USAID
FROM THE AMERICAN PEOPLE

BRIEFING PAPER

AN ASSESSMENT OF MARKET INFORMATION SYSTEMS IN EAST AFRICA

INTRODUCTION

This briefing paper presents the results of an assessment carried out to explore the current use of sustainable (without on-going donor support) and scalable (potentially to millions of farmers) agricultural market price information systems (MIS) in Africa, with a particular focus on East Africa. Its goal is to add value to the discussion in the region regarding alternative approaches to improving affordable access to market prices to value chain actors, including poor smallholder farmers—the target beneficiaries of USAID Feed the Future projects. The research, which was conducted between May and October 2012, included interviews with managers from MIS providers in Africa, along with practitioners and academics.

The full list of MIS covered by this assessment is as follows:

- Agricultural Marketing Information Services (Cameroon)
- Agricultural Input Market Information and Transparency System – AMITSA (East Africa)
- Esoko (many countries in Africa)
- Infotrade Market Information Services (Uganda)
- Lima Links (Zambia)
- Livestock Market Information System – LMIS (Ethiopia)
- MFarm (Kenya)
- Nokia Life Tools (Nigeria)
- Regional Agriculture Trade Intelligence Network – RATIN (East Africa)
- Zambia National Farmers Union – ZNFU (Zambia) [partial information collected]

Due to the increasingly regional nature of agricultural markets in East Africa and USAID's focus on facilitating cross-border trade, gaining access to crop prices across the region is of great interest to development practitioners. By now, most countries in East Africa have access to a variety of existing MIS platforms which follow diverse models—some are governmental projects, some are private efforts, and a few are public/private partnerships. Some of these systems are growing well; while others are stalled pilots; and a few are in the process of being assessed. Most focus on a particular country or set of commodities, while a few provide information on regional markets.

The focus for this analysis is on market price information services to enhance trade and competitiveness of smallholder farmers, not to track trends in prices. Clearly, the latter can be a side benefit of the former but the test of value is whether the prices are useful for commercial decisions.

Market price services are not provided in a vacuum. Farmers also want information related to agricultural processes, pests, weather, sources of inputs and more. Market research shows that it may be most cost effective (and hence more likely to be sustainable), if a platform combines market price services with other information services. While this assessment focused particularly on market prices, it also sought to understand the relative effectiveness of models that provide a larger basket of information services.

The dramatic increase in affordable access to mobile phone networks has opened potential new opportunities for MIS—for both data collection and dissemination—though other more traditional channels (radio, paper, chalkboards) are also still valuable as complements to the "mobile channel."

In order to ensure long-term sustainability at a sufficient scale, it is critical that any supported system—or set of integrated systems—be based on a business model that enables the services to be sustained and extended to millions of farmers. Scalability at this level has been elusive to date. Given that many Ministries of Agriculture consider market price information to be an important public good, governments may also play a key role in any successful business model, either via public-private solutions, content producers, key customers or funders.

BACKGROUND ON MIS

Agricultural market information systems are a set of integrated and coordinated processes and tools to collect and deliver agricultural and/or livestock market information and services to farmers, traders, food processors, government functionaries and others that may benefit from current market data. Agricultural MIS were developed to increase the transparency of markets by providing current price information to smallholder farmers who were historically unable to obtain market prices because of their isolated rural locations and lack of contact with actors in other components of their product value chains. MIS provide these farmers with access to relevant price information organized by country, crop, and marketplace to 'level the playing field' between farmers and market intermediaries who traditionally had been able to take advantage of farmers'

lack of knowledge about the market value of their produce.

MIS generally serve as components of wider government, NGO or donor agency efforts that are designed to increase market transparency, introduce standards, open markets, and otherwise intervene in strategically important value chains to combat poverty by shifting the share of income toward smallholder farmers and/or small traders or food processors. Access to current prices and price trend information supports commercial decision-making, allowing farmers to choose preferred markets to sell their goods, negotiate more effectively with intermediaries, and, in some cases, choose which crops to plant or how long to store their crops until prices increase. Small agribusiness traders also use MIS to decide how to price goods and where to sell them. In addition, MIS are used by donors, universities, businesses, and all levels of government to track agricultural prices and spot demand or supply trends so they can react to or prevent food security problems and support trade. In addition to prices, market information systems are often integrated with other mobile agriculture information tools and carry additional information, including agricultural extension advice, weather forecasts and prices for agriculture-related inputs, such as seeds, fertilizer or pesticides.

