market access to improve the lives of rural farming communities. Some use call-in centres for agricultural extension support. More complex voice technology uses a simple telephone community fixed phone or mobile as the medium of information exchange while sophisticated communication technology and computing applications have been configured at the back-end platform for the provision of the requisite information service. The solution is comprised of a unified messaging platform incorporating Interactive Voice Response (IVR) functionality, integrated with a Customer Relationship Management application to support integrated call handling and management of a very large audio database.

### 3.2 Radio: Dial-up (Agricultural Information on Demand) and Regular Radio Broadcasts

This includes regular radio broadcasts providing market prices or other agricultural information and dial-up radio that feature a series of short segment audio programs that provide farmers with phone access to relevant information through an automated voice system. This radio system is an information hub featuring a regularly updated, diverse menu of pre-recorded agricultural content. For this inventory we have only kept those projects we consider innovative – such as allowing farmers to ask questions through SMS, or broadcasting information gathered through question and answer vouchers or other innovative means.

### 3.3 Extension Services Based on Mobile Phone and Database Monitoring

This is a media channel that allows anyone to affordably share market information via mobiles or the internet. By tracking activities and profiles, the service becomes a crucial profiling and business monitoring tool, and advertising medium. By focusing on profiling, this service can minimize risk in transactions, offer some brokerage services, and provide a revenue stream by permitting advertising and data mining. To date, most licensees have been donor projects.

### 3.4 e-Learning for Basic Skills, Agricultural Education and Video-Based Approaches

This category covers the provision of information and learning material for agricultural skills. The specific video-based approach has several important advantages to traditional forms of agricultural content, which are typically not in the local language, are intended for a literate audience, use expert terminology, lack grassroots level practicalities, and remain inaccessible in a sea of scattered media. From a user's perspective, device convergence has two main aspects; first, users can access content in different formats (audio, data, location data, pictures, maps, text) and with different dynamic properties, produced by different authors, on the same device. Secondly, users can take advantage of different options (radio, GSM, Wi-Fi, Bluetooth, satellite) for accessing that content. The evolution of appliances in the mobile phone market illustrates these two trends. The focus is on portable devices that support multiple functionalities or multiple connectivity options, because they are vast majority of ICT appliances available in the world today. Portable devices, including but not limited to mobile phones, are starting to allow users dual (or multiple) mode flexibility. An example, dual connectivity (Wi-Fi/GSM and Bluetooth/ GSM) enables mobile phones to conduct both VoIP and standard mobile calls. Dedicated telephone devices are able to process VoIP phone calls using Session Initiation Protocol, as well as regular phone calls using analog signals.

## 4. ICT Technologies and Applications in Agriculture

Agriculture is the largest economic sector in most African countries and remains the best opportunity for economic growth and poverty alleviation on the continent, contributing about 17% to the Gross Domestic Product (GDP) and 40% to exports, besides creating employment (Delloit, 2012).  ICT can play a significant role in addressing these challenges and play a key role in economic development and growth as it can bridge the critical knowledge gap between stakeholders. The importance of Market information systems (MIS) in agriculture emerged during the era of economic liberalisation policies and structural adjustment. In these periods governments in developing countries withdrew support of agricultural markets, MIS was usually introduced as a donor initiative to fill the gap which was left by economic liberalisation (Tollen, 2006). The intention was to replace the role of parastatals in transmitting market information to correct the asymmetries created by economic liberalization. Initially the function of MIS was to provide market information to government officials instead of smallholder farmers and traders.

Given the rise of information and communication technologies (ICTs), MIS has become more accessible by these marginalised communities (smallholder farmers and traders). ICT revolution encompasses new ways of capturing, processing, storing and displaying information and is capable of increasing productivity and competiveness of smallholder farmers (Mangesi, 2010).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 (Okello, 2010). Majority of these applications target smallholder farmers. The shift in focus to ICT-based MIS is driven by the role they can play in communicating knowledge and information to rural farmers, reducing transaction costs, improving smallholder farmers' access to markets and agricultural credit and empowering farmers to

negotiate better prices. Studies suggest that the use of ICT-based MIS facilitate the linkage of smallholder farmers to input and commodity markets (Aker, 2008; Chigona et al, 2009).

Historically smallholder farmers have often struggled to access relevant market information especially with respect to market location, supply arrangement and pricing hence they do not the fully benefits of their production efforts. The advent of market information system (MIS) has been instrumental assisting farmers in accessing data on agricultural market. Different models have been created to suit farmer's needs and also to respond to the changes in the agricultural markets. The MIS seeks to guide farmers in their production and marketing system and to improve public policies through increased awareness of market realities. The emergence of cell phone and internet access has eased the availability of information by farmers. Data transmitted includes prices of products, contact details of buyers and sellers, advice on production, transaction opportunities and policy regulations. It is expected that MIS will be able to provide more services to farmers including opportunities for credit access, storage infrastructure, currency exchanges etc.

There has been a revolution on ICT use in agriculture especially with the advent of new, small devices (such as multifunctional mobile phones and nanotechnology for food safety), infrastructure (such as mobile telecommunications networks and cloud computing facilities). An ICT is any device, tool, or application that permits the collection, processing, storage or exchange of data. ICT is an umbrella term that includes the use of any device from mobile phones to ATMs. There are several platforms on how MIS systems are being applied to solve a range of challenges faced by smallholder farmers in developing companies. The internet, web-sites and web-based applications are becoming increasingly important in sharing and disseminating agricultural information, knowledge and marketing of goods and services. Other emerging ICT applications for small-scale agriculture include radio frequency identification technology (RFID), market information systems, geographic information systems (GIS), and precision agriculture and public access facilities.

ICT plays a number of functions in the development of the agrarian sector, some of them including the following
- Access to Market Information–help farmers find out about market prices, this helps them make decisions regarding when to harvest how to negotiate with intermediaries and so on. Often combined with other information such as weather forecast
- Distribution and supply chain management and traceability-to increase efficiency and profitability, reduce spoilage and more. To record movements along the value chain, respond to qualify standard requirements and help large buyers track, manage, pay and reward smallholder farmers
- Farm extension services, access to sector experience, research and other resource information– using ICT to deliver better farm extension services (utilisation or best agriculture practices, research, weather, climate and more)
- Commodity exchange/warehouse receipt systems-to promote transparency in price discovery and to facilitate
- Better prices and efficiencies between buyers and sellers It avoids moving crops themselves reducing spoilage, transportation costs, Exercises temporal and spatial arbitrage

The application of ICT in agriculture is based around two issues market services and knowledge creation. ICTs represent a medium through which marketing exchange can take place, by providing marketing through the dissemination of market information such as prices, location of produce, and bidding for stock ICT allows for processing of knowledge as well as provide platform for information dissemination especially through the provision of extension services. There are several ICT products which have been developed in many areas to enhance smallholder farmers participation in the

main stream agricultural economy (the next sections contains discussion on application of ICT on agriculture)

## 4.1 ICTs and financial services for the farmer

ICTs in universal access to financial services should not merely be limited to the access, but take into account the process and the end usage. ICT can be used for land records, future price discovery, market intelligence, and agricultural database management, e-banking, mobile-based payment, etc. New delivery technologies like ATM, digital cash, mobile banking, etc., can make microfinance reach until the last mile.

## 4.2 ICTs and information gaps

Farmers have little information on the kinds of crops they should grow, how they should grow the crops, what planning they need to do with respect to their area and soil conditions, and what the market dynamics are, etc. Other gaps include the credit gap, productivity gap, marketing gap, price realisation gap, and infrastructure gap, etc. Barring the infrastructure gap, all the above-mentioned gaps can be dealt with to an extent by using ICTs. It has been found that in developing countries information that is obtained from, or applies specifically to the local environment is valued much more than information about more distant happenings

## 4.3 eEducation

There is significant web-based distance education and video conferencing available that is relevant to stakeholders in the agriculture sector and which can complement and supplement courses given in African universities and vocational colleges.

## 4.4 Virtual aggregation of small stakeholders

Virtual aggregation of small stakeholders (producers) across multiple geographies, to get the power of scale, is possible through the use of ICT. Real-time multicasting, customisation of information, and personalisation of content on the basis of knowledge of who is logging in and who is participating, can be done through ICTs.

## 4.5 Mobile technology and agriculture

The most prominent form of mobile technology, namely mobile phones, and its penetration in Africa was discussed in the previous chapter. It is important to note, however, that this is not the only form of mobile technology that is of interest to agriculture. Numerous other devices with more specific purposes exist, such as smart cards and RFID tags used to store data and as scanners used to read and capture particular forms of data (barcode scanners, RFID readers and smart card readers). GPS systems have a specific purpose relating to pinpointing geographical location. Other components are essential to complement the input and output devices and these include the Internet, communication networks and regulatory systems to provide data security, standard systems for codes.

