

Report on the WorldAgInfo Visit to Africa (Mali and Zambia)

August 3 - 19, 2007

Report prepared by Patrick O'Shea and Thane Terrill

Introduction

This report is designed to explore the major themes and issues that arose during the site visits to Mali and Zambia in August of 2007. This paper is broken into three sections, the first two being descriptions of the major themes/activities that we observed in each country. The final section lays out the major themes that came from this trip and from the South Asia trip.

We want to gratefully acknowledge the help of John Staatz. and Michael Weber, both of Michigan State University (MSU), in facilitating our trip. They, with their capable staff and collaborators, made sure that no valuable connection was left untapped and that we always had the context required to understand what we saw. This MSU faculty support was integral to the success of this trip.

Project Goals

With the conclusion of this trip our team has completed the entire series of site visits within South Asia and Africa. The purpose of these site visits was to investigate the validity of some of our team's initial assumptions and to get a feel for what was happening with agricultural information. Visiting a handful of locations in both South Asia and Africa was by no means a conclusive study of even the places we visited much less of the continents they represent. Because of the wide divergence between the environments and conditions of the places we visited, however, we were able to come away with clear ideas of the central themes of the intellectual landscape our team has been tasked with exploring.

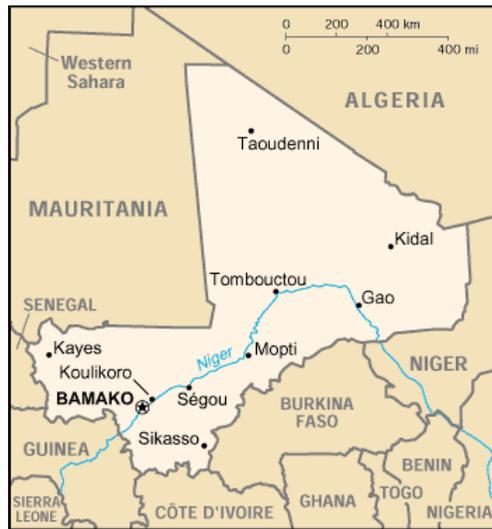
Our group started this project with the following three general assumptions.

1. Information is a critical component of agricultural success.
2. Feedback mechanisms are the key to creating a healthy agricultural information ecosystem.
3. Recent advances in the field of information technology make possible new models of information sharing.

Within this broad framework, our group met with many levels and segments of what we are calling the information ecosphere. We wanted to determine what information people had, what they needed, and what people and institutions are doing to create, transmit, organize, and understand information.

Mali (August 3rd – 12th)

Country Information



Mali, a landlocked country slightly less than twice the size of Texas, is located in a French-speaking section of Western Africa. It has been a functioning democracy for 15 years. According to the CIA world Factbook, nearly 12 million people live in Mali and that 65% of its land area is classified as desert or semi-desert. Eighty percent of the population is involved in some form of farming or fishing activities, and industrial activity is focused on processing these farm products. Purchasing power parity (PPP) per capita of about \$1,300 per year (IMF data) puts Mali near the bottom decile of nations.

Community Radio

The claims we heard that Mali is a leader on the African continent in the area of community radio seemed to be well founded given our experiences. Mali has more than 200 active community radio stations and the use of these stations for the benefit of the smallholder is impressive. The large number of radio stations may sound excessive until one considers the fact that Mali has over 50 languages -- 15 of which are official languages.

In terms of benefiting the smallholder farmer, the community radio's primary contribution is the supply of market information. This aspect will be covered more later on but it is important to note that community radio is thriving and already serving a substantial agricultural information role.

One example of how the local radio can be leveraged was introduced during our discussions with IPR/IFRA in the town of Katibougou. During the discussion, one presentation was given on a call-in radio show hosted by a member of the agricultural university's teaching staff. Each week a two-hour show was produced with the assistance of other university personnel. During this show, listeners were able to call in with questions that were then answered by the presenters. Reproducing this process at other radio stations, or even offering these programs for wider distribution, would be an effective way to partner agricultural institutions with communications media to provide interactive agricultural education.

The principal problem we observed with community radio was that they had to charge for all the programming, even if the programming was a public service. There appears to be no concept of a public service announcement in Mali. It is also true that none of the content providers had thought in terms of 30 to 60 second radio spots. It's possible that radio stations might be willing to use these short spots because it provides a community service without sacrificing too much revenue. Given the right incentives, students and faculty in the agricultural department of universities, and staff at the agricultural research institutes (among others) could be trained to produce such "spots." The result could result in a mutually beneficial relationship between information providers and smallholder farmers. Farmers would have more information and the inherent feedback enjoyed by the community radio stations would allow for meaningful information reaching

the agriculture universities.

The Segregation of Women

The concept that men and women undertake different roles in agriculture is not a new one. What we were surprised by was Mali's segregation of women to entirely separate crops, such as Shea nut production – referred to in Mali as “women’s gold”. This has significant ramifications for agricultural information because the normal channels of communication are focused on technologies and areas where women may not play a role. The result of women working separately is that even the most basic information does not reach them. In the case of Shea nuts, we were told that women farmers often lost a substantial portion of their crop's value simply because they were not aware of the required elements for achieving the maximum quality from their product. The processing style used by Shea nut processors was frequently related to how the village had previously done it rather than based on any calculation of effort versus possible product price. The women knew that there was a wide price range for Shea nuts but they were unaware that they had control over many of the factors which influenced the final value of their product.



