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Site Visit Reports

A key component of the Design Team's terms of reference was to consult, interact and seek input from smallholder farmers and public and private institutions supporting smallholders in South Asia and Africa. This consultation process included site visits to South Asia in June 2007 and Africa in August of 2007.

Our group started 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.

The purpose of both site visits to South Asia and Africa was to investigate the validity of these assumptions and to get a feel for what was happening with agricultural information "on the ground." We wanted to determine what information people had, what they needed, and what people and institutions were doing to create, transmit, organize, and understand information. While the number of locations we could visit in South Asia and Africa was albeit limited, the diversity of the environments and the conditions of places we visited enabled us to come away with clear ideas of the central themes in the intellectual and technological landscape of agricultural information.

Report on the WorldAgInfo Visit to South Asia (India and Sri Lanka)[1] June 2-16, 2007

Introduction

Five members of the Design Team visited India and Sri Lanka from June 2-16, 2007. We visited with more than 500 farmers, local market workers, extension workers, bank officers, representatives of the private sector, researchers and with the staff of three universities and their associated libraries. This report provides a summary of the meetings and discussions in India and Sri Lanka with various stakeholders and institutions, key observations, and preliminary recommendations based on the interactions and input from the stakeholders.

One of many group meetings with farmers

India and Sri Lanka differ greatly in size and historical experiences; they provided our trip with a useful contrast in terms of institutional structure and educational systems that support smallholder farmers.

The main goal of the site visits was to gain first-hand experience about the problems and information needs of smallholder farmers and the role that institutional innovations and information and communication technology (ICT) can play in fulfilling the four objectives just listed.

Site Visit to India

India is a vast country with more than 600,000 villages and home to one billion people and 100,000 extension workers. More than two thirds of the population depends on agriculture for their livelihood. More than 70% of the farmers in India are smallholders, defined as farmers with less than a hectare of land holdings. Farmers are the consumers of the majority of farm produce and the surplus is sold in local markets. The literacy rate in India is around 60%.

In India, agriculture is a state subject primarily supported by the state governments with additional funding coming from the central government and other sources. Each of the states in India has at least one State Agricultural University (SAU). These universities are similar to American agricultural universities that were created by the U.S. Land Grant System. The SAUs have a mandate for research, teaching and a shared mandate for extension with the State Department of Agriculture and the Central government. The front line extension workers are employed by the State Department of Agriculture while SAUs provide extension specialists and technical support to field programs.

The Indian Council of Agricultural Research (ICAR) operates and supports more than 80 agricultural research institutes across India that focus on specific crops and agricultural constraints. In addition, ICAR

1. This site visit summary report was prepared by Design Team members Karim Maredia and Carl Eicher in collaboration with Cholani Weebadde, our guide for the Sri Lanka portion of the trip, and with input from the other team members who participated, including Dwight Allen, Mary Ochs, and Thane Terrill. Melissa Ho of the Bill and Melinda Gates Foundation also joined the team on a portion of the trip.

provides financial support to more than 500 Krishi Vigyan Kendras (KVKs or Farm Science Centres) that are located in every district of India. The KVKs play a role in training, demonstration and outreach activities. Recognizing the need to foster interactions among various stakeholders, the Government of India has established a group of agencies called Agricultural Technology Management Agencies (ATMA).

Considering the diversity of agroecosystems and cultures, two states—Haryana in northern India and Kerala in southern India—were selected for site visits and interactions with the smallholders and institutions that support them. The neighboring states of Haryana and Punjab are considered to be the "bread basket of India," producing more than 40% of the national staple food grains (wheat and rice). The state of Kerala, on the other hand, is known for plantation crops (coconut, rubber, and spices), fruit crops and rice-based diverse cropping systems. The Design Team visits to Haryana and Kerala were organized by the CCS Haryana Agricultural University in Hisar and the Kerala Agricultural University in Trichur, respectively. The visits to these two states were complemented by consultation with various stakeholders through a roundtable forum organized by The Energy and Resources Institute (TERI) in New Delhi, visits to the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), National Institute of Agricultural Extension Management (MANAGE), and E-Sagu and Digital Green—a video-based agriculture training and information system.

Site Visit to Sri Lanka

Compared to India, Sri Lanka is a small country with around 12,000 villages and a total population of about 20 million people. Sri Lanka is one of the top twenty-five richest countries in terms of biodiversity. The literacy rate in Sri Lanka is 93%, one of the highest in the developing world. The majority of the farmers in Sri Lanka are smallholder farmers with less than one hectare of land.

Sri Lanka's attainment of almost complete self-sufficiency in rice production has been a major achievement over the past 40 years. However, agricultural growth has fallen to 1.5% per annum. The government's priority is to enhance the rice production from around 3.5 to 5 tons per hectare. A 2007 World Bank Study[2], calls for a shift from being supply-driven (producer of rice) to producing more high-value crops, livestock and related products.

The Design Team visited smallholders in the Dambulla area in the North Central Province of the country. With the support of the Cargills (Ceylon) Ltd Company, the Design Team met with smallholders from 19 districts across the country and discussed their sources of information and future research and extension priorities. The interactions with the smallholders were complemented by a roundtable discussion with stakeholders in Colombo and visits to the Department of Agriculture, IWMI (International Water Management Institute), RRDI (the Rice Research and Development Institute, Department of Agriculture, Sri Lanka), and with the University of Peradeniya which has the only post graduate institute of agriculture in the country.

Key Agricultural Observations from India and Sri Lanka

1. Overview of Concerns and Opportunities with Agriculture in South Asia

A. Concerns

a. Smallholder poverty

b. Declining yields of food staples

2. "Reviving Sri Lanka's Agricultural Research and Extension System: Toward more innovation and market orientation"

c. Rising rural wages
d. Declining water tables
e. Negative impacts of farm subsidies.
f. Declining performance of key agricultural support services
g. Lack of smallholder access and information on credit and insurance
h. Prospects of negative impacts of climate change

B. Opportunities

a. Improving access to technology and technical training
b. Providing greater access to trusted, timely information
c. Expanding cell phone coverage by smallholders
d. Providing better access to market prices and the requirements of products destined for the international market
e. Expanding private sector participation in providing market information and infrastructure
f. Growth of community lending groups and farmer cooperatives
g. New government regulations that extend loans for agricultural purposes

2. Smallholder Farmers' Objectives

Based on discussions with smallholder farmers in India and Sri Lanka, the team observed that the smallholder farmers were eager to gain access to information related to new crops, updated farming practices, affordable credit, new technologies, market pricing and to the standards required for selling products on the international market. The central factor was accurate and timely information. Farmers might have the ability to purchase or lease additional land, but they cannot afford to make a commitment without having accurate information regarding market prices, cost of production and new rules that may assist or hurt the anticipated use of that new land. The farmers frequently asked for information on how to obtain the information that would allow them to make economic decisions.