## 4.6 E-Agriculture Services

ICT-based agricultural development services focus on enhancing the skills and knowledge of smallholder farmers and enabling smallholder value chains to improve their competitiveness and flourish. To identify the right services to offer, public-sector planners need to understand where ICT

can have an impact and which services are likely to attract private investors. They can build these insights by synthesizing three areas of analysis:

- Agricultural value chain analysis helps identify the value chain issues to be addressed and the size of the opportunity for improvement.
- ICT analysis looks at the feasibility of ICT to address those issues and the size of the opportunity that can be captured.
- Service value chain analysis determines the financial viability of the ICT services and identifies the ecosystem partners who are willing to invest and deliver those services.

## 4.7 Electronic Prepaid Vouchers for Input Purchases

Prepaid vouchers can help input supply companies to increase sales during the period that farmers/ customers have resources available. The electronic registration of farmers' prepaid vouchers and their profile also enables companies to compile a database of customers for targeted SMS-based marketing, information and product promotion. Participating retailers can benefit by stimulating sales during traditionally slower periods. Farmers benefit by purchasing seeds at a discount and by gaining assurance that they will have the seeds they need during the retailers, and product updates and pricing.

## 4.8 ICT to Facilitate Crop Insurance

ICT is being used to distribute a micro-insurance program designed specifically for grain farmers to allow them to insure their farm inputs against excess rain and drought conditions. Policy registration is completed by scanning a barcode using a specially developed mobile phone application which sends a message to a cloud-based server. Farmers pay for the insurance using a mobile finance platform (e.g. M-PESA) and they then access information about their policies by sending SMS messages to an automated system. Solar-powered weather stations collect the weather data at the end of each growing season, they are automatically compared to an index based on historical weather data. If the season's rainfall is 15% above or below the average, the insurance pay-out owed to client farmers is calculated and sent via automated mobile payment. There is no "claims" process, and they do not send agents to visit the farms of clients.

## 4.9 Mobile Banking to Facilitate Payments for Inputs

Mobile phone-based payment system that can be used to facilitate input payments, they usually use a broad network of retailers across the country to deposit and withdraw to their accounts. Customers can use the system to make cash withdrawals, purchase items such as agricultural inputs, pay bills, receive salary payments, or purchase mobile phone credit. In exchange for providing this convenience, the retailers receive a commission, which can become a significant source of income. Input supply companies, agro-dealers, distributors, and farmers. This ICT application allows transactions to take place electronically thereby making transactions more convenient and reducing the risks of handling cash ("branchless banking"). This application allows agricultural input supply companies enjoy similar benefits of not having to physically get payment from farmers in person or deal with the paper trail and potential issues inherent in using a cash payment system.

## 4.10 Discount Coupons to Reward Rural Agents and Promote Sales

Some farmers are more comfortable travelling to agro-dealers to purchase inputs rather than giving their trust and money to local rural agents that represent input supply companies. In this arrangements farmers register with input supply to have access to relevant information on inputs and production.

## 4.11 ICT Applications to Expand and Manage Rural Agent Networks

Because rural agents are widely dispersed and often located in hard to reach areas, management of these networks can be difficult and expensive. A variety of ICT applications are being used by input supply companies to address this issue and manage and expand their rural agent networks. Input supply companies by identifying, training, and providing incentives to individuals in rural areas that can represent their company, sell their products, and provide technical support to farmers in the use of those products, input supply companies are tapping into new markets.

## 4.12 Electronic payment of agents

Coordinating commission and salary payments for a large number of widely dispersed agents can be difficult. By incorporating electronic payment services (now offered by several local banks) input supply companies, able to quickly and reliably pay their agents through direct deposits to their bank accounts.

## 4.13 SMS-based product ordering

Traveling to and from distribution outlets to place orders can be expensive for agents, so input supply companies such as now allow agents to place orders by SMS. Such systems save significant time and money. They also create electronic records of the transactions that can provide information such as agent identification, location, products and quantity requested, and any special requests.

## 4.14 Mobile payments by farmers

There are inherent risks in a system where cash payments are handled by multiple people as in a rural agent network. These risks are being reduced through the introduction of mobile payment systems. By allowing farmers, agro-dealers and distributors to transact electronically risks are reduced, financial transparency is improved, and agents can focus more on product marketing and farmer training

## 4.15 Database and tracking systems

It can be difficult for a company to manage large numbers of agents and monitor sales. To address this challenge, companies like use database systems to record agent activity and customer sales information. With this information, they can quickly identify sales trends and recognize successful agents. Some companies are using off-the-shelf software applications while others are developing customized systems.

## 4.16 Platform for Service Delivery and Innovation

Mobile phones are multifunctional devices. From smartphones to models available secondhand in rural markets, mobiles do much more than simply place voice calls. In designing a mobile intervention or project, it is important to keep in mind the various channels through which populations can be reached. In much of the world, voice is still king, owing to widespread illiteracy, but other considerations such as cost, ease of use, and trust influence users' choices. In Africa, the high cost of calls has made 160-character text messages (SMS) very popular. As networks and devices acquire more capabilities, richer uses of phones are unfolding, and information channels are converging. Camera phones send images, data transfer brings the mobile Internet to the bottom of the pyramid,

downloaded software applications provide advanced functionality, and GPS sensors provide mapping functionality.

**4.17 Mobile banking**

Mobile phones have the potential to provide low-cost banking wherever there is network coverage, but the use of mobile banking services has been held back because mobile banking services and microfinance institutions often play quite different roles that prevent them from leveraging their full potential. There is a wide variety of mobile services; some do not involve banking licenses and are therefore nonbank implementations, while others may involve banking partners.

# 5. Policy Dynamics and ICT Revolution

The use of phones and mobile technologies is still restricted to for basic communication or entertainment. This is often a result of participants' low exposure to ideas or methods on how the ICT can be used to achieve economic goals using ICT platforms. There are several challenges related to the affordability of ICT technologies they include partnerships arrangements, regulation and legislative framework, policy design and implementation.

**5.1 Partnerships**

Given the multi-layered nature of the problem of ensuring affordable rural access to infrastructure, devices, and services, partnerships among organizations with different specialties, capacities, and profit motives appear to be a key way to improve access and affordability. Partnerships serving as critical mechanisms for improving rural ICT access can take the form of partnerships within the public sector, negotiated public-private partnerships, private agreements among stakeholders in the telecommunications sector, or informal understandings between service providers and stakeholders at the community level. Enabling such partnerships and maintaining them remains a key government role.

**5.2 Licensing**

Licensing of operators has been a major stumbling block with regards to the evolution of the ICT sector in developing countries. Licensing of operators is very bureaucratic and very expensive. Singapore model presents a simplified licensing system which ensures the development of innovative and cost-effective infrastructure. Under this model licenses are issued to facilities-based operators (FBOs) and services-based operators (SBOs) of telecommunications networks. FBOs include companies deploying submarine cables to improve international connectivity infrastructure, companies rolling out fiber-optic cables to improve domestic backhaul connectivity, and companies setting up broadband Internet Protocol (IP) or infrared networks. Wireless networks making demands on scarce spectrum resources are licensed separately and subject to comparative selection or auctioning. The operations of FBOs effectively remain within the carriage layer, but FBOs have the flexibility to deploy and/or operate any form of telecommunication networks, systems, and/or facilities on a technology-neutral basis.

**5.3 Regulation**

The rapid expansion of mobile phone networks and market uptake of Global System for Mobile Communication (GSM) technologies following liberalization and deregulation are the most frequently cited examples of this evolution. Informed and effective regulation is necessary for creating an

enabling environment that will maximize entrepreneurs' abilities to expand market offerings and minimize the negative effects of competition on consumers.  Barriers such as a monopoly operator, excessive licensing regimes in some contexts can negatively affect business potential. At the other end of the spectrum, a supportive fiscal and financial environment and entrepreneurs' access to financial services can enable and increase the number of socially oriented services. Significant regulatory issues in the telecommunications sector include taxes, licensing, liberalization, and competition policies. Taxes on communication services strongly influence the affordability of ICTs in Africa, for example, given the low average incomes. Import duties on IT equipment, value added tax (VAT) (ranging from 5 to 23 percent) on goods and services, and excise taxes on communications services all raise prices, discouraging use. Excessive licensing can also stifle the delivery of various content-based ICT services.