The second significant aspect we observed was that women of Mali were clear and outspoken about what they needed. We had expected that the only way we would effectively get any female perspectives would be to separate males from females, and even to separate young females from older females. We expected that this would be necessary as the power dynamic of the village would not allow the free flow of ideas and a free discussion of the needs of all participants. We were pleasantly surprised to see several instances where females were open and honest with their opinions in the presence of males – including the village chief. The first instance occurred in the village of Manabougou, located approximately 40 kilometers north of Bamako. When we arrived at the village, the males were gathering. During the initial stages of preparation for the discussion, it was decided that the females of the village should be invited to the discussion as well. Once everyone was gathered, we were organized in such a way as to have the males to our left and the females to our right. During this discussion, the females forcefully voiced many important concerns, such as wanting information about entrepreneurial opportunities. One fact that the women made clear -- even with men present -- was that men could not be depended on to provided the information the women wanted and needed. We asked one of our male translators why men would hold back information from their wives when such information could benefit the entire family. The answer received was that Malian men would prefer to have power over their women even it resulted in a worse economic future for the family.

It was apparent that information intended for women needed to bypass forms of communication that are controlled by men. Informing men cannot be assumed to be the same as informing the family. It is probably

not surprising that when we asked women how they obtained information they most frequently mentioned radio. Radio is one of the few communication systems that bypass men because of its direct accessibility in the home. It is thus very important to realize that women have different information needs from the men of the village and that this information needs to be communicated in forms and at times of the day when women are available.

Use of Cooperatives

The use of cooperatives would appear to be an effective starting point to leverage the power of the smallholder farmers. A visit with a women farmers' association involved in horticultural production and food processing in Niono demonstrated the strength of the organization. There were several issues of concern, chief among these the fact that they were working very hard for marginal gains (each woman's share was about \$40 after three months of work), but the cooperative idea demonstrated that there is strength in numbers. Through the coop, the women have been able to raise some initial funding through grants and micro-loans. They have also been able to access certain types of seed more easily. In addition, the coop has given credibility to their work which has led to their husbands giving permission for them to be involved with the coop work. The coop has also promoted literacy training. The women report that out of 100 women in the cooperative, three read and write French and about 30 can now read and write Bambara.

However, even with the new skills and some economies of scale, the women still report great difficulty. They mention very basic information as needed but not available to them. Information on issues such as planting times, fertilizer, equipment and crop options as well as market prices are all issues that the women would want addressed.

The opportunity to participate in value added processing (such as onion drying done by the women farmers' has great potential. However, for the coop to really pay off, the women require more information than they currently have.

Rural Access to Agricultural Information.

Malian farmers lack access to the relevant agricultural information that could improve their livelihoods. The farmers we met in the village of Manabougou reported that they were unaware of basic government and NGO services available in nearby capital, Bamako. Several times even during these interactions with us, the participants would voice a concern or indicate a need, only to have one of our accompanying Malian agricultural experts describe where the desired service could be obtained. This is in a village only 40 km down a well-paved road from Bamako and accessible to the cell phone network - a fact that is particularly pertinent as we found that approximately 10% of the farmers -- including a few women -- had cell phones. This disconnect was also a problem going the other way in the information stream, with people in Bamako also unaware of the information gap with the farmers.

Marketing Information System



One answer to the lack of agricultural information in the rural areas is exemplified by the Observatoire du Marché Agricole (OMA). The agricultural market information system utilizes personnel in the field (the man in the photo wearing the hat is one such person) to gather price data for a series of crops. This is done through observing individual sales in the market place to improve the accuracy of the information. This information is then transmitted to a central information clearinghouse in Bamako via a computer modem connected to a radio transmitter. The

consolidated information is then shared with the individual community radio stations and analyzed for an executive summary circulated to a number of Mali's top ministries.

We found a widespread awareness of the radio broadcasts of market information. One of the interesting insights we obtained was that transferring written content into audio form is not enough for illiterate farmers. Farmers told us that while they appreciated and trusted the radio-based market information, the information was often read so quickly that they were not able to remember it. While our observations were quite informal, they do point to a need for information providers to assess the effectiveness of their information distribution systems. Literacy is just one issue to contend with. In Mali, there are many languages and not everyone who understands a language may do so as a first or even as a second language. So, a listener might be fine listening to a radio station broadcasting music and light news in English or Bambara (the most commonly spoken local language in Mali), but may still need agricultural information to be in his or her local language. And, of course, this is in addition to the basic question of whether the information being provided is appropriate for the intended audience. Much of the information we saw was suitable for the agricultural researcher or for the agricultural extension officer, but not for the smallholder farmer. There is much work to be done to determine what information is relevant and how to best digest and present that information.