One of the most exciting and promising findings is that the smallholder farmers, in at least the relatively remote areas we visited, are eager to access and use new communications technology, particularly where the younger generation has access to upper-secondary school education.

3. Decline in Agricultural Productivity

The very success of the Green Revolution of the 1970s and 1980s has produced a period of complacency and policy indifference to agriculture over the past 15 years. This might be acceptable if the techniques and strategies of the Green Revolution continued to work successfully, but the reality is that agricultural productivity is declining in most regions of South Asia with further prospects of even greater loss of productivity due to a combination of water scarcity and deteriorating soil health. The people we met well understood these two major impacts and the disastrous consequences of the current trend in declining productivity.

Haryana field with water conserving beans

Making the situation even more challenging is the unpredictable influence of global weather changes. It is one thing to respond to a challenging situation from a condition of health, and yet another thing to respond while ill. It is clear from our visit that timely and accurate information will be vital to responding to this rapidly evolving set of agricultural challenges.

4. Agricultural Support Services: Education, Research and Extension

a. Agricultural Education. The 41 State Agricultural Universities (SAUs) in India and the agricultural faculties in Sri Lanka are underfunded and understaffed. In 2005, about 30% of the academic positions in the SAU systems in India were vacant (Patil et al. 2006). This hiring restriction severely limits the ability of the SAU's to initiate badly needed new postgraduate programs in food science, biotechnology, food processing and agribusiness. Similar trends related to declining budgets and their impacts on the quality of higher education were observed in Sri Lanka.

At the undergraduate level, the disconnect between the current agricultural curriculum and the manpower needs of the society was underlined in conversations with students and faculty who agreed that a large majority of agriculture graduates don't pursue an agriculture related job. We were informed by agriculture students that agriculture universities are commonly viewed in India as "also ran" places for prospective students not admitted to "more desirable" schools. In one of our meetings with a group of 30 students, only a handful saw themselves working in agriculture after graduation.

At a time where flexibility and mobility are essential for responding to rapidly evolving agricultural challenges, agricultural institutions are hobbled.

b. Agricultural Research. Our group observed that in many cases, research findings are known at the university/research level but that this information is not effectively conveyed to the smallholder farmer. There is also a surprising lack of sharing of information among research entities in different Indian states. Clearly the means to communicate between institutions should be improved so that solutions to common problems may be shared.

c. Agricultural Extension/Outreach. Our group observed that the current extension systems in India and Sri Lanka are weak and not very effective in delivering real-time information to smallholder farmers. During our group meetings we asked farmers to identify their main sources of agricultural information. The answers we receive depended on the type of information being sought. Weather and general information was sought on television and radio. Newspapers carry general information and may also include a section covering the type of questions local farmers are having and the answers to those questions. Farmers expressed concern that the information sources often didn't agree and they lacked the ability to determine which source was timelier or more trustworthy.

HAU's agricultural call center

When it came to more specific information, the farmers had a much more difficult time finding the information they desired. At the Haryana Agriculture University (HAU) we visited one of the new Kissan Call Centers. These call centers have been established in each state in India to provide individualized answers. For example, how much fertilizer to apply or what to do when plants turn an unusual color. We initially assumed that the farmers we met did not know about this new service because they expressed frustrations at not having the type of information that we knew the call centers claimed

to supplied. What we heard from the farmers was that they did know about the call centers and that they had the access to village pay phones and to cell phones. The problem was that they could not get through to the call centers.

During our visit to HAU's call center, we discovered the reason why farmers could not get through: the call center had one telephone. That single telephone was designated to support Haryana's 1.7 million farmers. HAU knew that this coverage was not adequate but did not have the financial resources required to operate more lines. Our meetings with farmers indicated that they would be willing to pay for the call if they could get the information they needed. On more than one occasion the farmers said they would be willing to buy a cell phone if it could be used to access important agricultural information.

Community radio is a promising concept, but in India there are regulatory issues blocking it. Our discussions indicated that India might be at a point of possible reconsideration of these restrictions. It is also possible that podcasting and other more directed forms of mass communications could be an alternative route to providing the benefits of community radio.

5. Markets and Food Systems

The roundtables on agriculture marketing systems noted the expansion of supermarkets and the benefits the private sector could bring to smallholder farmers. The team was impressed with the innovations of the Vegetable and Fruit Promotion Council in Kerala (VFPCK), a collaborative that has helped develop a network of smallholders in fruit and vegetables production, marketing and microfinance. These farmer innovations are helping to address the inequities of pricing by middlemen who have the best access to market information. In many cases, the farmers said they had no idea of the market prices in other towns or what middlemen received for their sales. The middleman was by far the most disliked and least trusted component of the supply chain.

Typical Kerala wholesale market

Cargills (Ceylon), a large supermarket chain of 117 stores throughout Sri Lanka, uses a combination of superior market information and direct purchasing from the farmer to provide a 20% premium on the sale price for farmers and assure the best value for its consumers. We were impressed with Cargills' agricultural extension program. The farmers we met were very pleased with the information Cargills' employees supplied them on agricultural practices. The only significant problem the farmers reported was their inability to sell their entire range of products to Cargills.

In both cases, the value of cooperatives and supermarket out-reach programs can extend beyond the community of participating farmers. Farmers are quite collaborative by nature. Many times our group found that farmers referred to other farmers as the main source of trusted information. When new information sources permeate the community as a whole, they put pressure on middlemen to offer fair prices.