Regulations on content broadcasting should be synchronized with pure data transmission regulations (UNCTAD 2010). In terms of competition, policies fostering the effective management of competitive markets, interconnection regimes, and mobile termination rates can provide incentives to invest in quality of service, differentiation, and innovation. With the increasing adoption of ICTs and growing prominence of ICT-enabled services in consumers' lives in developing countries, it is worth emphasizing the significance of consumer protection regulation for ensuring the effective governance of multilayered ICT access. Recurrent problems include gaps between advertised "headline" broadband access speeds and what subscribers actually experience, lack of transparency in the pricing of mobile voice and data services, lack of effective mobile number portability, and excessive SMS pricing. Consumer-focused regulations should also target improvements in the legibility and ease of comprehension of transactions, made possible through improved ICT access. Consumer protection can pursue such goals through measures for mobile phone number registration, identity verification, confidentiality, and privacy.

## 5.4 Fixed mobile convergence

Means the increasingly seamless connectivity among wired and wireless networks, devices, and applications, which permits users to send and receive data regardless of device and location. Convergence is the result of converting content formats (text, images, audio, and video), devices for creating and communicating this content, and telecommunications infrastructure to digital standards. Device convergence allows devices to support different functionalities and different network access technologies. Service convergence means that end users are able to receive comparable services via different devices and technologies for accessing networks. Network convergence means that a single network is able to carry voice and data formats and can support access by different technologies. Convergence (as the name implies) blurs the distinctions between the domains of Internet service providers, cable television media companies, fixed-line telecommunication companies, and operators of mobile telephony networks.

## 5.5 Infrastructure

What are the current wired and wireless options to improve domestic backbone and "last mile" connectivity? Wired telecommunications infrastructure tends to reach rural areas in the wake of complementary rural access infrastructure such as roads and electricity and the expansion of public services such as education. The lag between the arrival of complementary infrastructure and public services and the establishment of wired ICT infrastructure in rural areas can be considerable, but the introduction of wireless, especially mobile, infrastructure is bound neither by the presence of roads nor by access to the electricity grid.

Rural infrastructure development needs to be considered in light of the different opportunities offered by wired and wireless technologies and the fixed-mobile convergence occurring throughout the ICT sector. Sunderland (2007) notes that fixed-mobile convergence differs in developed and developing countries, where fixed-line teledensity is low. As a result, convergence in developing countries largely amounts to convergence in the delivery of Internet access and voice telephony services over wireless networks. For example, in rural Africa where the teledensity of fixed networks is low and their rollout can be prohibitively expensive, fixed-mobile convergence enables the use of wireless "last mile" infrastructure, while the backhaul traffic is carried on fixed fiber-optic cables because of their high capacity.

Telecommunications networks comprise a hierarchy of links that connect users at the "edge" of a network to its "core," also called the "backbone" (the high-capacity links between switches on the network). The backhaul portion of a network consists of the intermediate links between sub-networks at the users' end and the core network. In considering how best to develop affordable telecommunications infrastructure in developing countries, all three connectivity segments of the network need to be taken into account:

- the international and domestic connectivity that makes up the network's backbone capacity,
- the domestic backhaul connectivity that enables the intermediate links, and
- the local loop or "last mile" connectivity that serves end-user access at the edges of the network.

The expansion of backhaul connectivity and the provision of "last mile" connectivity pose particular challenges to extending ICTs to rural areas in an affordable way. Wireless infrastructure may be an economical option, but it has certain cost constraints. Buys et al. (2009) show that the probability of the presence of mobile tower base stations is positively correlated with the potential demand (population density, per capita income). At the carriage level, network convergence is associated with the transformation from circuit-based public switched digital telecommunication networks (PSTNs) to packet-switched networks using the Internet Protocol (IP) and known as next generation networks (NGNs). A comparison between traditional fixed-line telephone services and voice over IP (VoIP) clearly demonstrates the difference between the two types of networks. NGNs completely separate the packet-switched transport (connectivity) layer and the service layer, enabling any available fixed-line carriage infrastructure to be used efficiently for any service.

## 5.6 Affordable fast devices

The gains in processing power allow functions with higher technology requirements to work on smaller devices (high-end smartphones and Netbook appliances). Conversely, bulkier stationary devices such as the desktop computer have evolved functionalities traditionally associated with more portable devices, such as VoIP telephony and on-demand radio and TV broadcasts. Among rural users in developing countries, the trend is to move from mobile phones with basic voice and text message capabilities to feature phones. Feature phones are low-end phones that access various media formats in addition to offering basic voice and SMS functionality, capturing the functionalities of multiple ICT devices that are also available as standalone appliances. Rural consumers prefer the combined devices because of their affordability. Features appreciated by consumers in developing countries include digital camera, voice recorder, flashlight, radio, and MP3 player. Bluetooth and general packet radio service (GPRS) are the most widely available connectivity options in addition to GSM. Chinese mobile phone manufacturers tend to be at the forefront of making devices that are particularly affordable and attuned to the needs of rural users in developing countries. The demand for features tends to vary depending on the availability of complementary rural services.

## 5.7 Public Support for Low-Cost Devices

Unlike public support for the provision of infrastructure, public support for the provision of low-cost devices has experienced considerable criticism. The most prominently instance one obstacle to expanding wireless technologies is the unlicensed use of wireless services. The main problem associated with unlicensed multipoint wireless services is interference arising from the operations of other wireless networks within an area. Interference often causes unlicensed wireless services to have much higher error rates and interruptions than equivalent wired or licensed wireless networks (for example, copper telephone, coaxial cable, and mobile networks). For these reasons, unlicensed multipoint services often grow slowly and lose customers; their operators may be required to rethink their business model. Interference problems have yielded several responses. An organizational response has been to establish voluntary spectrum coordination organizations, entirely independent of government, to coordinate the actions of unlicensed wireless network operators and minimize disruptions through the maintenance of an operator frequency and sources database. Cooperation with the voluntary coordination body is enforced through peer pressure by cooperative operators on uncooperative operators.

A technology-centered approach to the interference issue is the development of adaptive and meshes network technologies. Adaptive networking improves performance by developing dynamic interference and fault detection and reconfiguration protocols. Mesh networking optimizes quality over routing and the possible paths for the delivery of service to customers. Neither technology is yet capable of delivering high-speed, low-latency, business-class, and reliable local loop service.

# 6. Innovative Practice Summary

## 6.1 Impact of MIS on rural livelihoods

The proliferation of mobile phones across the globe has impinged on agriculture in various ways. Mobiles are being used to help raise farmers' incomes, making agricultural marketing more efficient, lowering information costs, reducing transport costs, and providing a platform to deliver services and innovate. Whether the potential of these trends can be realized more widely, especially in rural areas and in an equitable way, is uncertain. Every aspect of the technology is changing rapidly; the public sector, private sector, and private citizens are constantly experimenting with new applications for it; and governments are grappling with any number of strategies to ease the digital divide. This note summarizes what is known so far about the benefits, challenges and enabling factors associated with mobile phones in relation to several aspects of agricultural livelihoods.

## 6.2 Helping Farmers Raise Their Incomes

In some instances, access to mobile phones has been associated with increased agricultural income. A World Bank study conducted 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 behavior (Labonne and Chase 2009). 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. A study of farmers who purchased mobile phones in Morocco found that average income increased by nearly 21 percent (Ilahiane 2007).

Mobile phones seem to influence the commercialization of farm products. Subsistence farming is notoriously tenuous, but smallholder farmers, lacking a social safety net, are often highly risk averse and therefore not very market oriented. A study from Uganda found that market participation rose with mobile phone access (Muto and Yamano 2009). Although better market access can be a

powerful means of alleviating poverty, the study 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.

Mobile phones can serve as the backbone for early warning systems to mitigate agricultural risks and safeguard agricultural incomes. In Turkey, local weather forecasts transmitted through SMS provided very timely warnings of impending frosts or conditions that favored pests. Mobile platforms may also have potential for enabling rural people to find employment. In Uganda, Grameen AppLab partners with government and NGOs to employ farmers to collect information (for more on Grameen, see Module 3). This method, which relies on local people to transmit data to more centrally located research and extension staff, is much less costly and can provide much more timely information than traditional disease surveys.

## 6.3 Making Agricultural Marketing More Efficient

At a fundamental level, markets are about distributing information. They do so through prices, which serve as a unifying signal to participants to allow for the coordination of dispersed producers and consumers. Underlying this powerful mechanism, though, is the assumption that everyone knows the market prices for commodities, which is not the case in much of the developing world. Farmers have little information about market prices in urban areas of their own countries, let alone internationally. The result of this information asymmetry is price dispersion is that the same goods sell for widely different prices in markets merely a few kilometers apart. Mobile phones, in addition to other ICTs, can overcome this problem by informing both producers and consumers of the prices offered for agricultural products in various locations. A number of studies have shown that when mobiles are introduced to farming communities that previously lacked any form of connectivity, prices unify as farmers learn where they can sell for a better price (Jensen 2007). 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 found that farmers with mobile phones increasingly dealt directly with wholesalers or larger-scale intermediaries than smaller intermediaries (Ilahiane 2007).