Market Timing

Market timing was frequently raised in our meetings as a structural problem by smallholders. Farmers indicated that they were forced to sell their crops immediately after harvest in order to be able to pay their water irrigation bills. This effectively means that the farmers are forced to sell at the exact point when their goods would be at their lowest sale point (due to everyone else having to sell at the same time). This results in a system where traders are able to purchase these goods using credit, store them, and then sell them for a predictably higher price later in the year (often back to the smallholders themselves!). This is a very profitable venture for the traders and it is at the expense of the smallholder farmer.

In discussions with the Office du Niger, the organization that controls water management, the idea of allowing a delay in repayment of the water fee was raised. Another opportunity that came to light during our meeting was the fact that they were in the process of building a number of new canals. We pointed out that when building new canals they should consider including conduits in the canals' structure for electrical lines and fiber optic cables. Any project building canals, roads or railroads should consider what other infrastructural support it might provide. It's safe to assume that all of three types of projects will result in high population densities surrounding them. Going back later to install infrastructure will be far more expensive.

Internet Access Limitations

There are two relatively large concerns with Internet access that impact the ability of ordinary users to gain access:

- 1) high operating costs, and
- 2) structural inefficiencies with Internet connectivity.

High operating costs make sustainable infrastructure and services almost impossible to the average Malian. Our visit to a Centre Local d'Information et de Communication (CLIC) located on the outskirts of Bamako illustrated the fundamental problem of Internet access (see photo). The center had subsidized Internet access for its first year of operation because of funding from a grant. Once that grant ran out, the center was forced to stop its Internet service because the service was no longer cost effective. The little money the center currently earns comes primarily from typing local students' term papers. Even so, the center is not viable in its present form.



The problem with this CLIC is one shared by the entire country. The cost of Internet bandwidth is so expensive that even a heavily used center -- as this one was during the time it had Internet access -- is often not financially viable. Bandwidth costs are far higher in Mali than in North America. We frequently found that sites offering Internet access had 128 to 256 Kb connections and paid between one and two thousand dollars a month. These same fees in North America would purchase at least ten times the bandwidth and would certainly not have the frequent interruptions we experienced.

Some of the government officials we met claimed that there was simply not enough bandwidth coming to West Africa while other people claimed that it was the government of Mali's telecommunication regulations that made prices so high. Whatever the cause, the Internet is out of reach to the average Malian. Worth considering may be an initiative to differentiate between infrastructural problems that require technical solutions and policy and tariff issues that require changes in government policy and practice. A comprehensive assessment of the short and medium term prospects for Internet access in Africa will be critical to identifying the opportunities for information dissemination over the next five years. There was enough disagreement about the reasons for limited Internet connectivity in Africa in general, and Mali in particular, that there appears to be the possibility of improving pricing and access with relatively small changes in government policy. While new sources of bandwidth will ultimately need to be found, there may be short terms solutions at the national and pan-African levels that could be identified by a technical assessment.

Regional Common Concerns

An impressive level of cross-national cooperation is already taking place across much of the Francophone area of Africa. A common currency (the CFA) is now used in multiple countries. The Institut du Sahel (INSAH) facilitates collaboration across nine member states (Cape Verde, Senegal, Gambia, Guinea Bissau, Mali, Burkina Faso, Niger, Chad and Mauritania) on a variety of agricultural issues. For instance, INSAH houses the SPC (Sahelian Pesticide Committee) that provides information on pesticides and grants licenses for those pesticides approved for use across the member states. INSAH also encourages a variety of other information exchanges and helps to promote the sharing of resources with academics and researchers. INSAH lacks the resources required to extract the information required for the smallholder farmer and then to translate those documents into local languages. INSAH is a good example of an organization that possesses a substantial collection of potentially useful information for the smallholder farmer if only that information could be refocused and presented in a form and language suitable for the intended recipient.

Inter-Agency Networking

One of the most immediate and apparent benefits of our visit, which we observed in Mali as well as in Zambia, was that the round-table sessions we participated in brought people together who had not been brought together before. The opportunity that our visit provided to people from different agencies to network and discuss issues and offer differing perspectives allowed them to learn from each other. This was a benefit that the participants themselves noted. In many cases multiple entities were either unaware of, or not benefiting from, the knowledge resident in other like-minded agencies.

This being the case, it would appear that efforts should be made in fostering intra- and inter-institutional as well as intra- and inter-national communications. Using the model of social networking software packages such as Facebook and MySpace, forums for this type of communication can be created technologically. Technological solutions should be only one form through which these connections are made. Other non-technological solutions, such as conferences, workshops or guided discussions, likely are equally appropriate. The need is to develop a variety of mechanisms through which participants can share their experiences, discover overlaps between projects, explore means for creating efficiency and effectiveness, and develop appropriate solutions to shared problems.

Policy Creation

Agriculture information is a dynamic combination of traditional wisdom and cutting-edge science. During a meeting with a group of bio-tech experts, they claimed that much of the wary attitude towards bio-tech and GMO crops in Africa was due to one-sided information being available to Africa's policy makers. Obviously, these experts disagreed with the current restrictions on GMO crops. Regardless of the position one takes, it is critical that such discussions such as these take place with the benefit of state-of-the-art information and exchanges of perspectives. If the proponents are correct, GMO crops could revolutionize African agriculture so that fewer pesticides, less water, and less fertilizer is required to obtain higher outputs. If the opponents are correct, GMO crops could disastrously reduce bio-diversity, harm local plants and animals, and make the farmers potentially dependent on foreign corporations. The real issue is not whether or not to promote widespread use of GMO crops but how GMOs should be developed, managed, marketed, and used. It is undeniable that such important decisions are not currently being made in a fully informed environment.