6. Post-harvest Losses of Fresh Produce

One third of the fruits and vegetables produced in India and Sri Lanka are lost to spoilage or the inability to sell them after harvesting. In Sri Lanka we met one man who purchased leftover produce for his pig farm. He paid virtually nothing for the day old produce simply because the farmers did not have access to a refrigerated facility. The lack of market information and inflexible transportation options means that

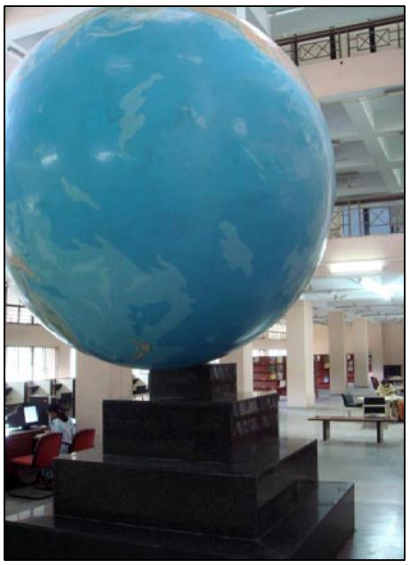
farmers have no option other than to bring produce to the market with the hope that all will be sold that day. The Design Team was frequently asked about new international markets as an opportunity to absorb the local peaks in production that frequently now go to waste.

7. Credit/Microfinance

In the absence of effective microfinance organizations, the smallholder farmers are in the clutches of private money lenders who are charging interest rates ranging from 60 to 120% per year (as compared with 7-12% from local cooperative and commercial banks). Because rural wage rates are rising, farmers are keen on purchasing farm machinery to replace hired labor. While India law has created a number of loan programs for the benefit of the smallholder farmers, the Design Team found that farmers were either unable to qualify for these loans or were asked for collateral in situations where the law indicated that none should be required. We were left wondering if the bankers were unaware that farmers were not finding the loans to be as expected or whether the farmers we spoke to misunderstood the loan parameters and were thus disappointed. This situation seems to be one where even a little more information and feedback on the part of bankers and farmers might have a huge impact.

8. Libraries

The Design Team visited three university libraries: Haryana Agricultural University, Kerala Agricultural University and the University of Peradeniya (Sri Lanka). The team also met with librarians at MANAGE, ICRISAT in Hyderabad, and IWMI in Colombo, Sri Lanka.



Kerala Agriculture University library

The librarians at all three university libraries we visited were knowledgeable about new ICT technologies and their applications for libraries. However, to varying degrees, the librarians were frustrated by serious funding issues, which prevented them from effectively serving the university's students and staff. The key issues identified by the librarians included: staff shortages, poor Internet connectivity, old and/or inadequate numbers of computers, cuts in journal subscription budgets, and seriously outdated collections.

We found the librarians we met to be creative and energetic at providing the best service possible within the tight constraints they experienced. For example, their libraries participate in various networks for document delivery and have developed exchange agreements with other institutions to obtain publications. Several libraries have set up "book banks" for students to borrow textbooks, and they are launching projects to digitize theses and dissertations. Given the serious shortages of books and journals, the digitization of agricultural information and subsequent access to it via the Internet or DVD readers appears to be one of the most practical means by which these libraries can be brought up to international standards.

Libraries in national centers, such as MANAGE, and international centers, such as ICRISAT and IWMI, which are part of the Consultative Group on International Agricultural Research (CGIAR), are considerably better off in terms of funding, infrastructure and facilities. They offer tailored collections of books, journals and online resources for staff members of their organizations, and they participate in outreach activities, such as training and digitizing projects. The staff at these libraries may well be ideally suited to assist with the needed modernization projects we found to be required at the university libraries.

9. Collaboration with CGIAR Centers

Our group visited ICRISAT and IWMI and noted the pressures from donors to work on development projects rather than on their core research agenda. While ICRISAT and IWMI appeared to have improved funding, the reality is that an increasing share is earmarked for specific projects. The result is that the individual projects are well funded but core institutional services constantly have to adjust to limited financial resources. These are distractions that cannot continue if the CGIAR centers are to play an active role in assisting the universities.

10. Partnerships, Linkages, and Scientific Collaboration among Various Institutions in South Asia

Our group found that the linkages among various public research and academic institutions are weak in the South Asia region. These institutional linkages need to be enhanced and nurtured through a combination of technology projects and the sponsoring of regional conferences of topics of common interest.

Farmers showing their cell phones

11. Cell Phone and PC Access

While a large effort is being made to install PC-based kiosks, the potential near-term ICT success story in India and Sri Lanka is the use of cell phones by smallholder farmers. From our conversations with farmers, we estimated that 20% of farmers in Haryana and 60% of farmers in Kerala have access to cell phones. Approximately 40% of farmers in Sri Lanka have cell phones. That number is rising rapidly. However, the farmers reported that they rarely use their cell phones for accessing agricultural information.

Our group noted that the personal computers have an important role to play in terms of information access at the university and KVK levels. However, there are many barriers to the widespread use of computers by smallholder farmers, including the substantial costs, irregular supply of power, lack of technical support and infrastructure, and lack of supporting business models. Even if personal computers and Internet access were practical, most farmers lack computer and literacy skills to make effective use of them. The computer-based ICT information systems are currently being built on shaky foundations. This will, of course, change as the infrastructure and literacy rates improve. There is no doubt that the PC with a fast connection to the Internet is the optimal platform for access to agricultural information.

Key Information Technology Related Observations

1. Establishing Trust

Getting information to farmers, or anyone else, is futile if that information source is not trusted. Any system that is to serve the smallholder farmer must both function in their technical environments and instill the sense of trust. The technical issues, as difficult as they are, are trivial compared to the trust issue.

Perhaps the most consistent truth we observed related to the information needs of the smallholder farmer was the constant refrain that farmers respect the opinions of other farmers. Lack of trust in most sources of information was a consistent theme on our trip. Farmers don't trust middlemen, bankers, agriculture extension workers, and vendors (specifically in the sale of such basics as fertilizers, pesticides, and seeds). Given that all these elements of the agricultural environment will continue, the real question is how

to make the information they provide trustworthy. We believe that the fact that farmer-to-farmer communications are trusted could supply a needed foundation of trusted feedback and evaluation that would either force the other entities to become more worthy of trust or their information would be deemed trustworthy, when warranted.