## 6.4 Lowering the Costs of Information

The most obvious and cross-cutting way that mobile phones can improve agriculture is by improving access to information and making it less costly to obtain. In many rural areas, the arrival of mobile coverage is a radical change in the nature of the information ecosystem. Although simply having more information is not sufficient to make advantageous decisions (other resources may be needed to implement them), it is a necessary step toward access to knowledge. Transaction costs are present throughout agricultural value chains, from initial decisions about whether and what to plant, to all of the operations during the growing cycle, harvesting, postharvest and processing operations, and selling (to intermediaries, consumers, processors, exporters).

## 6.5 Reducing Transport Costs

Mobile phones may help users to substitute phone calls for travel. Where safety standards are minimal, roads are in disrepair, and distances are great, substituting phone calls for travel reduces farmers' time and cost burdens. 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). Transportation cannot be avoided entirely: Crops need to get to

customers. Although mobiles can inform farmers where they should travel to market their crops, evidence suggests that the wealthy maintain an advantage in their ability to make use of this information (Fafchamps and Hill 2004).

In combination with improved rural roads, ICT will encourage larger truck-traders to visit harder-to-reach areas, connecting rural and urban regions. As noted in Module 9, the onion wholesalers have known as "Market Queens" increasingly use mobile phones to coordinate supply among themselves and to improve profits by facilitating reductions in their transportation and opportunity costs (Overa 2006). These costs are particularly high in commodity chains that are geographically extensive and organizationally complex, such as the onion trade in Ghana.

## 7. Summary and Conclusion

Market information systems can play a significant role in addressing these challenges and play a key role in economic development and growth as it can bridge the critical knowledge gap between stakeholders. Given the rise of information and communication technologies (ICTs), MIS has become more accessible by these marginalised communities (smallholder farmers and traders). The application of ICT in agriculture is based around two issues market services and knowledge creation. ICTs represent a medium through which marketing exchange can take place, by providing marketing through the dissemination of market information such as prices, location of produce, and bidding for stock ICT allows for processing of knowledge as well as provide platform for information dissemination especially through the provision of extension services. ICT revolution encompasses new ways of capturing, processing, storing and displaying information and is capable of increasing productivity and competiveness of smallholder farmers. The advent of market information system (MIS) has been instrumental assisting farmers in accessing data on agricultural market. The emergence of cell phone and internet access has eased the availability of information by farmers. Data transmitted includes prices of products, contact details of buyers and sellers, advice on production, transaction opportunities and policy regulations. It is expected that MIS will be able to provide more services to farmers including opportunities for credit access, storage infrastructure, currency exchanges etc.

ICT platforms in agriculture can be described in four categories, Voice Information Delivery Services, Radio: Dial-up (Agricultural Information on Demand) and Regular Radio Broadcasts, Extension Services Based on Mobile Phone and Database Monitoring and e-Learning for Basic Skills, Agricultural Education and Video-Based Approaches  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. Southern Africa is lagging behind West and East Africa with respect to penetration of ICT technologies among smallholder farmers. Despite this the use of ICT based market information system is on the rise technologies. These systems are being applied to solve a range of challenges faced by smallholder farmers in the region especially improving smallholder farmers' access to markets and agricultural credit and empowering farmers to negotiate better prices.

## 8. Recommendations

The discussion in the paper illustrates the use of ICT based Market information systems in improving livelihoods of smallholder farmers through reducing transaction costs incurred in market exchange. The ICT need revolution will be have much more impact if the following recommendations are considered

**8.1 General recommendations**

The proliferation of ICT technologies requires democratisation of the information industry, restrictive laws with respect to dissemination and access remains a stumbling block with regards to the impact of ICT on rural development.

There is need to promote open access to information to allow for dissemination of knowledge to address information asymmetry bedevilling development in rural societies. There is a tendency by both corporates and states to limit amount information available for public consumption. This is done in the name of national security (for the state) and maintaining competitive (for the private sector).

The design of ICT innovations for agriculture requires mind-shift interventions, it is vital to bear in mind that "access" refers not only to the physical proximity and accessibility of ICT infrastructure, tools, and services but also to their affordability, use, and usage models that are appropriate for the local physical, environmental, and cultural constraints.

**8.2 Public sector recommendations**

There is need for designing relevant policies and legislation to drive ICT revolution in developing in countries. There is lack of knowledge among policymakers on the appropriate policies which can the use of ICT in mainstreaming smallholder farmers in the mainstream economy.

Decision makers in Africa need to invest in infrastructure to allow for universal access of ICT services by the majority of the rural population.

Governments should provide
- a sound, market-oriented regulatory framework;
- universal access regulations and mechanisms that motivate operators to serve regions where it is economically infeasible but socially desirable for them to do so;
- incentives such as a sound business and taxation environment to encourage investor and donor involvement in ICT infrastructure development in Africa;
- the preconditions for inter-African collaboration through, for example, the introduction of common

**8.3 Private sector recommendations**

The responsibility of developing the ICT sector should not the public sector prerogative alone, the private sector need to join hands with government in designing and implementation of appropriate policies for supporting the role of ICT in driving rural development.

The private sector should
- be aware of the socioeconomic dimension of activities related to the ICT sector;
- take advantage of the lessons learned from franchise systems that have been successful business models in many developing countries, including Senegal, Gambia, and Bangladesh; and
- aim toward the stepwise extension of phone shops to more sophisticated telecenters using knowledge transfer, capital availability, and, if need be, ICT infrastructure support schemes, such as universal access funds compensating for potential losses.

# 9. Annex

**Annex 1: ICT Innovation Case Studies**

Entries include projects using ICT solutions or implementing ICT-based activities, institutions/groups providing services using ICTs as well as ICT solutions software providers, both at the national and regional level. While many entries are projects with a definitive beginning and end date, others are national or regional information systems providing many agricultural services using ICTs

| Project Title | Donor/entrepreneur | Countries | Technologies | Partners | MIS Type | Info source |
|---|---|---|---|---|---|---|
| Banana Information Line | Kenyan Ministry of Agriculture | Kenya | TTS text to speech | National Agriculture and Livestock Extension Programme | Extension services | www.nafis.go.ke |
| National Farmer's Information Service (NAFIS | Government of Kenya | kenya | Cellphone, IVR | | Extension services and market information | http://www.nafis.go.ke/termcond |
| T2M (Time to Market) | Manobi | Senegal | Cell phone, PDA, Multi-Channel Service Platform | | Market information and prices | |
| African Farm Radio Research Initiative (AFRI) | Bill and Melinda Gates Foundation | Malawi; Mali; Tanzania; Uganda | | World University Service of Canada (WUSC); Farm Radio International | Extension service, training | |
| FADECO | | Tanzania | Radio, SMS, magazine, CD rom | CTA | Extension services(question and answer), | http://www.hedon.info/FADECOTanzania |
| Freedom Fone | Kubatana: The Zimbabwean NGO Network Alliance Project | Zimbabwe | Dial up Radio, VOIP, Content Management Systems (CMS) | Kubatana: The Zimbabwean NGO Network Alliance Project | Extension services, market information | |
| Rural Radio Resources Packs(RRRPs) | CTA | African and Pacific countries | Radio | CTA | Extension services | http://ruralradio.cta.int/ |
| The Organic Farmer | The Organic Farmer | Kenya | Radio, magazine, internet(RADNET) | BioVision; Led Leichtenstein | Extension service , market information | www.organicfarmermagazine.org |
| MISMalawi | Malawi Agricultural Commodity Exchange (MACE) Ltd | Malawi | Central Hub Marketing Information Centres (MICs): Marketing Information Points (MIPs): Market resource centres: Short Messaging Service (SMS Radio | Telekom Networks Malawi; Rockefeller Foundation; University of Malawi Bunda College IDEAA | Market information, prices, extension | www.ideaamis.com |
| AMSDP | Government of | Tanzania | SMS | Partner IFAD; | Market and | http://www.ifa |