Without that informed environment, optimal choices are unlikely.

Zambia (August 12th -- 19th)

Country Information

Zambia is a large and sparsely populated country with 78 languages, of which 7 are considered major. In addition to the normal division of its land into different soil types and crop patterns, Zambia has a significant portion of this arable land contained within its many nature parks. Zambia's independence was obtained in 1964. It is approximately the size of Texas with a population of about 12 million. Despite being one of the largest per capita recipients of international aid, the average annual purchasing power parity (PPP) per capita is about \$1,000, which places Zambia in the bottom decile of nations (IMF data). Agriculture constitutes a key livelihood source for over 75% of the rural households in Zambia. A total of more than 1.3 million households in the country are totally dependent on agriculture for their livelihood and are classified as agricultural households (Central Statistics Office, 2000).



Educational Radio

The Education Development Center's (EDC) QUESTT project uses community radio to educate approximately 80,000 Zambian children otherwise unable to attend school. The EDC broadcasts one 30-minute English-language radio presentation per day for each elementary education level. In addition to the broadcasts, the class monitor – a volunteer 9th-12th grade graduate – spends approximately an hour covering auxiliary materials and discussing the broadcast.

The program uses radios with both a solar panel and a hand-cranked generator because many classes take place in areas where dependable electricity is not available. According to EDC officials, these 90 minutes of instruction each day produce test scores approximating the scores of students attending traditional Zambian schools for four or five hours a day. If these claims hold true with further statistical collection, the results are truly remarkable. The idea that students do better outside of a school with an untrained teacher and with less time indicates the EDC's model may hold the potential to reach vast numbers of rural households.

The fact that basic literacy is being taught with solar powered radios (seen to the right) in places that don't have a school or electricity points to a need for technical literacy. In North America, learning how to use a cell phone was built on top of decades of using landline telephones, answering machines, email messages, and pagers. In India, Microsoft Research had a computer application designed for illiterate users. The first thing the application did was to show a video demonstrating how information got into the computer and what the user was supposed to do to make it work. As new systems are developed with ever greater technical complexity, it may be wise to consider what type of technical



training might be required by the end user.

In our talks with Celtel we found that they had a training system to teaching users how to use their cell phones. It could very well be that one of the reasons cell phones are popular is due to the fact that the distributor of the technology is providing training concurrently. The cell phone companies underplay this work because they don't want to embarrass their users by brining attention to their inability to use the cell phone. In fact, their training system is designed as a form of entertainment. The participants believe the main focus is their entertainment and not the learning how to use a cell phone.

MP3 Devices

EDC is currently evaluating the use of video iPods as a potential replacement and/or augmentation for its radio programming. The potential benefits are significant. With the radio broadcasts there is a specific amount of time during the broadcast for class discussion, but that time is necessarily the same for everyone. Using MP3 devices the instructor can control the amount of time used for discussion. The potential for MP3 devices, such as the iPod, is great. Controlling the scheduling and pace of the class is an immediate benefit, but content providers can also now add supplemental content or include the same content in other languages. It's important to note that MP3 devices can also be used to record student and staff feedback. Students could ask a question and have it relayed to a central support center. The main barrier we saw with the use of MP3 devices was for the need to have a computer. MP3 devices require a computer of some sort in order to transfer files back and forth. Where there is limited access to computers in real time, alternatives can be explored to provide asynchronous access, giving students expanded information access.

One possible solution we saw for the requirement to have a computer and some sort of connection with the content provider, was to use cell phones as MP3 devices. A number of cell phones currently play MP3 files and a few can download MP3 files over the cellular network. In Zambia, we were told that the entire national network had data network service. At present, Celtel is moving from GPRS to EDGE data transmission standards. Fortunately, the speed of the connection is not critical because MP3 files are not being played in real-time. If it takes an hour or ten minutes to transmit a 30 minute class to the teacher, it does not matter. The quality of the file is exactly the same regardless of how long it took to transfer. It should be equally feasible for students and teachers to provide feedback via uploading an MP3 file or by calling the main office.

Cell phones have the current capability of transmitting information via SMS messages. SMS could be used for anything from asking questions, to requesting certain "broadcasts," to processing information about student attendance and grades. In the near future, it should be possible to transmit video and audio from a cell phone to a standard television. We saw examples of video-based presentation via MP3 player at EDC. These presentations were designed for the instructors because the videos were shown on the relatively small screen of an iPod, and thus were too small to be seen by a class full of students. Once a television can become the display device, the options are greatly increased.