A PC in the field in India

Feedback, especially that which comes from farmers, supplies the only mechanism we could identify for assaying the value of the many information sources we explored. We visited research institutes, NGOs, and universities with various collections of research papers, reports, journals, and dissertations. Valuable information is certainly locked in these documents repositories. But determining what is a vein of valuable information and what are the less valuable surrounding materials is not easy task. The only solution we could identify is to openly and genuinely welcome all sources of information and to provide the feedback mechanisms that would allow for the proper classification of worth. The "many eyeballs" phenomenon of multiple user validation of information is one of the prime initiatives to pursue.

2. Breaking the Language Barrier

India reinforced our belief that some form of computer-assisted translation is necessary for any large-scale agriculture information system. Our investigations indicated that perhaps five or six of India's twenty-three official languages might be required to achieve even near universal information access.

We saw demonstrated a program that placed an English document in two panes side-by-side. The right-hand pane then started to be translated into Hindi. Those words that the system could not translate were kept in the original English. The human translator could select each unknown word and then put in the Hindi word. As each word is added, all future translations will benefit accordingly.

The key to this system's effectiveness is the language structure rules and the completeness of the dictionary. We were told that having approximately five thousand known good translations between a second language and English would provide the structural information required. The facility to translate words is directly related to the completeness of the second language/English dictionary being used by the computer.

Fortunately, there are bodies of documents in India that are in parallel languages. For Hindi, the primary source would be the Indian government because of its legal requirement to have documents in both languages. Of course, if a body of agriculture documents could be found in target languages, it would be even better. As for the dictionary, we were told during our visit to the Indian Institute of Technology in Mumbai that they were well on their way to creating an open source Hindi/English agriculture dictionary. We believe that the systematic translation of English language agriculture information into Hindi is well within sight and should be given serious consideration. We should also mention that many of the sources of local information we observed in the various agricultural universities we visited were primarily in English. These sources of information are potential goldmines of relevant local agricultural knowledge and their translation to other languages could make them more available to even the local populations served by the universities.

3. Rebuilding Agricultural Libraries

The majority of libraries we visited were under-funded and in need of updated resources. Creative solutions are needed for increasing library budgets for journal subscriptions and books while building new systems for improving access to open access documents. The libraries we visited all identified the Internet as a primary information source for their students. This claim was all the more remarkable when one saw that the library only had half a dozen old computers sharing an anemic Internet connection. If there is going to be a satisfactory solution to the deficits of the current agriculture libraries, it will be through the Internet and other online sources similar to the transformation taking place in American university libraries.

Clearly, the more agricultural information available to an online representation, the more feasible and valuable an online system would be for agriculture university libraries and for other conduits for agricultural information. India is one of the principle centers for document and book scanning. Specifically, Carnegie Mellon University's Million Book Project has India as one of its main processing centers. Agriculture is one of the Million Book Project's core assets with partnerships with the UN's FAO, the United States National Agriculture Library, and U.S land grant libraries, including Mann Library at Cornell. This collection, which has yet to be released, should be further augmented by the holdings of the local agriculture universities in India. Potential supplemental projects could include an Indian online agricultural journals portal, repositories for providing access to extension documents (one already in pilot stage at MANAGE), and a thesis scanning project (in pilot stage at Haryana Agricultural University). Every indication we saw is that such a comprehensive online collection would be extremely important to the agriculture universities and could potentially be transformational in its effects.

4. GPS and Satellite Imagery

Agriculture is unlike most other disciplines in that it is highly geo-specific. This is a very important fact to keep in mind as information becomes accessible on a global basis. What may work well in one location could be disastrous in another location. At IWMI (International Water Management Institute), we were told of how their staff use of Google Earth's satellite images with local volunteers to take precise measurements of water use. The volunteers go out in the field to fixed GPS coordinates and report what they see. That information can then be used by the IWMI to calibrate its image processing system so that it makes accurate measurements from the images. IWMI is primarily interested in water management and they have already determined that reported water use is quite different from actual water use. These discrepancies are not surprising given that some forms of water use are fee based and thus under-reporting is in the farmer's interest. It would obviously be highly significant to know if the water table will be depleted in five years rather than in ten.

Farmers showing their national awards for rice growing

It would be very interesting to explore if this system now being used for water could be used for other agricultural measurements. The percentage of cultivated land should be reasonably easy. More difficult, but worth substantial effort, would be assessments of specific crop acreage. One of the problems we observed was that the farmers had no reliable information about what other farmers were growing. Thus, they were likely to plant the same crop that many other farmers were growing and therefore risked planting a crop that would eventually be sold in a saturated market place. Any tool that could give an approximate indication of future crop yields would be highly useful. One of the saddest moments of our visit was to a farm family's house in Kerala.

The farmers were award winners for their rice farming techniques. They were quite literally among the best farmers in India. Yet they were close to bankruptcy because they had leased land for the purpose of growing ginger. Unfortunately, many other farmers did the same and now the price is so low that any further efforts to cultivate ginger just increases their losses. It was hardly a surprise for us to learn that the farmer's son wants to become a civil servant.

5. Reaching the Illiterate

One of the primary obstacles to access to information is literacy. A substantial number of smallholder farmers are illiterate. The use of text-to-audio is clearly going to be a principle method for making information available, but developing the system to the point where that process can take place is still a barrier that requires a solution. Microsoft Research in India is currently developing interfaces that use cartoon figures and common symbols to replace written instructions. The system also provides a video on the first screen that demonstrates how the system works and how the data being accessed got there in the first place. This is a concept that frequent users of the Internet and online data might never question, but it is easy to understand that someone with no technological background might find the billions of documents available on the Internet to be unnerving because it could appear that local computer contains all that data. Computer literacy for people who have never been exposed to computer technology requires a deeper level of assistance than it would for a person familiar with computer technology and the many virtual worlds where interactions with other people are performed in a mediated fashion.