Market information systems developed during two primary phases. The first generation of MIS appeared in the United States during the 1920s to support price transparency and fight market concentration in agro-industry.[1] These systems were replicated in Europe during the 1930s but were not extended to Africa and other developing regions until the wave of market liberalization in the 1980s when most governments in the region stopped fixing prices via Cereal Marketing Boards. These MIS benefitted from the work done to establish famine warning systems, which also gathered market prices and information on staples in Africa. One USAID-funded project, the Famine Early Warning System (FEWS), dates back to 1984 and is still expanding across the globe.

Examples of first generation MIS include the Agricultural Market Observatory in Mali (OMA), the Agricultural Marketing Information Centre in Zambia (AMIC), and the Agricultural Market Information System of Mozambique (SIMA).

The rise in accessibility of new information and communication technologies in Africa—such as internet-based applications and mobile phones—led to the emergence of second generation market information systems in the 2000s. In second generation MIS, market prices were integrated with other mobile agriculture information tools to provide additional information, including agricultural extension advice, input price information, weather forecasts, and trading platforms to match producers with buyers. These systems tended to be created and led by the private sector, or farmers' or traders' associations rather than governments and they at least attempt to achieve financial sustainability by charging user fees, permitting advertising and/or providing fee-based additional services. Examples of second generation MIS include Esoko (formerly known as TradeNet, which is based in Ghana and now active in 16 countries), Infotrade (Uganda) and the Regional Agriculture Trade Intelligence Network or RATIN (based in Kenya but operating throughout East Africa).

MIS PLATFORMS

Early agricultural MIS systems were often required to create their own platforms for distributing price information. Today many such platforms exist, some of which are specifically designed for MIS and others which serve as general purpose SMS platforms. Choosing a platform has implications for the ease of delivering MIS data as well as the extent of additional services that may be delivered with the data, and may determine the possible business models available to MIS projects.

Initial platform design was basic among the systems reviewed, but most systems have evolved their platforms as they have developed. Several systems use free and open-source software, while others program their own systems or license third party platforms. For instance, the AMITSA network for agriculture input market information currently uses a software platform from Image-AD called mFarms (not to be confused with MFarm in Kenya) for price collection and dissemination as well as profile management for agro-dealers across the region. Specifically, they are using mFarms' Market Information Platform for Agrodealers (MIPAD) module.

Some MIS are the result of a complex integration of various systems. In addition to its use of the mFarms platform, AMITSA, for example, uses the KENTICO content management system to manage its website to incorporate information from mFarms, publications, catalogues, directories, news, events, blogs and other sources. AMITSA also uses Microsoft Reporting Services to manage agro-input statistics on the same website and takes advantage of Facebook and Twitter as additional channels to reach its audience. In addition to price dissemination by SMS, most MIS also distribute information via radio, internet, newspaper and television. Again, this widespread diffusion increases accessibility for all market stakeholders.

Enumeration. The systems examined all strive to remain relevant to users by regularly updating price data. Additional production- or sales-related information is also updated in a timely manner, with data provided by market-based enumerators. Most of the systems which were reviewed collect data using enumerators who observe prices in public marketplaces and report those prices via mobile phone. Most enumerators are third party observers, although Infotrade uses market workers as enumerators and Esoko uses traders or wholesalers in some countries. Enumeration has always been an expensive component in MIS because it is human resource intensive, adding cost and requiring significant management

[1] Bowbrick, P. (1988). Errors to Avoid with Price Reporting Systems

overhead. Informally, some systems have reported a concern that paid enumerators could send fabricated market price information without actually going to the markets to observe prices. Systems such as Esoko in Malawi have combated this risk by adding GPS stamps to mobile phone-based price reporting tools so that enumerators must be physically present at the indicated market in order to report prices for it.