Radio Listening Groups

In both Mali and Zambia we found that radio listeners, especially women, listen to broadcasts in groups. In some situations this may be due to a lack



of radios, but mostly it seems that the women want to have a support network and because there is an expectation that these listening groups may lead to organized business ventures. The fact that the radio groups tend to be comprised of women demonstrates both the lack of information reaching women in Africa and the eagerness of women to have more information access. In both Mali and Zambia we heard that men were not inclined to share information with women – even with their wives. The male translators we had said this was due to men wanting to have power over their wives even it meant a worse economic situation for the family. This last point is not to single out Mali and Zambia; clearly, discrimination against women is a global issue. Whether gender prejudice results in the glass ceiling in the West or social or legal restrictions in other parts of the world, the result is always harmful. Until each society resolves the issues of discrimination against women, those people constructing socio-economic development plans must find ways to work around the systemic blockages. Radio is technology well-suited for this task because it does not require a middleman to reach women.

We visited a number of groups created around a radio broadcast and found a wide range in the groups' effectiveness. The Radio Women's Forum we visited outside of Kabwe clearly had the most positive attitude about agriculture as a way of life. One of the most inspirational points of our trip was hearing the women singing a song that spoke about their experience with learning via the radio. The song described their wish to become "commercial farmers" so that they could better educate and feed their children. When we asked if they wanted their children to become farmers, they were universally excited about the prospects. On further questioning, it was clear that they were talking about their children becoming commercial farmers -- not the type of farmers the women are now.

The term commercial farmer could mean a number of things, but we took it to mean that they would become successful enough to have farming as a profitable business. The women we met did not classify themselves as commercial farmers. In Zambia, most farmers don't sell their produce on the market. Most of what is grown by smallholder farmers is eaten by the family or traded with other farmers. Most of these women would fall into this category. Yet, their optimism was nothing less than inspiring. In all other villages we visited in Africa and South Asia, parents overwhelmingly reported that they did not want their children to be farmers. What our visit to this group told us was that the question might not have been asked correctly in earlier settings. We did not think to stipulate that the children might become commercially successful farmers. We strongly suspect that the answers we were given might have changed if the parents thought farming could offer a good living for their children.

Not every radio based listening group was as successful or the participants as optimistic. We met a women's group whose members were raising pigs without adequate training and financial resources. The agricultural experts we had with us were very concerned that these women would lose their pigs to disease and end up forfeiting their entire investment.

The lesson we took away was that radio education can get farmers started on new ventures but the one-way nature of radio means that critical pieces of information may be left out. The women clearly understand this weakness of the broadcast model. When we asked if they would like to have the ability to use their cell phones to call into the radio station, they were universally enthusiastic. Alternatives to make radio based agricultural education more interactive should be a development priority.

Formative Evaluation

One of the most notable aspects of our trip was the infrequency of which those responsible for projects knew the effectiveness of their projects. The general assumption was that a practice put in place at the beginning of a project would remain fixed until completion. We saw very few cases where near real-time information was being collected and even fewer situations where such information was being used to make programmatic changes. Partly this was due to a lack of resources and partly, we suspect, it was due to the terms of program funding. Grants tend to have specific language on how a project is to be carried out. Performing a mid-course evaluation might be a waste of time if the grant obliges the organization to only one course of action. Ironically, a grantee could get in trouble for making improvements if those improvements were outside the scope of the original grant proposal. Effectively, the only evaluation for many projects may be when they seek another grant. This process produces built-in biases. The grant seeker will usually want to demonstrate the correctness of the previous work rather than show that another direction might have been better. The visit to the village of Manabougou in Mali was illustrative of the problem. Service providers in the capital were feeling successful because they were creating the materials and producing the new seed variants needed in the rural areas. The shortfall was that no one was measuring the ultimate effectiveness of the work. In terms of the grant, they were successful; in terms of the benefits for the farmer, they were not successful. Until grants specify formative evaluation as an integral component of a project, we believe a substantial amount of valuable work will continue to be dissipated.



While we saw few particularly good examples of formative evaluation being used, we were impressed by the FAO's Disaster and Recovery department's use of near real-time data collection. The FAO is using a digital-paper system to collect information and then use cell phones to transmit the information via a series of SMS messages. Digital paper (seen to the left) is a special type of paper which uses a grid made of faint lines and dots running vertically and horizontally. This grid, barely visible to the eye, allows a special pen to record via a small built-in optical sensor the markings on the page. FAO uses this paper for their disease report forms. The FAO's person in the field fills out these digital paper forms in exactly the same way he or she would have done before, but now the information on the form has been digitized. At the next available connection, the cell phone then sends the information via SMS messages to FAO's data collection server.

We thought this use of digital paper was an excellent example of a low-cost system for collecting near real-time information. While it would have been about the same price to have used a smart PDA to collect the information, digital paper has the advantages of being more durable in harsh environments, it creates a backup copy of the information on paper, and it requires very little training because the user's experience with the digital paper form is almost identical to using a regular piece of paper. The next step for the FAO is to further develop their database reporting tools so that information coming into the system can be analyzed more effectively. One of the complaints we heard was information was frequently misinterpreted because Zambia's administrative zones were often in misalignment and thus patterns of disease that might have been otherwise discovered were lost. We suggested that a GIS system for mapping the data might be a good solution because map points don't care where a political line might be drawn.