This research starts to answer what the important issues are in reaching illiterate and first-time users of technology. We believe that the current work could become the starting point for designing a system for agricultural information for use by the smallholder farmer.

6. WorldAgInfo Online System

The site visits were quite encouraging in terms of our investigation into the viability of a WorldAgInfo system. The WorldAgInfo online system is a conceptual test-bed for the principles and mechanisms of most interest to this project. The visits to Microsoft Research in Bangalore, India and to IWMI in Sri Lanka indicated that some of the key technical challenges we identified for a successful WorldAgInfo system are more than solvable; they are in working form and in some cases performing the tasks we envision for WorldAgInfo. It was also encouraging to see a number of efforts aimed at collecting and distributing agriculture information. Many of the people with whom the team interacted were either interested in some sort of large-scale agricultural information repository or were working on components to achieve this goal. While some of these projects appeared promising, none of them incorporated the degree of feedback mechanisms essential to WorldAgInfo's operation, nor did any of them look beyond their geographic or content focus.

The main lesson learned from the site visits in terms of WorldAgInfo is that partnerships that allow for WorldAgInfo to aggregate and distribute the materials of other projects will be essential. The technology for accomplishing this is not difficult; rather, it will be the letters of understanding that create a mutually attractive partnership that will be challenging. One of the primary obstacles to access to information is literacy. The use of text-to-audio is clearly going to be a principal method for making information available, but getting into the system to the point where that process can take place in still a barrier that requires a solution. Microsoft Research in India is currently developing interfaces that use cartoon figures and common symbols to replace written instructions.

The screen on this page represents what an article on WorldAgInfo might look like.

Conclusions

1. Curriculum reform and enhancement at agricultural universities and other educational institutions in South Asia region – With the changing structure of agricultural markets, and the emergence of supermarkets, there is a need for market-driven curriculum reform and enhancement, including agricultural marketing, food processing, food safety, food packaging, agribusiness, supply chain management, etc. In addition, the curriculum reform needs to encompass the new and emerging areas of science and technology including biotechnology, biosafety, intellectual property rights, geographic information systems, remote sensing, etc.

2. Human Capital Improvement – The human capital base in agriculture in South Asia is depleted. There is a serious need for continuing education and networking programs that link scientists and faculty members from South Asia with each other and with centers of excellence around the world through professional exchanges and sabbatical/study leaves. There is a need to improve incentives, and to recruit scientists and faculty members of international caliber.

3. New Models of Extension – Given that the current extension systems are not effective, there is a need for piloting new extension models such as the village level extension models and ATMA. Special attention should be given to the financial sustainability of public, NGO, and private extension models. The new pilot models should harness the modern ICT tools to help improve smallholder access to real-time information and new technologies.

4. Need for WorldAgInfo – A Global Ag Information Resource - With the new trends of globalization of the agricultural sector, there is a need for a global information resource encompassing diverse areas of agricultural research, education and extension. As a starting point, the WorldAgInfo resources should be piloted using the key priority areas identified by the Design Team prior to the South Asia site visit. The key challenge will be collaboration, partnerships, and intellectual property issues associated with information resources included in the WorldAgInfo. Our site visits confirmed our group's belief that a comprehensive information resource—based, as envisioned in our WorldAgInfo functional overview document—is both feasible and necessary. The visit to Microsoft Research offices in Bangalore provided compelling evidence that some of the most technically challenging aspects described in WorldAgInfo are indeed possible. Other visits, such as that to the Indian Institute of Technology in Mumbai, demonstrated a belief that aggregating and distributing agricultural information on a large scale was timely. WorldAgInfo has the potential to both extend the current agriculture information projects and to reinforce their impacts. However, it will be important to develop any system in consultation and collaboration with already existing large-scale agricultural information systems.

5. Enhancing Agricultural Libraries – Strengthening university libraries has the potential to significantly strengthen research, teaching and extension. The agriculture libraries need investments in the following areas:

- Development of institutional digital repositories for enhancing access to all types of publications, including multi-media.
- Collaborative E-Journals publishing for agricultural libraries throughout South Asia that would have access to journals from all of the universities. Libraries throughout the world would potentially subscribe to the collection as well.
- Digitization of graduate theses and dissertations for easy access and sharing of research findings from South Asia with the global community.
- Connectivity and equipment through high quality, high-speed reliable Internet access and adequate computers, including literacy classes to teach students how to use online resources.
- Consortia purchasing of international journals to reduce costs.
- Acquisition of books and journals in emerging fields of agricultural research and development covering areas such as climate change, biotechnology, food processing, supply chain management, agribusiness, etc.

7. CGIAR Centers – Based on our visits to ICRISAT, Hyderabad and IWMI in Sri Lanka, we observed the increased pressures from donors in pulling CGIAR researchers downstream to work on development problems. Also, a number of Indian researchers expressed their concern about the lack of CGIAR attention in building the scientific capacity of NARS. This is a common problem throughout the CGIAR system and the one that deserves a major study over the next three to five years. The CGIAR Centers have accumulated a wealth of knowledge and experience in specific areas and crops through global agricultural research network. Development of special modular learning materials (based on specific focus and strengths of CGIAR centers) in key areas by the CGIAR centers seems much more reasonable

than undertaking any kind of degree offerings by the CGIAR. New forms of partnerships should be encouraged and supported such as the one created by IWMI with the Imperial College in London to create learning modules on Water Resources and Water Management for a master's degree program.

8. Institutional Innovations in South Asia – Considering the weak linkages among institutions and programs in South Asia region, a competitive grant program should be initiated for enhancing inter institutional collaboration, cooperation and partnerships. These linkage programs should foster and build cooperation and collaboration among institutions within India, within South Asia region, between South Asia and Africa, and enhance linkages with advanced research and educational institutions globally. In addition, in an emerging era of privatization, the competitive grants program should foster public-private sector partnerships. This program could also be designed to encourage the inclusion of women in the inter-institutional partnerships, since in many institutions they are at a significant disadvantage.

9. Moving on Key Technical Hurdles – Our visits with various organizations involved in the testing and implementation of new technologies indicate that it is not too soon to begin large scale evaluation of key technologies, such as automated language translation.