Lima Links and MFarm, the two most recently established MIS surveyed, have innovated by pulling price data from actual transactions handled by the systems, rather than relying on third parties to observe and report the prices. Lima Links avoided enumeration along with the substantial costs it adds to the system and the data reliability problems it causes by developing a point of sale (POS) system optimized for agriculture and giving it to small scale traders in Zambia. The POS provides these traders with a useful tool for conducting trades and storing information regarding their transactions. The prices recorded during each transaction are then announced to other stakeholders through the MIS. Lima Links' price data is therefore based on actual prices paid for agricultural products with no distortion or reporting delays. The MIS, however, is still new and has few users, so the price information it carries is not yet based on enough data points to ensure that it is accurate. If Lima Links scales successfully, the POS strategy will be a powerful and efficient method of tracking accurate prices.[2]

Data Collection, Cleaning and Aggregation. All of the MIS systems surveyed have data validation systems. The first validation step is verification by the enumerator's supervisor, followed by checks at the data analysis stage. Raw data submitted from the field are reviewed using statistical software by analysts at system headquarters in order to identify mistakes or aberrations. Further checks are also undertaken at this stage to validate data values. Some systems have pre-programmed macros and other code so minimal analysis is necessary, freeing staff time for other duties. As a final check, users are also encouraged to report data that seems incorrect.

While farmers and retailers may simply receive the mean product price for a particular time period, government and university users like to receive the prices in both formatted and 'raw' form to enable further analyses. The data are generally stored on a server at the host agency in SQL, MySQL, Java or Access/Filemaker Pro formats or—in the case of newer systems—in the cloud, where they can be accessed for analysis.

KEY FINDINGS

The assessment uncovered several key findings about the characteristics of and challenges faced by MIS, which are highlighted below.

Variations in Sources and Amount of Start-up Funds. The majority of systems reviewed were developed in consultation with MIS experts associated with USAID or other donors, universities, UN agencies, and international NGOs. All of the MIS reviewed, except for Nokia, received some type of external funding—most start-up financing for the MIS surveyed came from international donors and private foundations. Though several groups declined to share start-up cost information, it is clear that start-up costs varied significantly: reported start-up investments ranged from MFarm's US$12,500 to well over $500,000.

Business Models and Sustainability. As is the case with many information and communication technology for development (ICT4D) projects and tools, agricultural market information systems struggle to remain financially sustainable and have adapted a variety of models to support their ongoing operations. The most common but least sustainable of these models is donor support. None of the systems studied claim self-sustainability, as defined by raising sufficient revenue to cover annual operating costs. The majority of MIS continue to receive grant or donor funding today, in many cases several years after start-up.

All of the MIS studied are in search of ways to grow their income. Two-thirds of the systems (all but Lima Links, LMIS and AMITSA) are attempting to raise operating income by incorporating user fees; two of the remaining MIS are considering user fees in the near future. One system manager expressed concern that user fees deter the "neediest" of the market stakeholders from accessing the market data. He noted that the US$1.00 monthly fee to receive price messages is a deterrent to the smallholder farmers his project serves.

Infotrade charges substantially higher rates: 25,000 Uganda shillings (about US$10) per commodity per month or 125,000 shillings (US$50) for all 46 commodities; however, one can pay a fixed price of 62,500 Uganda shillings (US$25) for information on a total of up to 10 commodities. Additional costs are determined by the number of commodities accessed and years of price data requested.

In addition to user fees, some of the systems permit advertising on their websites to raise additional revenue. One of the main operating costs for the systems is the fee for sending text messages to users' mobile phones. Most systems attempt to lower these fees by negotiating preferred rates with mobile network operators and then pass the remaining fee to the user, but the strategy often means losing the poorest small producers who are unable or unwilling to pay the fee.

Though individual smallholder farmers may have difficulty paying for MIS services, associations of these farmers may be able to do so by aggregating demand for MIS data and providing other efficiencies. The ZNFU model is interesting because it is operated by a farmer cooperative whose members include both small and large scale

[2] As of April 2013, a soft launch of Lima Links with 6,000 farmers was still pending. At this point, therefore, it is important to take anything reported about them in this paper with that fact in mind.

farmers, companies and agribusinesses, which effectively subsidizes smallholders. ZNFU is affiliated with international agricultural associations such as the International Federation of Agricultural Producers and the Southern African Confederation of Agricultural Unions, which could further aggregate demand across the region.