The only place we saw true formative evaluation was at the major cell phone provider, Celtel. Celtel both measures their results and make changes based on those results in near real-time. For example, they found that the poorer areas of Lusaka were in fact their most profitable areas. They used this information to design infrastructure services to better serve these areas. They also looked for towers that were unexpectedly under utilized in order to identify problems that required solutions. One lesson Celtel said they had learned was that illiterate people needed help with how to use a cell phone but were too proud to ask. So Celtel customized a truck to visit the rural areas with an entertainment system that also includes tutorials on how to use cell phones. People would be attracted to listen to the music and would stay to see entertaining demonstrations on how to use the phone. No one needed to be embarrassed because the entertainment aspect was reason enough to be present. We were very impressed by the creativity of Celtel's approach. It bears being said that the one true instance of formative evaluation we saw was being undertaken by a commercial venture, which, by its very nature, would be interested in making sure that its practices were as effective as possible. There is a lesson to be learned there for non-commercial endeavors.

In every case where we discussed the advantages of formative evaluation, there was great interest. We believe that training in how to incorporate formative evaluation in a wide range of development efforts would be both welcomed and highly beneficial.

Fertilizer, Seeds and Lime

Farmers in South Asia frequently use too much fertilizer and farmers in Africa use too little. In Zambia we received a number of presentations indicating that African farmers were using too little fertilizer and lime. This is a huge issue in Africa for a number of reasons. For one, the productivity of the soil is greatly reduced by the insufficient use of fertilizer. Another important issue is that the government's subsidizing of fertilizer often consumes the largest share of the agriculture budget. As oil prices, and hence fertilizer prices increase, the strain on the government increases and the likelihood that any other agricultural project will be funded decreases.

Unlike India, where the soil and water are being pushed to their limits, African field productivity can be greatly improved. An obvious question is why farmers aren't using more fertilizers. One reason seems to be the fact that even with government subsidizes, fertilizer in many African countries is still more expensive than in South Asia. Another reason is a lack of information for the farmer to know what amount of fertilizer needs to be applied. There is the associated issue of not knowing how much and what type of lime needs to be used in order for the fertilizer to have long term maximum effect after improving soil health.

Zambia has a nationwide standard of fertilizer use called "four by four." The argument we heard for using this cookie-cutter model was that it was a baseline amount by which every Zambian farmer would presumably benefit. We also heard that very few of the farmers were able to follow this recommendation. The one thing that is clear is that farmers currently don't know how much fertilizer and lime they should be using. The amounts that should be used vary greatly based on such factors such as soil type, the crop to be grown, the pH of the soil, and the current conditions of the soil. Something as simple as having the wrong pH or not having water to activate the fertilizer can essentially result in the fertilizer being wasted. While soil testing is available to farmers through various outlets, only a few thousand farmers, almost all of which are large holders, take advantage of these services. What is needed is some sort of soil testing device that provides information on the critical soil factors and would also provide recommendations based on farmer-controlled variables. It, desirably, would also be able to project crop harvest based on lower and higher

fertilizer and soil dressing inputs. Our meetings with farmers indicate that farmers don't always choose to achieve the maximum output for reasons of food security, payment schedules, and opportunity costs of various types. The important thing is that the farmer is fully informed as to what his or her options are. The farmer will more likely make the best possible decision based on enhanced information.

One of the principle barriers to the greater use of fertilizer in Africa is its high cost. Fertilizer isn't just expensive, it's two, three, or even four times more expensive in Africa than it is elsewhere in the world. Transportation is the primary reason for this surcharge. When we asked if the fertilizer could be mixed locally so that the heaviest inert elements did not have to be shipped, we were told that this could be done for some types of fertilizers with potentially large cost savings. The reason this is not being done is because African farmers are not likely to trust that the local mixing would result in the same quality of fertilizer. This is clearly an information problem. We heard many times that seeds and fertilizers were adulterated by vendors. A system that could effectively monitor or test the major inputs would be extremely valuable.

Digital Resources

The Acting Director informed us that the library's principle resource was an offline based resource called



The Essential Electronic Agricultural Library (TEEAL). TEEAL is an impressive collection of agricultural scientific journals delivered on hard disk for installation on a LAN (Local Area Network) connected computer. The library also subscribes to the FREE online UN resources, AGORA, HINARI and OARE. The library unfortunately does not have the ability serve its 10,000 students with these valuable resources because it has only 10 computers. We were told that every morning at 8:00 a.m. there is a rush of students to sign up for computer time on these ten computers. As with the libraries in India, the University of Zambia is doing the best it can do with a virtually impossible situation. As bad as the computer situation is, it is clear that computer-based information

systems is the only viable way to bring the University of Zambia's library to international standards.

In our meeting with FAO, we saw that even when funding was available for technology, that did not always guarantee success. The director pointed out the need for its FAO's various databases to be "rationalized." What he meant was that related information could be found in multiple FAO databases without the FAO or its clients being able to see patterns that might result from a consolidated view of the information. This problem is exacerbated by the misalignment of Zambia's organizational and governmental geographic redistricting.

Data does not guarantee meaning. Digital resources and new equipment will only make an impact if the entire system is well thought out. In the case of FAO, they are losing some of the value of their existing information because related information systems within Zambia are not coordinated. In the case of the University of Zambia's library, adding new databases will have virtually no impact if the library only has ten computers.