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Schedule for Site Visits of WorldAgInfo Design Team in India and Sri Lanka

June 1 - 16, 2007

Trip coordinated by Dr. Karim Maredia – Michigan State University
Dr. Cholani Weebadde – Michigan State University

June 1: Departure from U.S.A.; Arrival in New Delhi, India June 2/June 3

June 3: Weekend

June 4: New Delhi

Host: Dr. Vibha Dhawan, Vice Chancellor, TERI University,

Hosted by TERI, roundtable meeting and discussion with stakeholders involved in providing agricultural information (related to agricultural inputs, credit, production practices, and market information).

Travel from New Delhi to Hisar, Haryana

June 5 – 6: Hisar, Haryana (Dr. J. C. Katyal and Dr. Ram Srivastava)

Host: Dr. Ram Srivastava, Professor and Associate Director, IP/Technology Transfer Office, Haryana Agricultural University (HAU), Hisar

Hosted by Haryana Agricultural University (HAU). Overview of Agricultural Extension System in India and in the State of Haryana; visit to agricultural knowledge center (KVK), rural technology providers, interactions with farmers, visit to local market, etc.

June 6: Travel from Hisar to Hyderabad

June 7 - 8: **Hyderabad, Andhra Pradesh (Dr. Venkataraman Balaji and Dr. P. Krishna Reddy)**

Host: Dr. Venkataraman Balaji, Head, Knowledge Management and Sharing (KMS)
ICRISAT Campus, Patencheru, Hyderabad, Andra Pradesh

Visit to International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) Information Systems program, and e-Sagu project.

June 8: Travel from Hyderabad to Kochin, Kerala

June 9 - 12: Kochin/Trichur, Kerala (Dr. David Alexander and Dr. C. R. Elsy)

Host: Dr. C.R. Elsy, Assistant Professor
Kerala Agricultural University, Thrissur, Kerala

Hosted by Kerala Agricultural University, visits to Kerala Vegetables and Fruits Promotion Council (KVFPC), Extension service of KAU, rural technology providers, interactions with farmers and visit to a village, visit to a local market, etc.

June 12: Travel from Kochin to Colombo, Sri Lanka

June 13 - 15: Colombo, Dambulla, and Kandy, Sri Lanka

Host: Mr. Adrian Mendis, Commercial Specialist

Host: Dr. Cholani Weebadde, Michigan State University

Hosted by the U.S. Embassy/USDA, Colombo, roundtable meeting with stakeholders, visits to the Department of Agriculture, University of Peradenyia, and Cargill's Food Company (farmer-friendly marketing), interactions with extension personnel, rural technology providers, interactions with farmers, visit to a local village, visit to local market, etc.

June 16: Travel from Colombo to U.S.A.

Report on the WorldAgInfo Visit to Africa (Mali and Zambia)[1]
August 3-19, 2007

Introduction

This report highlights some of the issues and opportunities we encountered during the Design Team's site visits to Mali and Zambia in August 2007. It is organized in three sections. The first two describe our observations in each country. The final section reflects on some major themes emerging from this trip and from the Design Team's trip to South Asia in June 2007.

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

Site Visit to Mali

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 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, and industrial activity is focused on processing these farm products. According to 2008 International Monetary Fund (IMF) data, Mali's per capita purchasing power parity (PPP), which is used as a measure for standard of living, is about US$1,400 per year. This places Mali near the bottom decile of nations.

Community Radio

Claims we heard that Mali is a leader on the African continent in the area of community radio seem to be well-founded based on our experiences on this visit. 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. Supplying market information is one of the primary contributions of community radio to smallholders. This aspect will be covered in more detail elsewhere in the report, but it is important to note that community radio is thriving and already serving a substantial agricultural information role.

One example of how local radio can be leveraged was introduced during our discussions with IPR/IFRA, Mali's college of agriculture and natural resources in the town of Katibougou. During the discussion, a presentation was made on a call-in radio show hosted by a member of the agricultural university's

1. This site visit summary report was prepared by Design Team members Patrick O'Shea and Thane Terrill, with input from the others who participated including Dwight Allen, Doug Allen, Gracian Chimwaza, and Karim Maredia.

teaching staff. Each week a two-hour show is produced and broadcast with the assistance of other university personnel. During the show, listeners are able to call in with questions that are 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 is that stations charge for all the programming, even if the programming is a public service. There appears to be no concept of a public service announcement in Mali. None of the content providers had considered the option of 30- to 60-second radio spots. It is possible that radio stations might be willing to offer these short spots because they provide a community service without sacrificing too much revenue. Given the right incentives, students and faculty in the agricultural departments of universities, or staff at agricultural research institutes (among others) could be trained to produce such "spots." This could result in a mutually beneficial relationship between information providers and smallholder farmers. Farmers would have more information, and feedback elicited by the community radio stations would allow for meaningful information reaching the agriculture universities.

Segregation of Women

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

It was our observation that women in Mali are clear and outspoken about what they need. We had expected that the power dynamic of the village would not allow for the free flow of ideas and a free discussion of the needs of all participants, and that the only way to get any female perspectives would be to separate men from women, and even to separate young women from older women. We were pleasantly surprised to see several instances where women were open and honest with their opinions in the presence of men, including the village chief. When we arrived in the village of Manabougou, located approximately 40 kilometers north of Bamako, the men were already gathering. During the initial stages of preparation for the discussion, it was decided that women in the village should be invited to the discussion as well. During the discussion, the women expressed many important concerns, such as wanting information about entrepreneurial opportunities. They made clear—even with men present— that men could not be depended on to provide the information they 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 we received was that Malian men would prefer to have power over their women even if it resulted in a worse economic future for the family.

Thus, informing the men cannot be assumed to be the same as informing the family. Information intended for women needs to bypass forms of communication that are controlled by men. 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 it is directly accessible in the home. It is thus very important to realize that women have different information needs from men and that information to meet these needs must be communicated in forms and at times of the day when women are available.