| | | | | ADB; the Government of the Republic of Ireland Vodacom | price data | d.org/english/operations/pf/tza/i575tz/index.htm |
|---|---|---|---|---|---|---|
| ARENET | Government of Tanzania | Tanzania | Radio and internet(RADNET) | National Agricultural Research Organization (NARO); NationalAgricultural Advisory Services (NAADS); Agricultural Research Information Service (ARIS); B Zonal Agricultural Research and Development Institutes (ZARDIs); Information Centre in Apac; FoodNet Lira; IITA/FoodNet; Agency for the Promotion of Sustainable Initiatives (ASDI) in Apac; Volunteer Efforts for Development Concerns (VEDCO); DATICs in Rakai; Action AID International in Masindi; Uganda National Farmers Federation (UNFFE); e (NAFIRRI | Agricultural documents system Extension service 2. The Question and Answer service (Q&A): News and events | ttp://www.arenet.or.ug/question2.php |
| Esoko/ Tradenet | | Benin; Burkina Faso; Côte d'Ivoire; Ghana; Madagascar; Mali; Mozambique; Nigeria; Tanzania; Uganda; Cameroon; Afghanistan | SMS | | Live market feeds Direct SMS marketing: Scout polling: Online profiling and marketing: | http://www.esoko.com |
| Farmers Information Communication | Uganda National Farmers Federation | Uganda | Radio and internet (RANET) | Partners Information and Communication Technologies for | agronomic information, advisory information, | http://www.syngentafoundation.org/projects_programs_fic |

| | | | | | | |
|---|---|---|---|---|---|---|
| Management (FICOM) | (UNFFE) | | | African Rural Development (ICTARD); Meteorological Department of the Ministry of Lands Water and Environment; NARO; Uganda Microfinance Union; Foodnet Uganda; Busoga Rural Open Source Development Initiative (BROSDI); MTN Village phone project; Uganda Microfinance Union | microfinance information, market information and agro enterprise development | om_o verview.htm http://www.ict ard.org/ictard_ projects_pilot.h tm |
| InfoPrix | National Bureau for Food Security (ONSA) | Benin | SMS, radio | German Centre for Documentation and Information for Agriculture (ZADI); German Centre for Technical Cooperation (GTZ) | Market prices, location | http://www.on asa.org/ |
| KACE MIS project | Kenya Agricultural Commodities Exchange | Kenya | RECOTIS, IVR, SMS, RIC, MISP | CTA; Safaricom Ltd; Rockefeller Foundation; USAID; Hans Seidal | Market information ,Prices, extension | http://www.ka cekenya.com/. |
| LINKS | Global Livestock Collaborative Research Support Program (GLCRSP) | Kenya, Ethiopia, and Tanzania | SMS | USAID; Texas A & M University; (CNRIT). Kenya Livestock Marketing Council; Ministry of Livestock Development; SNV | Trends in livestock prices , sales volumes, animal type Transport costs, transport duration . • Prices of livestock products – milk (camel, cow, goat), meat (camel, cow, goat, sheep), hides, skins, honey. | www.lmiske.ne t, www.lmiset.net , www.lmistz.net |
| Maluleke Project | Vodacom | South Africa | Internet, cellphone | Alcatel; Manobi; Vodacom | Market prices | http://www1.al catellucent. com/sustainab |

| | | | | | | le/DigitalBridge/?_requestid=38780 |
|---|---|---|---|---|---|---|
| MISTOWA | | ECOWAS countries | internet, radio, print, email and SMS | USAID; Agriterra; IFCD | Early warning, market price and trade information | www.mistowa.org |
| SMS information center | Zambian National Farmers union | Zambia, DRC | SMS | Partners IFAD; Vodacom DRC; AfriConnect/Cel Tel | Market price, sales trends, stock availability | http://www.farmprices.co.zm/ |
| (SIMA | | Niger | Web based | Famine Early Warning System Network (FEWS NET) | Collect market information | http://ictupdate.cta.int/en/Feature-Articles/Dakoro-calling |
| Trade at HAnd | United Nation's International Trade Centre | Burkina Faso; Mali; Senegal; Mozambique; Liberia | Web-SMS | United Nation's International Trade Centre | Commodity prices | http://www.intracen.org/trade-at-hand/ |
| Xam Marsé | Manobi | Senegal | SMS | Partners Senegalese Agricultural Credit Fund; Sonatel; Swiss Agency for Development and Cooperation; Senegalese Ministry of Commerce; Alcatel; Sontel; IDRC | on prices and stock availability | http://www.manobi.sn/sites/za/index.php?M=9&SM=20&Cle=54 |

## 10. mFArmer Fund

The mFarmer Initiative Fund is designed to: Stimulate the development of mobile phone-enabled agriculture information and advisory services that are commercially sustainable; Build services that impact farmers' income and productivity; Reduce the barriers for operators to launch and improve mFarmer Services; Test and prove models for delivering agricultural information services via mobile phones; Promote a culture of knowledge sharing in the mFarmer ecosystem. The mFarmer Initiative Fund will support projects implemented in South Asia (India) and sub-Saharan Africa (Ethiopia, Ghana, Kenya, Malawi, Mali, Mozambique, Nigeria, Rwanda, Tanzania, Uganda and Zambia). Whilst these are the target countries for disbursements, the mFarmer initiative has the wider scope of sharing learnings with the mFarmer ecosystem. Disbursement decisions will be made on a competitive, deadline-driven basis by an independent assessment panel. Grant recipients will have access to relevant agricultural information via an on-line database. Technical assistance will be provided to support the design and implementation of projects.

The fund will encourage mobile communications service providers, in partnership with other public and private sector agriculture organisations, to use mobile communications to provide information and advisory services to smallholder farmers in developing countries. Projects eligible for funding must include the use of the mobile communications channel as a significant element of its delivery model.

To date, the focus has been on engagement with mobile operators and their partners to prove the market opportunity of agricultural extension services through mobiles to smallholder farmers and to understand which business models are most suitable. Projects eligible for funding must involve a mobile communications service provider in partnership or consortium with one or more organisations that are using, or planning to use, mobile communications to provide agricultural information and advice to poor smallholder farmers.

## 11. Agricultural Commodity Exchange Index - Esoko in Ghana

Ghana has launched an agricultural commodity index that tracks the prices of selected agricultural products across the country. The Esoko Ghana Commodity Index (EGCI) is a rural communication platform that publishes a cash market price index composed of data on physical commodities. The index, which is published weekly, tracks prices at wholesale and retail levels. Esoko seeks to improve incomes by building healthy markets. Any individual, business or producer group can set up Esoko to better manage their marketing, distribution and procurement networks. Currently Esoko is active in ten countries throughout Africa with different partnership agreements which include public sector agricultural projects, Esoko country franchises and licensed partners. Esoko provides a complementary partner support programme which is focused on capacity building and financial sustainability, with an emphasis on market data enumeration and business development services.

Esoko enables consumers to request services by texting through short messaging service (SMS) codes. There are four key services provided by the platform. Donovan (14) describes these as follows: Live market feeds: real-time SMS alerts on market prices and offers that are automatically delivered to subscribers. Users can submit offers into the system directly using SMS. Direct SMS marketing: businesses can target specific groups of users and target procurement or extension messages to reduce their travel and communication costs. Scout polling: enterprises can set up automatic SMS polling for field activities to track inventories, crop activities, etc. to monitor and report on crop cycles and yields. Online profiling and marketing: any user or business gets a customizable web space that can advertise their goods and services. This space can be updated using Esoko's mobile-to-web content management service‖.

In the absence of a proper warehouse receipt system and a regulatory framework that would support the operation of a commodity exchange in Ghana, the system has established a network of enumeration agents stationed in market centres. These agents feed Esoko with critical data like prices, offers and industry profiles. Markets were selected based on their regional location and strategic importance. The updates for farmers and traders are delivered by SMS. Recognizing the explosive growth of cellular services in Africa, Esoko makes use of both web and mobile devices to push and pull market information from the field. Esoko originated as TradeNet in 2005 as a private initiative and has partnered with USAID's MISTOWA programme in West Africa and CIAT's FoodNet programme in Uganda. Esoko was recognised by the United Nations as a World Summit Awards 2009 Winner for its work in creating unique content.

## 12. Agricultural Insurance in Africa

Crop insurance has long been used in developed countries to deal with weather uncertainties, but itsavailability in Africa, particularly to smallholder farmers, has been extremely limited. Agricultural insurance is particularly important in Africa today as the extreme weather patterns generated by climate change are introducing increasing volatility to food production and food prices. In the South African Insurance Industry Forecast to 2013' by RNCOS Industry Research Solutions, 70% of the current

African insurance market is said to be in South Africa. The figures demonstrate the potential of the insurance market on the continent. The industry however faces major challenges, according to the African Insurance Organisation, including underdeveloped insurance organisations, a weak insurance regulatory environment, need for expertise in the sector, and lack of ICT infrastructure. Despite the challenges, micro-insurance or insurance for low-income people is drawing attention. The MicroInsurance Centre estimates only 4% of Africans and less than 1% of poor Africans are covered by micro-insurance. Major insurance companies like AIG, Zurich, and Swiss Re have entered the market. AIG was the first major player to enter micro-insurance in Africa, partnering a local microfinance institution in Uganda in the 1990s. This increasing interest will naturally lead to opportunities for the ICT industry.