One of the principles which emerges from our visit is the need for information interventions to be much more comprehensive in scope, or at least be required to participate in, and perhaps even fund networking opportunities for information sharing.

Leveraging Private Cell Phone Networks

Cell phone technology has consistently been one of the most promising technologies our team has observed. Zambia's experience with cell phones only confirmed our good impressions.

We visited two organizations making use of SMS messaging systems for agricultural purposes. Zambia National Farmer's Union (ZNFU) allows farmers and wholesalers to get agricultural pricing information for that week. Zoono uses SMS messages to transfer funds. ZNFU's project looked to be quite useful though it did not have the depth of coverage found in the market information system developed in Mali. ZNFU's system can be more accurately described as a commodity trading index because the system is based on bid and ask prices, not actual sales. In Mali, the price was determined by the market enumerator physically seeing a trade taking place. Still, this SMS system is an improvement over not having market information.

Zoono's SMS money transfer system while still new and not widely deployed illuminated a number of interesting issues. The most interesting issue is this system's ability to avoid the expensive money transfer fees common in Zambia. It is not surprising that most Zambians don't have a bank account. Not only is interest on bank accounts very low but any movement of money comes with a large transaction fee. Using SMS messaging to transfer money makes money far more fluid than it is with the current system.

Zoono is not currently designed to provide banking services and even if it were, the high level of inflation would make bank accounts unattractive. What farmers are doing now is to immediately plow their harvest earnings into livestock or other material investments. The livestock is then sold to purchase seeds and fertilizer. This is an unfortunate economic model because the farmer is constantly selling when the market is saturated and purchasing when the many other farmers are also purchasing. As in Mali, the ability for farmers to hold their crops off the market for short periods of time or to buy when the prices are lower would be a major advantage. Celtel recently spun off a business unit, Celpay, that will look into cell phone based banking. Whether they can be successful in a country where inflation is running at 20% is a question they will have to answer.

Everywhere we went we saw Celtel's signal and evidence of its operations. Celtel currently claims approximately 15% total market penetration of cell phones in Zambia with that number expected to increase to 40% within five years. Everything we saw indicates that this percentage, as dramatic as it may sound, might be conservative. We can reasonably assume that most communities in Zambia will have substantial access to cell phones in the next five years. Celtel's accomplishment is truly remarkable if one tries to envision the task of creating a nation-wide bi-directional communication system being assigned to a government agency. Given what we have seen, only the private sector could have made this happen.

We have found that the private sector can play constructive and destructive roles -- often a combination of both. The main weakness of depending on the private sector is that the smallholder farmer often does not have enough economic clout for the private sector to cater to them profitably, which means that they tend to be ignored as a market segment. In Celtel's case, they have a great deal of interests in the poorest segments of Zambia's population -- the inner city areas of Lusaka called "compounds". These densely populated areas are

Lusaka's poorest areas but Celtel's most profitable. The rural areas are not nearly as profitable but Celtel needs to assure nationwide coverage so that anyone in Zambia can be comfortable going to any other part of Zambia, and many of the inhabitants of dense urban townships have rural relatives with whom they wish to communicate.

Sometimes the private sector stumbles on a socially beneficial service. One such example is Celtel's system for the transfer of cell phone talk time (called "Me to You"). Any Celtel subscriber can transfer purchased talk time minutes to other subscribers. The transfer of minutes is used by rural populations as a surrogate for money transfers, eliminating the traditionally usurious bank transaction fees. Celtel's motivation is increased cell phone use and to reduce the number of physical phone cards they must sell. The unintended benefit for the smallholder farmer is that someone he knows in a city can purchase cell phone time and transfer it to him. He can then transfer time to his neighbors for cash. When it takes hours and may cost a bus ticket to get to a cell phone refill center, this electronic transfer system is highly desirable. We were told that this system is actually being used as part of a barter system.

Celtel pointed out their motto is "Making life better." They said they took this seriously in terms of providing service to the community. Most corporations will make similar statements. It's difficult to judge such statements given that the ultimate mission of any publicly traded firm is to return the greatest return to the shareholders. Yet, on the other hand, corporations are learning that being a good corporate citizen is an important element of being a profitable operation. We therefore believe that associations with the private sector can be beneficial to both the firm and to the community as long as those asking for help are cognizant of the corporation's responsibilities.

National Intranet

In both Mali and Zambia we saw a strong need for Internet access. As previously mentioned, getting that access is expensive and unreliable because of the dependency on satellite connections and anemic connections to the global Internet network. Whatever the reason, Africa is not on the Internet super highway. Yet, the question of what is the Internet is quite germane in this situation. The Internet is



both a vast collection of content and a system of technical specifications. It was these technical specifications that helped to create the environment that resulted in the creation of content. This becomes a meaningful distinction for us when we discovered that cell phone networks have the data carrying capacity for Internet access. The only reason they are not used for such access, as far as we could determine, is because of the impracticality of accessing outside of national borders and outside of Africa. To put it in terms of telephone calls, every call is an expensive international call with the Internet. Given that the "long distance" characteristics don't appear to be going away, the question we are asking is whether a local call environment can be created.