Use of Cooperatives

Cooperatives 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 revealed several issues of concern, chief among these was the fact that they were working very hard for marginal gains (each woman's share was about $40 after three months of work). However, 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 in turn has led to their husbands giving them permission 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, 3 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 that very basic information they need is not available to them. This includes information on issues such as planting times, fertilizer, equipment and crop options as well as market prices. The opportunity to participate in value-added processing, such as onion drying, 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 generally lack access to 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 the 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. It should be noted that this was in a village only 40 km down a well-paved road from Bamako and accessible to the cell phone network. The latter fact 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, with people in Bamako unaware of the information gap with farmers.

Marketing Information System

One answer to the lack of agricultural information in rural areas is demonstrated by the Observatoire du Marché Agricole (OMA). This 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 marketplace 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 individual community radio stations and analyzed for an executive summary circulated to a number of Mali's top ministries.

We found widespread awareness of the radio broadcasts of market information. One interesting insight 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. 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. For example, a listener might be capable of listening to a radio station broadcasting music and light news in French or Bambara (the most commonly spoken local language in Mali), but may still need agricultural information to be in his or her local language. 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 best to 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 means that the farmers are forced to sell at the exact point when their goods are 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 higher price later in the year (often back to the smallholders themselves!). This is a very profitable venture for the traders at the expense of smallholder farmers.

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 is safe to assume that all three types of projects will result in high population densities surrounding them, and going back later to install infrastructure will be far more expensive.

Internet Access Limitations

There are two serious concerns with Internet access that affect the ability of the average Malian user to gain access: high operating costs and structural inefficiencies with Internet connectivity. Our visit to a Centre Local d'Information et de Communication (CLIC) located on the outskirts of Bamako illustrates the fundamental problem of Internet access (see photo next page). The center had subsidized Internet

access for its first year of operation with funding from a grant. Once the grant ran out, the center was forced to stop its Internet service because the service was no longer cost-effective. The small amount of money the center currently earns comes primarily from typing local students' term papers.

The problem experienced by this CLIC is widespread throughout the 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. Frequently, we found that sites offering Internet access had 128 to 256 Kb connections and paid between US$1,000 and US$2,000 per 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 make prices so high. Whatever the cause, the Internet is out of reach to the average Malian. While new sources of bandwidth will ultimately need to be found, there may be short-term solutions at the national and pan-African levels that could be identified by a technical assessment. 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. There appears to be the possibility of improving pricing and access with relatively small changes in government policy. 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.

Regional Common Concerns

An impressive level of cross-national cooperation is already taking place across much of the Francophone area of Africa. Besides use of a common currency (the CFA franc) in a dozen 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), which provides information on pesticides and grants licenses for those pesticides approved for use across the member states. INSAH also encourages information exchange to promote the sharing of resources among academics and researchers. INSAH lacks the resources required to extract information required for the smallholder farmer and translate it 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 presented in a suitable form and language.

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 roundtable sessions in which we participated brought people together who normally do not interact on a regular basis. Our visit provided an opportunity for people from different agencies to network, discuss issues, share different perspectives and learn from each other. This was a benefit that the participants themselves noted. In many cases, various individuals and agencies 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 to fostering intra- and inter-institutional as well as intra- and inter-national communication. 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, would also be effective. 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

It was our impression that currently important policy decisions are not being made in a fully informed environment. The debate over biotechnology and the potential for Genetically Modified Organisms (GMOs) is one example. During a meeting with a group of biotechnology experts, they claimed that much of the wary attitude towards biotechnology and GMO crops in Africa is because Africa's policymakers are not receiving all the facts. These experts disagreed with current restrictions on GMO crops. While proponents argue that GMO crops could revolutionize African agriculture so that fewer pesticides, less water, and less fertilizer are required to obtain higher outputs, opponents warn that GMO crops could significantly reduce biodiversity, harm local plants and animals, and make farmers dependent on foreign corporations. Regardless of the position one takes, it is critical that exchanges of perspectives take place with the benefit of the very latest research. Without a more informed environment, optimal choices are unlikely.

Site Visit to Zambia, August 12-19

Country Information

Zambia, which achieved independence in 1964, is a large and sparsely populated country with 78 languages, of which 7 are considered major. It is approximately the size of Texas, with a population of about 12 million. A significant portion of its arable land is contained within its many nature parks. Despite being one of the largest per capita recipients of international aid, the average annual purchasing power parity (PPP) per capita is about US$1,200. This places Zambia in the bottom decile of nations (IMF 2008 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 (Zambia Central Statistics Office 2000).

Educational Radio

Quality Education Services Through Technology (QUESTT) is a project sponsored by Zambia's Ministry of Education through the Educational Development Center (EDC), and funded by the U.S. Agency for International Development (USAID). QUESTT 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 one 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 this is verified with further statistics, the results are truly remarkable. The idea that students do equally well outside of 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 left) in places that do not have a school or electricity points to a need for technical literacy. In North America, users learned how to operate a cell phone after decades of using landline telephones, answering machines, email programs, 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 discussions with Zambia's mobile telephone company, Celtel, we found that they had a training system for 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 do not want to embarrass their users by bringing 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 rather than 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 radio broadcasts there is a set amount of time during the broadcast for class discussion, but that time is not necessarily the same for everyone. Using MP3 devices, such as an iPod, the instructor can control the amount of time used for discussion. 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. 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 see with the use of MP3 devices is the need to have a computer 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 is 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 has data network service. At present, Celtel is moving from GPRS to EDGE data transmission standards. Fortunately, the speed of the connection is not critical in this scenario because MP3 files are not being played in real time. It does not matter if it takes an hour or 10 minutes to transmit a 30-minute class to the teacher. The quality of the file is exactly the same regardless of how long it takes 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 currently have the 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 presentations 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 audiences, especially women, listen to broadcasts in groups. In some situations this may be due to a lack of enough 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. Radio technology is well-suited to address this challenge as it does not require a middleperson 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 successful, profitable commercial farmers as opposed to subsistence farmers, which they are now. In Zambia, most farmers do not sell their produce on the market. Most of what they grow is consumed by the family or traded with other farmers.

The women we met did not classify themselves as commercial farmers. 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. The insight we gained from our visit to this group was that the question might not have been asked correctly in earlier settings. We did not think to specify 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 one 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 learned 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.