System Users. System users include producers, retailers and wholesalers along with government policy makers, donors, NGOs, universities and other research organizations. Examples of private businesses include insurance companies responsible for assessing risks and shopkeepers who use market data to price their goods. The number of reported users also varied significantly, from tens of millions globally in the case of Nokia Life Tools, to only a couple of hundred in newer, localized systems, such as Lima Links and MFarm.

Services Provided. With the advent of newer technologies (such as email and SMS), the private sector has innovated to provide a range of demand-driven products along with prices. A few systems even have links to a 'library' of agriculture-related information. All told, 70% of the systems surveyed provide services in addition to price data, including weather information, pest alerts, communication with other users, and match-making between producers with traders. (Only AMITSA and Nokia of the 10 systems do not provide some sort of trade support).
To impact farmer competitiveness and income, MIS data must not only be relevant to the crops cultivated by farmers and the markets available to them, but they must also be actionable. Information about crops that farmers do not grow in commercial quantities, or about high prices in markets that farmers are unable to reach with their produce, cause frustration at best.

Providing information in addition to prices improves the relevance and 'actionability' of MIS systems. Five of the MIS providers report input prices in addition to retail and wholesale data.

The Public Good Nature of MIS and Sustainability

Prior to private sector entry into market information, price data were generally provided by national governments because of the 'public good' nature of such information. Key informants pointed out that strong price data are critical to a well-functioning agricultural sector, but that the economic benefits of supplying the data are difficult to quantify, so governments often have difficulty allocating resources for MIS activities. Health activities, such as vaccinating babies, for example, are much more tangible and provide more immediately measurable results.

The dilemma is exacerbated because governments that invest in capturing price information as a public good are sometimes uncomfortable with the profit motives of private firms that wish to distribute the information. There is an on-going dance between both groups, with the public sector requiring access to additional market information for policymaking and planning, and the private sector seeking remuneration for the information. The absence of a sustainable model for governments to obtain the price information reinforces dependence on donors and grants. Public-private partnerships, where governments support price collection needed for policymaking, and the private sector, which manages collection and distribution, would result in a more stable model.

Systems delivering weather information generally include forecasts, precipitation monitoring, and extreme weather alerts. Other systems provide prices related to transport, and inform farmers about transport availability in specific locations by date. One system, Infotrade, even provides fuel prices to help users estimate transportation costs. Nokia Life Tools in Nigeria provides weather information by season and region, further adding value to its service. Providing additional information can make MIS platforms popular among other stakeholders in the market, not simply producers, retailers and wholesalers, which may generate revenue and increase the sustainability of those systems.

Esoko allows for the collection of detailed information on users to permit data mining for marketing or meta-analysis purposes, which increases the value of the system for potential users.

RATIN provides location information on grain storage facilities across the region it covers. Using website menus, the user can view an East Africa map with points representing locations of the facilities. Market prices for each RATIN country can also be downloaded from the site, permitting users access to price trends, highlighting any shocks or abrupt fluctuations. The website includes data on regional trade flows dating back to 2004.

AMITSA is different than the other MIS profiled here in that it provides information on farm inputs such as fertilizer, pesticides and seeds for the Eastern and Southern Africa region rather than on agricultural products or livestock. Price data are collected directly from a network of volunteering private agro-dealers. Other information is gathered from public and private sources available for free. AMITSA does not target smallholder farmers directly; its goal is to inform stakeholders within the agro-input supply chain, making the chain more efficient, transparent and reactive to the needs of farmers. To provide this service, AMITSA has licensed the Esoko platform to collect and distribute price info on mobile phones and websites in the countries it serves. Given the size of many smallholder plots (< .5 hectares) along with soil nutrient depletion, information on inputs is critical for smallholders.

In addition to agricultural staples, some MIS provide horticulture, vegetable and fruit prices. MFarm, for instance, presents transaction requests for fruits and vegetables. Some systems also allow communication among system users to

encourage establishment of user groups. These systems allow, for example, all participating maize farmers to communicate with each other about emerging situations, such as crop plagues or market opportunities.

RECOMMENDATIONS

Market information systems are still trying to find a sustainable model for communicating price and other valuable market information to farmers. The organization of MIS and the technical platforms they use have innovated to take advantage of mobile technologies and, in some cases, social media, but their business models have not matured at the same pace, leaving most in a precarious state because they depend on donor funds to operate. Donor and development practitioners should clearly move away from providing general funds that support MIS systems.