In terms of agricultural information, it is likely that most of the resources a farmer in Mali or Zambia would need would be within their respective countries. This is even truer if the desired content has been translated

into one of the local languages. We already know from the examples of TEEAL that valuable content can be pre-packaged for local delivery. The conclusion we came to was that Mali and Zambia could utilize the cell phone data networks and use all the Internet standards and Internet tools, such as web browsers, to access web servers located physically within the country. Normally, the physical location of a server has little meaning on the Internet, but in Africa it makes all the difference. As a side benefit, the construction of a healthy local Internet system would greatly increase the likelihood that international Internet providers would want to connect with Africa. The Internet respects volume. Until Africa demonstrates the type of penetration with the Internet as it is now developing with cell phone systems, the Internet will have little incentive for installing connections.

There is nothing technically difficult with creating a national level Internet. The beauty of the Internet is that it works on principles that scale to any size. Essentially two things need to happen. The first is that some local Internet exchange location is established where all the national Internet providers can have high speed access. The second is that the Internet providers provide billing and administrative structures with their customers so that customers can be billed at a much lower rate for local information and can know when a link to external information would be required.

As with the Internet, once a certain momentum was achieved, the system should become self-sustaining and profitable. It is also likely that efforts to produce content for the Internet locally will become much more attractive when there is actually a viable location for the resulting content. The reference to the Internet as an information highway is not an empty metaphor. In Africa it is all too clear what happens when a good road does not exist. The same is true with information. Without a dramatic change in the current Internet connection rates for Africa, the only viable solution we could identify was the creation of a national-level Internet.

Viability of Smallholder Farmers

One area of debate in both Mali and Zambia was the question of the future viability of the smallholder farmer. Some people expressed the opinion that farmers with either a very small amount of land or lacking animal traction or mechanized equipment were simply not viable and thus not worthy of being helped. Others claimed that the issue was not so much the size of a farmer's operation as it was access to information and education that would allow them to choose profitable crops and engage in additional value chain activity.

We did not come to a conclusion one way or another, but we felt that this issue was important enough that it should be studied. If certain types and scales of operation are not viable, that is information that should be known. It may be determined that certain crops cannot be made profitable unless the farmer has access to a certain amount of land and to certain farm aides, such as animal traction.

If nothing else, the general question of viability needs to be addressed. Clearly, these organizations are not going to be working to solve problems they believe to be inherently unsolvable.

We offer this observation in the spirit of searching for sustainable solutions. We note that although a strong urbanization trend is underway in much of Africa, the absolute number of rural dwellers is forecasted to grow. This means that the same amount of rural land is likely to be under greater pressure in the foreseeable future. With less land to allocate among a growing rural population, the question of viability becomes even more acute. Does the future of the smallholder farmer lie in improving the productivity of most or all

smallholders as farmers, or does a future acceptable level of prosperity require that a substantial number of smallholders take on new, more viable careers either to replace or supplement farm income and/or migrate to cities or other venues. A study of the future of the smallholder might be targeted at answering these questions, both at a general level and perhaps at an individual national level. Absent a clearer understanding of this fundamental question, it seems that hybrid interventions that can assist smallholders improve their productivity on the farm as well as provide choices about alternative livelihoods may be very powerful.

Concluding the Site Visits

What We Have Learned

From our visits we can confidently report that enhanced information is critical for all levels of farmers. In fact, as the farm size goes down, the access to accurate information becomes relatively more important – and, on occasion, literally life and death. The farmer until recently did have a global information system. That system was the farmer's village and those few surrounding villages with whom he would have traded - for all intents and purposes the farmer's world. Today, we see the world as the global village and the farmer no longer has access to all the pertinent information within his or her world. The farmer of the past knew who was growing what, what seed varieties were available, and what the wholesale and market prices were. Basically every bit of information about agriculture in his environment was available through the collective wisdom of the village elders. A compartmentalized world where this type of information system functioned effectively is only a memory. Technology of various types created the global village, now the task is to use technology to reintegrate the farmer into the information landscape of his new world.

Feedback, collaboration and the "wisdom of crowds" are well accepted cornerstones for multi-billion dollar firms. Feedback is more than a valuable component of some future information system; it is already the core element of virtually every successful information system we saw. Time and time again, we heard that farmers most respected the views of other farmers. The ability to interact and to understand the context of persons providing the information was a key component in farmers' information credibility. Every successful project we saw had some sort of feedback mechanism and every system that was not working was out of touch.

Knowing the requirements and the fundamental principles does not necessarily mean a solution is technically possible. There are many barriers between designing an information system and making it happen. As attractive as it might seem to solve the problems of South Asian and Africa with massive influxes of computers and satellite dishes, the results would likely be mixed, at best. There is the temptation to believe that the answer to problems in these parts of the world is to reproduce what we know to be working from the West. On the other side some believe that only indigenous solutions work. Both sides are right and wrong. Every new technology is both new and strange. It's indigenous to the country in which it was developed but even there is foreign in terms of the old methods and devices that served the same function. Feedback and community aren't simply "things" that need to be provided to the farmer, they are key components of all information solutions. It is entirely possible that focusing on issues of feedback and community and developing new alternatives in the smallholder context may suggest new solutions for the developed world as well.