Challenges in providing agricultural insurance include the following: There is generally a very low level of awareness and education among those for whom this insurance is targeted; Being remote areas, documents required for certification like age-proofs, death certificates and the like are often not readily available and it takes time for these to be obtained; Common insurance products which work in urban areas are often not completely suitable for rural areas. Significant product customisation is required for pricing, payment options and simplicity; a change in mind set is required to be brought about from ─willingness to pay‖ for services obtained to ─willingness to charge‖ approach for eventualities that could happen. More often than not, with no direct access and poor banking infrastructure, premium routing is often found to be a bottleneck. Unless some minimum volumes are acquired remuneration of expenses for distribution and servicing is generally very high owing to factors of remoteness.

## 12.1 Role of ICT in insurance

ICTs could be used at least in the following ways:
- to facilitate access to information and services to stakeholders;
- to provide advance information about weather and market price situation;
- to provide better services and facilitate speedy claim servicing;
- to monitor and track premium repayment;
- to ensure better interface between the insurer and the insured, particularly field based transactions;
- to bring improvements and change through the use of complaints & feedback;
- to use developed databases and analysis of collected information to develop specialised and affordable rural insurance products.

## 12.2 DrumNet as a solution

DrumNet tries to overcome the lack of information flows by directly linking commercial banks, smallholder farmers, and retail providers of farm inputs through a cashless microcredit program. DrumNet encourages production of export oriented crops even as it ensures that farmers meet the quality standards. DrumNet members, organized into co-guaranteed solidarity groups, are able to access required farm inputs (seeds, fertilizers, pesticides, etc) at local participating stockists (input suppliers) through an established line of credit using their DrumNet transaction card.

# 13. The SMS-Based Information Service

The Zambia National Farmers Union (ZNFU) operates an SMS-based information service that provides details of commodity prices and is aimed at smallholders who have access to a mobile phone. Farmers who have produce for sale can find out the best price and the best buyer they are likely to get for their produce in their district and beyond. This saves them from transporters and agents who

would offer farmers lower prices. The service allows smallholder farmers to compare current prices in their district, province or nationwide and to make the best decision on where to sell their output, thus giving them commercial power that they did not have previously. It spurs competition among traders and processors, who keep a close eye on the website to see how their competitors 'prices are moving. So far, over 1,000 hits per week have been recorded on the system. It is estimated that more than 15% of SMS messages directly lead to farmers selling their outputs, and over 130 traders update their prices on the system weekly. Prices are updated each day, and more comprehensive information is also available via a website. To make information available to farmers without mobile phones and in areas lacking network coverage, ZNFU trains at least one farmer in every district to act as a contact farmer who would then publish the commodity price and trader information that they get either via SMS or from the website and give it to extension officers. Extension officers weekly display the prices and details of interested traders on posters in local information centres).

## 14. e-Transport System

The ZNFU has also launched an eTransport system, a web-based interactive information system which allows transport users to publicise availability of loads or cargo to a known destination and at preferred times of delivery to transporters. The system allows registered transporters to inform transport users the availability of trucks on various routes. The SMS-based information system could be applied to the sale/purchase of any commodity or service. The system has been tried with seeds and veterinary service. Consolidation could also happen when integration is effected between these different platforms trading in different commodities and services. With infrastructure being shared, transaction related prices could come down further. The programme could be taken beyond the boundaries of Zambia. The cross-border SMS-exchange will help further spur competition and better returns for Zambian farmers. Beyond commodity prices, through easy-to-use mobile applications farmers can be served with market trends for different crops that would help them diversify further into other commodities and services. More service providers could be brought into the fraternity to link research-seekers and research providers just as well as the other matchmaking services are being provided. The e-Transport system helps farmers arrange for transport of their produce after sale. This ties in with the current programme and makes for added adoption rates. Where access to technology is a problem, use of alternative media, such as printed notices, are also used and resolve the problem. Hence, although with a bit of delay, the same objectives are realised.

## 15. Livestock Tracking and Traceability in Namibia

Animal traceability refers to the ability to follow an animal or group of animals during all stages of their life – i.e. from birth to death (29). Under the Codex Alimentarius, traceability is the forward and backward tracking of animals and food by paper or electronic means. The International Organization for Standardization (ISO) defines traceability as the ability to trace the history, application or location of what is under consideration or a series of recorded identifications. In order to gain access to international trade, animal traceability and the traceability of products of animal origin should have the capability to be linked to achieve traceability throughout the animal production and food chain taking into account relevant OIE and Codex Alimentarius standards.  The most common systems used for identification in Africa are hot branding and ear notching where no formal traceability system is in existence. In a presentation on animal identification and traceability a comparison was made on the suitability of the available ways in which traceability could be established. From a practical point of view, radio frequency identification (RFID) technology and electronic ear tags, visual ear tags, bolus (ceramic coated transponder inserted into the rumen of an animal) and branding, or a combination of the items mentioned, seem to be the logical solutions for pastoral Africa. A data accumulator is used to capture data from the reader. It can be any device

(wire or wireless) such as a laptop or handheld computer which is capable of interfacing and accepting data from the electronic reader. Data are then transferred to software/web-based analysis and storage systems that can be linked and interfaced with herd or health management software.

### 15.1 Namibian Livestock Identification and Traceability System (NamLITS)

The NamLITS was established in early 2005 for use in supporting the implementation of the animal identification and traceability system in the FMD free zone. The system consists of a central computerised database with an extensive network linking workstations at most Directorate of Veterinary Services (DVS) offices to the database in Windhoek. A second phase of NamLITS for implementation in the Northern Communal Areas (NCAs) was initiated during June 2010 where the current NamLITS database and network infrastructure would be utilised. This second phase is set to be completed in October 2012. Enhancements of both the functionality and structure of the database and network infrastructure will however be required. The current database provides DVS with the capacity to control and monitor animal movements through the issuance of movement permits and notification of movements. This enables DVS to trace-back a diseased or suspected animal through animal registration and recording of animal movements between establishments.

The key functions of the current NamLITS database include the following:
- User access control and managing business units;
- Maintenance of the register of establishments;
- Maintenance of the register of livestock keepers;
- Monitoring use of official ear tags;
- Registration of tagged cattle;
- Maintenance of a central livestock register;
- Managing movement restrictions on establishments and keepers;
- Livestock import controls;
- Recording slaughter data including carcass traits;
- Monitoring animal movement history;
- Providing a number of key reports required by DVS and the industry;
- Providing access to the stock brands register;

## 16. Banana Information Line

This text-to-speech (TTS) telephone service provided farmers in Kenya with information related to how to plant, grow, and harvest bananas, in either English or Kiswahili. According to the organisers, because anyone with a land line or mobile phone can access the information line, communities that are more difficult to reach by traditional means can more easily access agricultural information. A TTS service bypasses the need for literacy, as well as the problem of reaching farmers living in very remote areas, and can easily be kept up-to-date by extension workers. Farmers could call the line any time of day, everyday. This project ran as a pilot for several months in 2006, but has now been superseded by the recently-launched National Farmers Information Service (NAFIS) information line

## 17. National Farmer's Information Service (NAFIS)

Kenya launched, in May 2008, a farmers' information service where the country's farming community will receive and exchange timely news and information on agriculture, weather patterns and other related issues through their mobile phones. The service will allow 4.5 million farmers access to agricultural extension information through the web and telephony. The system will be updated

through the web by field extension officers and the same information will be updated on the IVR (interactive voice response) to be accessible by any kind of phone.

## 18. Project Title T2M (Time to Market)

Manobi developed the T2M, a system that enables producers, exporters and the public regulatory agency to use a mobile telephone, a PDA (personal digital assistant) or the internet in order to know in real time both the price and arrival status of their products at the markets, and the availability of the same products in the production sites. The price and arrival changes of the products on the markets are collected by Manobi market researchers twice a day on a PDA application. The data, which is sent via the mobile network to the Manobi Multi Channel Service Platform (MCSP) and stocked at a centralized database, is analyzed in real time before it is broadcast to the users through a multi-channel platform specially developed by Manobi to provide value added data services at lower cost with the mobile telephony operators' first generation classical vocal networks.