Any new funding provided to MIS actors should be focused on helping MIS systems to make concrete progress at developing revenue streams. This does not mean that all MIS should earn enough revenue to be self-sufficient. As some types and uses of market information are clearly public goods, it makes sense that governments and other supporters—including donors—have an interest in supporting the availability of market information, but MIS need to be organized in stable models so their existence from year to year is not in question.

Be Wary of Investing in New MIS Software Platforms

While new models for MIS sustainability are desperately needed, new platforms are not. Early agricultural MIS systems often did not have a choice but to create their own platforms to distribute price information, but today many such platforms exist. The diverse array of platforms, however, makes data harmonization and standards setting significantly more difficult and expensive. More MIS sharing fewer platforms would naturally lead to more harmonized data and shared systems and would also likely lead to more cooperation between staff of different MIS as it would make shared training and other collaboration more valuable. Although stakeholders cannot control which platforms MIS use, they can encourage the use of existing platforms (with the appropriate licensing, reimbursement or other arrangements, as necessary) and refrain from supporting the creation of new ones.

Encourage End User Payments

Though many MIS are now charging for access to market data by smallholder farmers, few agricultural MIS have been successful at raising substantial portions of their operating budgets through user fees. It may be that many smallholder farmers are simply unable to afford the cost of messages or any agricultural expense beyond the most basic inputs, but their unwillingness to pay for this data calls into question the value of the service. Development practitioners could consider strategies directly aimed at incentivizing user supported models, such as micropayments or group subscriptions offered as a member benefit by farmers' or traders' associations. One option would be to offer a prize (at a much lower financial level) patterned after the Haiti Mobile Money Initiative, which awarded US $3.2 million to Digicel and Voilà, the first two mobile networks to reach the project's target milestone of five million mobile finance transactions. Such an incentive could reward the first organization to successfully reach a threshold of farmer or other direct user payments by number of users, messages or transactions.

Promote Advertising

In addition to income that end users may contribute, advertising has the potential to support the cost of enumerating and distributing price data. A few systems accept ads on their web sites, though it is doubtful that they are earning much revenue from the ads. Fees for listing and preferred placement in active trading systems are much more promising. In Malawi, Esoko expects small agro-traders to market their services to participating farmers using Esoko's platform and stored user profiles. Mobile advertising is admittedly difficult; even Google and Facebook are having trouble developing an effective mobile advertising model. Advertising via text messaging on simple mobile phones is challenging, but possible. In Kenya, SangoNet is testing a system that will reserve a certain number of characters for advertiser messages. Obviously, marketing text within a 140-character SMS must be exceedingly brief, but in the case of very simple price data messages, it is possible.

Continued Innovation in the Provision of Related Services

Smallholder farmers and other MIS stakeholders, such as policy makers, export growers' associations, farmers' associations, agro-processors, traders and transporters, benefit from a variety of information services in addition to price data. MIS platforms should continue to diversify the types of additional information they provide to their users in order to increase the overall value of their services for MIS stakeholders. MIS can also provide communication services to additional customers, such as government programs and NGOs that are not traditional MIS stakeholders.

Support Nascent MIS Trading Modules and/or Integration with Commodity Exchanges

All but two of the MIS studied for this paper provide some type of service to match farmers with traders or other buyers, but these trading platforms are generally immature and poorly trafficked. If MIS providers are able to improve these services so they increase the number of transactions they broker, or MIS are able to facilitate commercial transactions in some other way, then they may be able to benefit financially from those transactions. Without a portion of trading revenue from transactions, it is difficult to imagine that MIS systems can sustainably offset the cost of their services—especially their price enumeration activities, which require a substantial presence in markets, which are often geographically disperse.

One way to ensure that MIS providers share transaction revenue is to integrate or merge them with commodity

exchanges, as is happening with Esoko and the Agricultural Commodity Exchange (ACE) in Malawi. In that case, Esoko serves as a paid platform which ACE uses to manage and distribute price information. Once ACE reaches a threshold of trading throughput a more stable model would be a partnership or joint venture where Esoko shares in a percentage of transaction revenue or, in the case of an MIS platform not as diversified as Esoko, where the two entities merge.