## 19. African Farm Radio Research Initiative (AFRRI)

AFRRI is a 42 month action research project launched in April 2007. AFRRI gathers, implements, evaluates, and shares best practices for using radio-based communication strategies to enhance food security in rural Africa. It also offers radio broadcasters capacity-building and training services that aim to improve their programming for rural listeners.

## 20. Family Alliance for Development and Cooperation (FADECO)

A local NGO in Karagwe district of Tanzania, FADECO specializes in agricultural extension and participatory technology development with rural farmers. FADECO started with a rural library which provided information resources (books, CD-ROM libraries, magazines, newsletters, etc) and then started its own newsletter called WAZA) and established information notice-boards. Computer training started and in 2004, with support from RAIN (then an ASARECA Project), FADECO went online with VSAT and implemented a Question and Answer Service (with CTA). In 2007 the radio project was launched. The radio signal covers over 1 million listeners spread across the whole of Kagera region and neighbouring countries' districts of Kyotera, Masaka, Mbarara (in Uganda), Kibungo in Rwanda and Kobero (Burundi). FADECO mainly uses the radio for disseminating information and SMS text messaging to receive feedback and questions.

## 21. Freedom Fone

Freedom Fone (Dial-up Radio) addresses communities' requirements for a simple, affordable technology to communicate with one another. Audio files are stored by Freedom Fone in a Content Management System (CMS) which is updated through a simple to use browser interface. These audio clips populate an Interactive Voice Response (IVR) menu through which callers can navigate for information. Deployment in any language is possible as key global files for menu prompts can be uploaded through the browser interface to the CMS. Freedom Fone is network agnostic and can work with mobiles and landlines. Scalability can be factored in through Voice over Internet Protocol (VoIP) where VoIP is available. This technology can be used in a 'cost free to caller' context – where users can dial a toll-free number to access the service – or tickle a number that records the user's phone number and calls them back, connecting the user to the IVR menu content. In a 'low cost to caller' context users can SMS in for a call back.

## 22. Rural Radio Resource Packs (RRRPs)

CTA produces, every year, 5 Rural Radio Resource Packs on a variety of topics related to agriculture and rural development to be re-packaged and broadcast by local radio stations in African, Caribbean and Pacific countries (ACP). Through the Rural Radio Resource Packs a panel of experts from developing countries, submit material on diverse topics. The material is then compiled to produce CDs and brochures that are distributed among partner radio stations throughout Africa. Resource packs are offered only in English and French and therefore tend to be more readily available to public broadcasters than to smaller stations which broadcast in local languages.

## 23. The Organic Farmer

The Organic Farmer (TOF) is an independent and sustainable publication of relevant, reliable and ecologically sound information for farmers in Africa. As an information service for farmers in Africa, TOF has a monthly magazine, weekly radio program and a website. The magazine distributes 18 000 copies in Kenya and neighbouring countries and reaches around 150 000 readers who include the farming community as well as decision makers who are interested in learning more about sustainable agriculture and ecologically sound development. The electronic version of TOF can be accessed free of charge on the Internet and has been used so far by farmers and researchers in over 20 tropical countries. The radio program gives tips on organic farming and answers farmers' questions. TOF Radio is on air on the national broadcaster KBC Kiswahili service every Thursday from 8.15 to 8.45 pm.

## 24. Agricultural Marketing and Information System for Malawi (MISMalawi)

The Agricultural Marketing and Information System for Malawi (MIS-Malawi) is a 5 year project implemented through MACE within the overall framework of the Initiative for Development and Equity in African Agriculture (IDEAA). It uses various tools to integrate ICTs into the provision of relevant and timely market information and intelligence targeted at smallholder farmers and serves other market intermediaries in the commodity value chains that represent market outlets for the farmers.

There are several system components:

- Central Hub: based in Lilongwe.
- Information Centres (MICs): 3 centres located in Limbe, Lilongwe, and Mzuzu.
- Marketing Information Points (MIPs): 4 centres located in Lobi, Kasungu, Rumphi and Lizulu.
- Market resource centres: 6 centres located in Muloza, Mwanza, Liwonde, Mitundu, Jenda and Karonga.
- Short Messaging Service (SMS): using the cell phone number 08200777, the service allows users to access wholesale prices from 13 markets, sell or buy agricultural commodities and access retail prices from 45 markets, buy prices of agricultural commodities and access hybrid maize variety yields and fertilizer recommendations. There were approximately 30 000 users of the SMS services in 2007.
- Radio program: In January 2008, MACE commissioned the virtual trading floor through the radio. The program, called Misika ya pawailesi or Supermarket on the Air, is an interactive radio program that allows farmers in Malawi to trade various agricultural commodities in a timely and effective manner, by placing their offers to sell and bids to buy live on the radio. MACE staff interact directly with the farmers who call in to sell and buy commodities. From January to September 2008 the total volume traded through the radio program was MK (Malawi Kwacha) 32,733,845.10, equivalent to $US 233,813.00.

## 25. Agricultural Marketing Systems Development Programme (AMSDP)

Vodacom is working with the Ministry of Industry, Trade and Marketing to implement its AMSDP, a seven year programme. Information is provided by the ministry to Vodacom where farmers and traders can access the data, including the latest commodity prices through SMS sent from their mobile phones. This service enables farmers and traders to negotiate more effectively on the sale of agricultural produce.

## 26. Agricultural Research Extension Network (ARENET)

ARENET was developed through a Technical Cooperation Programme (TCP) between the Ugandan government and the FAO. The project that developed ARENET ended in 2007 and was entitled: Strengthening Information and Communication Linkages between Agricultural Research and Extension in Uganda. The project pilot site is in Zonal Agricultural Research and Development Institutes (ZARDIs) of Bulindi, Ngetta and Mbarara, Agricultural Research Information Service (ARIS), NAADS, Agricultural Production Departments and NGOs in the districts of Mbarara, Lira, and Hoima.

ARENET provides 3 basic services:

- Agricultural documents system: an internet tool for documenting, storing, sharing and disseminating simple technical agricultural information applicable to farmers and extension agents.
- The Question and Answer service (Q&A): an internet tool for solving technical problems related to agriculture and rural development. It was developed with the aim of helping farmers to get answers to different questions. Farmers, extension workers and service providers post the questions online under the appropriate category. The questions are answered by the best experts in each field and then posted for all to access. The questions and their appropriate answers are then stored in a data repository.
- News and events: a system to enable districts and research sites to post news or events announcements.

## 27. Esoko (formerly Tradenet)

Esoko is a rural communication platform that seeks to improve incomes by building healthy markets. Any individual, business or producer group can set up Esoko to better manage their marketing, distribution and procurement networks. There are four key services provided by the platform:

- Live market feeds: real-time SMS alerts on market prices and offers that are automatically delivered to subscribers. Users can submit offers into the system directly using SMS.
- Direct SMS marketing: businesses can target specific groups of users and target procurement or extension messages to reduce their travel and communication costs.
- Scout polling: enterprises can set up automatic SMS polling for field activities to track inventories, crop activities etc. to monitor and report on crop cycles and yields.
- Online profiling and marketing: any user or business gets a customizable web space that can advertise their goods and services. This space can be updated using Esoko's mobile2web content management service.

Esoko was begun as TradeNet in 2005 as a private initiative. It partnered with USAID's MISTOWA program in West Africa and CIAT's FoodNet program in Uganda. It works with both web and mobile devices and has a team of 20 in Ghana developing the technology. It is currently licensed by partners in 10 countries throughout Africa. Anyone can license the platform for use in their own country. Esoko provides a complementary partner support program which is focused on capacity building and financial sustainability, with an emphasis on market data enumeration and business development services.

## 28. Farmers Information Communication Management (FICOM)

FICOM was a pilot study to test sustainable ICT tools which can be used to effectively disseminate agronomic information, advisory information, microfinance information, market information and agro enterprise development, and related business development support service to rural farmers in the Jinja, Kayunga and Luwero districts of Uganda. Important tips on growing crops were relayed from the Uganda National Farmers Federation (UFFE) headquarters to district level offices, and then to 24 village phone centres, in which each farmer's group owned a mobile phone. The farmers also sent and received SMS messages with updates on market prices. The project redeveloped the UNFFE Website and established a wireless network and World Space radio using the radio and internet Systems (RANET) which enabled access to advisory information (UNFFE website) without internet connection.

## 29. InfoPrix Benin: Market prices via SMS

Surveyors of the food security office in Benin (ONASA) monitor 64 rural markets on the prices of the 25 most important staple foods. After business hours, prices are supplied to an Internet café where the data is processed and sent to ONASA headquarters. After a quality check, subscribers receive an SMS message with the prices of the main products from the six most important markets. Other information can be requested via SMS, and information is forwarded to radio stations to be communicated in local languages.