Improve Monitoring and Evaluation
Monitoring and evaluation continue to be a challenge for MIS. Monitoring does occur but is often insufficient to gauge impact. Defining impact is challenging for MIS because the systems operate across many levels, resulting in numerous potential impacts: on national, institutional, stakeholder (producers, retailers, wholesalers, consumers) and household levels.

The Agricultural Learning and Impacts Network (ALINe) has developed an excellent, detailed monitoring and evaluation (M&E) framework for the mFarmer Initiative, a partnership between USAID and the Bill and Melinda Gates Foundation implemented by GSMA. The Global Monitoring, Evaluation and Learning Framework is based on an articulated theory of change which envisions, "improved poor farming households' resilience and decision-making as a result of improved access to relevant agricultural information through sustainable business models and continuous learning." The Framework was specifically designed to get around the factors that make evaluating mobile agriculture projects, such as MIS, difficult by helping mFarmer Initiative grantees in distinct countries and environments identify and track common indicators based on the theory of change. The indicators are designed to include outcomes and impacts for 'business' metrics, such as demand for services and sustainability of project business models, and 'social' metrics, such as users' understanding of information provided by mobile agriculture systems, actions users take based on that information, and effects on farmers' livelihoods.

A number of monitoring and evaluation tools also exist for health programs to improve the way that multi-level projects are evaluated and which may be adaptable for MIS. One such evaluation tool is the Monitoring and Evaluation System Strengthening Tool (MESST), which has been used to evaluate malaria and HIV programs in Mali.

CONCLUSION

What is clear from this research is that even the most established MIS continue to face challenges with delivering market information to farmers in a way that is profitable without ongoing government or donor support. Some of those MIS profiled here may eventually succeed in that task, but doing so will require effort and experimentation.

As an ever increasing number of smallholder farmers in Africa obtain access to mobile phones, demand for mobile-based market information is likely to grow as well. Whether MIS providers can convert this potential demand into a sustainable business model remains to be seen. Their success will largely depend on providing poor smallholder farmers with services that enable them to increase their incomes and therefore merit payment. That task is complicated by studies showing that not all price information creates value for farmers. For example, a randomized control trial by NYU of 1,000 Esoko users in Ghana documented a 7-11% price increase for yams, but no increase for the price of maize and groundnuts. As more research is conducted, MIS providers may begin to narrow their scope to selected crops and regions which are better suited to take advantage of market information. That, coupled with additional value-added services, may be the eventual road to sustainability.

RESOURCES

Subervie J. (2011). Evaluation of the impact of a Ghanaian mobile-based MIS on the first few users using a quasi-experimental design.

Fafchamps M. and B. Minten. (September 2011). Impact of SMS-Based Agricultural Information on Indian Farmers.

Kizito A. (2011). The Structure, Conduct, and Performance of Agricultural Market Information Systems in Sub-Saharan Africa.

Tollens E. (August 2011). Market Information Systems in Sub-Sahara Africa Challenges and Opportunities.

Staatz J., A. Kizito, M. Weber, and N. Dembélé (June 2011). Evaluating the Impact on Market Performance of Investments in Market Information Systems: Methodological Challenges.

Staatz J. (May 2011). Market Information and UNECA: Where's the Value Added?

Kpenavoun C., S. Lebailly, P. Adegbidi, and E. Gandonou. (2009). Impact of Public Market Information System (PMIS) on Farmers' Food Marketing Decisions: Case of Benin.

Aker, Jenny. (May 2008). Does Digital Divide or Provide? Information Technology, Search Costs and Cereal Market Performance in Niger. *BREAD Working Paper No. 177.*

This series of papers is supported by USAID's Fostering Agriculture Competitiveness Employing Information Communication Technologies (FACET) project under the Financial Integration, Economic Leveraging, Broad-Based Dissemination and Support Leaders with Associates award (FIELD-Support LWA). It was written by John Zoltner of the TechLab @ FHI 360, assisted by Mona Steffen. FACET offers on-demand field support to help missions with the challenges of using these ICT interventions in agricultural development. To learn more about field support options, contact Judy Payne, ICT Advisor, (jpayne@usaid.gov).