## 30. Kenya Agricultural Commodities Exchange (KACE) MIS Project

The KACE MIS pilot project was initiated by KACE, in collaboration with CTA. KACE collects, processes, updates and disseminates market information daily to farmers and other market intermediaries through the MIS. Market information includes prices of commodities in different markets, and commodity offers to sell and bids to buy, as well as short extension messages. Through the offers and bids function, farmers are able to advertise their stocks (offers) for sale or their demands (bids) for farm inputs such as fertilizers and improved seeds. KACE monitors the usage of the MIS, and receives feedback which it uses to continuously refine and improve the system.

There are several components to the project:
- Rural based Market Information Points (MIPs): information kiosks.
- Market Information Centres (MICs): centres which provide internet connectivity and liaison points.
- Mobile phone Short Messaging Service (SMS Sokoni): a partnership with Safaricom Ltd, a leading mobile phone service provider. A farmer anywhere in the country where the Safaricom mobile phone network exists can access market information like commodity prices in different markets, who is buying or selling what commodity, at what prices, where and when, as well as access extension messages using their Safaricom mobile phones. The user receives and pays for the SMS messages, about KSh 7 per message, to Safaricom.
- Interactive Voice Response (IVR) service: an IVR network that KACE uploads market information into regularly. Users access the information in voice mail by dialing the number 0900552055 with any mobile or digital phone through a simple menu.
- SOKO Hewani: a virtual trading floor created for small-scale producers to offer for sale various agricultural commodities and bids to buy available commodities using mobile phones by calling in to the radio station (in design).

- An Internet-based Regional Commodity Trade and Information System (RECOTIS): an electronic database of clients interested in buying, selling, importing, exporting or distributing agricultural commodities for dissemination of market information (not fully operational).
- A website: http://www.kacekenya.com/

## 31. Livestock Information Network and Knowledge System (LINKS)

LINKS is an ongoing and expanding regional linked livestock marketing information system that is geared towards addressing the needs for timely and reliable livestock marketing information for producers, traders and policy makers in the livestock subsector. The LINKS system supplements the Livestock Early Warning System (LEWS). The service covers 18 markets in Kenya, 32 in Ethiopia and 30 in Tanzania.

The information on prices and volumes may be downloaded from the web using the individual country URLs: Kenya (www.lmiske.net), Ethiopia (www.lmiset.net), and Tanzania (www.lmistz.net) or accessed through SMS. Pastoral areas in the 3 countries carry about 30% of the total population estimated at 160 million people which amounts to 48 million people. It is estimated that out of the 48 million, about 5% (2.4 million) have access to the information through the network of major project partners with an estimated 3% (720,000) using personal mobile phones.

## 32. The Makuleke Project

This pilot project allows around 100 farmers in Makuleke to test cell phone technology that gives small rural farmers access to national markets via the internet. Using a virtual trading facility installed on mobile phones provided by the project sponsors, farmers can sell their produce directly from their small farms. By checking prices in the Johannesburg markets, farmers can avoid paying commissions to intermediaries and are able to negotiate for a price fully aware of market and price conditions.

## 33. Network of Market Information Systems and Traders'

Beginning in 2004, MISTOWA was funded by the USAID until September 2007 and implemented by the IFCD. With the overall objective of increasing intra-regional trade of agricultural commodities within West Africa, the project focused on removing obstacles to trade such as a lack of access to timely information on prices and market opportunities, inadequate ability of producers and traders to respond to production and market opportunities and an unfavorable trading environment, including tariff and non-tariff barriers. MISTOWA worked with national affiliates of Market Information Systems (MIS), Traders' Organizations (TOs) and Producers' Organizations (POs) and regional public MIS networks such as RESIMAO/WAMIS-NET and private ones such as TradeNet (aka Esoko) which provide, to all stakeholders, up-to-date and accurate information on 400 rural and urban agricultural commodity markets via the internet, radio, print, email and SMS. Other partners were inter-governmental economic, monetary and policy organizations, ICT providers, media and private companies in the agro-processing sub-sector.

The project targeted all 15 ECOWAS member countries but activities were carried out most intensively in Ghana, Nigeria, Mali, Burkina Faso, Senegal, Benin, Togo, Cote d'Ivoire and Niger, with significant though lesser involvement of key partners in Guinea, The Gambia, and Sierra Leone. MISTOWA developed a very successful private-public partnership with "Busylab", a private software company in Ghana to create the electronic agribusiness information exchange platform, www.tradenet.biz. To assist users in accessing TradeNet and a variety of other market information and business services, MISTOWA assisted partners in establishing over 100 Agribusiness Information Points (ABIPs) in 13 countries throughout West Africa. ABIP managers are now highly trained in the use of

TradeNet and are able to facilitate producers and traders developing profitable market linkages. A new USAID funded project, Agribusiness and Trade Promotion (ATP), has since taken over most of the activities of MISTOWA. ATP will focus on maize, onion/shallot, and live cattle value chains.

## 34. Regional Agricultural Trade Information Network (RATIN)

RATIN is a five year project which is a collaborative effort comprising the USAID projects Famine Early Warning System Network Project (FEWS NET), focusing on bringing in crop production and trade information, and the Regional Agricultural Trade Enhancement Support Program (RATES) dealing with changing trade policy to enhance regional trade in maize. The project objective is to supply traders with improved early warning marketing and trade information in East Africa. To easily distribute RATIN information to hundreds of small and medium-sized cross border traders of cereals and pulses in East Africa, the traders have been organized into 30 loose associations, each of which receive RATIN's monthly bulletin and disseminate it to all members. RATIN also disseminates trade-related information through TV and radio, telephone, newspaper and through its website.

## 35. Réseau des Systèmes d'Information des Marchés en Afrique de

Countries Benin; Burkina Faso; Côte d'Ivoire; Guinea; Niger; Mali; Senegal; Togo; NigeriaRESIMAO/WAMIS-NET is a Network of Market Information Systems from its member countries that provides, to all stakeholders, up-to-date and accurate information on 400 rural and urban agricultural commodity markets via different media. The network monitors the development of the agricultural sector through the collection and publication of related statistics and analytical reports. It provides market information through the internet, radio, print, email and SMS.

## 36. SMS Information Service

The IFAD-supported Smallholder Enterprise and Marketing Programme (SHEMP) in Zambia created a cross-border SMS market information service that provides farmers and traders in Zambia and the Katanga province of the Congo with daily information on stock availability, market prices and sales trends that is also supported by its website. To obtain the best prices for a commodity, farmers send an SMS message containing the first four letters of the commodity name to 4455. Traders access the information in French via Vodacom DRC in the Congo and in English via AfriConnect/Celtel in Zambia.

## 37. Trade at Hand

In the agricultural sector, the service provides daily commodity price information for fruit and vegetable exporters. "Market Prices", consists in sending, via SMS, product prices on international markets, in real time. Users of market prices are registered by the local Trade at Hand Focal Point. Upon subscription, the exporter chooses the products for which he/she wants to receive price quotations. Real time prices for wholesale markets will be sent to the exporter through the Short Message Service (SMS) in his/her mobile phone. "Market Alerts" is a Web-to-SMS tool that enables Business Support Organisations to transmit business opportunities, contacts and market news to business people. Trade at Hand was designed to be self-sustainable in countries where the service is launched. The services costs are negotiated on a case-by-case basis, for each country, in order to set-up an affordable information service. The management of Trade at Hand is given to local organizations (called T@H Focal Points). Over 90% of fruits and vegetables exporters (to Europe) from Senegal, Mali and Burkina Faso have subscribed to Trade at Hand Market Prices. The ITC is currently

implementing a project which collects, by SMS, agricultural food prices on national markets in Senegal, Mali and Burkina Faso.

## 38.Xam Marsé

Xam Marsé provides market information about various products to Senegalese farmers, traders, hoteliers and others via internet and free daily SMS. Xam Marsé provides SMS with real-time information on the prices and availability of fruit, vegetables, meat and poultry, on any of Senegal's markets. Throughout Africa, ICTs have become increasingly integrated into information disseminated to farmers. For decades "traditional" forms of ICTs have become more prevalent in advisory service provision. Radio and TV programmes feature agricultural information. Rural telecentres provide information on education, agricultural and health issues and equip rural citizens with skills on how to use computers and provide basic literacy. National ministries of agriculture have attempted to integrate ICTs into the delivery of information and have established district information centres focusing on agriculture. Many NGOs and research organizations have also attempted to facilitate technology transfer in the agricultural sector.