Digital Resources

The Acting Director of the University of Zambia library 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 journal delivery resources, AGORA, HINARI and OARE, which are led by the FAO, WHO and UNEP, respectively. Unfortunately, the library 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 10 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 are the only viable way to bring the University of Zambia's library up to international standards.

In our meeting with FAO, we learned that even when funding is available for technology, it does not always guarantee a successful outcome to a problem. There is also the issue that sometimes related information is housed in multiple databases, which makes it difficult for managers and users to see important patterns that might emerge if the information could be consolidated. This problem is then exacerbated when within countries there are misalignments between political and organizational districts. What we took away from our meetings at the University of Zambia library and the FAO is that digital resources and new equipment will only have a positive impact if the entire system is well thought out. In the case of FAO, they are losing some of the value of their data 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 10 computers. Information interventions should be more comprehensive in scope and funding made available for networking opportunities to promote information sharing.

Leveraging Private Cell Phone Networks

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

We visited two organizations that use SMS messaging systems for agricultural purposes. Zambia National Farmer's Union (ZNFU) allows farmers and wholesalers to obtain weekly agricultural pricing information. ZNFU's system functions more like a commodity trading index because the system is based on bid and ask prices, not actual sales. Although this SMS system is definitely an improvement over not having any access to market information, it does not have the accuracy that we saw in Mali, where the price was determined by the market enumerator physically seeing a trade taking place.

The Zoona Project uses SMS messages to transfer funds. Most Zambians do not have bank accounts. Not only is interest on bank accounts very low but any movement of money comes with a large transaction fee. A high level of inflation also makes bank accounts unattractive. Zoona is not designed to provide banking services, however, its SMS messaging service to transfer money enables people avoid the expensive money transfer fees common in Zambia. While still new and not yet widely deployed, this service does allow for greater movement of money than previously.

Generally, farmers immediately spend their harvest earnings on livestock or other material purchases. The livestock is then sold to purchase seeds and fertilizer. In this economic model the farmer is constantly selling when the market is saturated and purchasing when many other farmers are also purchasing. Both in Mali and Zambia, farmers would benefit substantially if they were able to hold their harvested crops off the market for short periods of time or to buy when the prices were lower. Celtel recently spun off a business unit, Celpay, which will explore the potential for cell phone-based banking. However, this will be a challenge in Zambia due to the high rate of inflation.

Everywhere we traveled in Zambia we saw evidence of Celtel's signal and observed signs of its operations. Celtel currently accounts for 15% of the cell phone market in Zambia; market penetration is expected to increase to 40% within five years. Based on these figures, we can reasonably assume that most communities in Zambia will have substantial access to cell phones in the next five years. Celtel's creation of a nationwide bi-directional communication system is a truly remarkable accomplishment and we believe one that could only have been achieved by the private sector.

Celtel, however, has a strong interest in the poorest segments of Zambia's population, especially 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 as many of the residents of the urban townships have rural relatives with whom they wish to communicate.

Celtel has also devised, though inadvertently, a socially beneficial service called "Me to You," which involves the transfer of cell phone minutes. 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 expensive bank transaction fees. Celtel's motivation is to increase cell phone use and reduce the number of physical phone cards they must sell. If a smallholder farmer knows someone in a city who can purchase cell phone time and transfer it to him/her, s/he can then transfer time to 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.

Over all, we observed that the private sector can play both constructive and destructive roles, and often even a combination of both. For smallholder farmers, the main problem in depending on the private sector is that they normally do not the economic clout for the private sector to cater to them profitably. This means that they tend to be ignored as a market segment. We believe that associations with the private sector can be beneficial to both the company and to the community as long as those asking for help are cognizant of the corporation's primary responsibilities to its shareholders.

Some Final Observations from the Site Visits to Africa

It is clear from our visits that improving access to information is critical for all levels of farmers. In fact, as the farm size gets smaller, access to accurate information becomes relatively more important, and, on occasion, can mean the difference between life and death. Until recently, farmers relied on others in their village and nearby villages with whom they traded for their "information system." Today, we refer to the world as the global village. In today's village the farmer does not have access to all the pertinent information necessary to survive and compete. The farmer of the past knew who was growing what, what seed varieties were available, and what the wholesale and market prices were. Technology of various types has created the global village. Now the task is to use technology to reintegrate the farmer into the information landscape of this new world.

There are many barriers between designing an information system and making it happen. There is also the temptation to believe that the answer to problems in these regions is to reproduce what we know already works in the West.

As attractive as it might seem to solve the problems of South Asia and Africa with massive influxes of computers and satellite dishes, the results would likely be mixed, at best.

National Intranet

In both Mali and Zambia we saw a strong need for improved Internet access. As previously mentioned, access is expensive and unreliable because of the dependency on satellite connections and weak connections to the global Internet network. In this context, it is relevant to think about what the Internet enables, namely the collection of content and ability to create content. This becomes meaningful in thinking about cell phone networks, which in fact 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 and expense of accessing the Internet outside of national and continental borders. This raises the question whether it might be possible to create a local call environment.

Most of the agricultural information farmers in Mali or Zambia need is probably available within their respective countries. This would be even more the case if content had been translated into a local language. We already know from examples of how TEEAL is used that valuable content can be pre-packaged for local delivery. The conclusion we came to was that Mali and Zambia could use 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. Moreover, the construction of a healthy local Internet system would greatly increase the likelihood that international Internet providers would want to connect with Africa. Until Africa demonstrates the same degree of penetration with the Internet as is now occurring with cell phone systems, there will be little incentive to install connections.

Technically, it should be quite feasible to create 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. First, a local Internet exchange location must be established where all the national Internet providers can have high speed access. Secondly, the Internet providers need to structure a billing system so that customers are billed at a much lower rate for local information and are alerted when a link to information outside the national system is required.

Once a certain momentum is achieved, the system should become self-sustaining and profitable. It is also likely that efforts to produce content for the Internet locally would become much more attractive. 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.

Formative Evaluation

In the development of any future information system, feedback must be a key component. 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 with and understand the context of persons providing the information is essential to how credible farmers perceive information to be. Every successful project we saw had some sort of feedback mechanism and every system that was not working did not have such a mechanism and was out of touch. The need for feedback and community applies not only to farmers, but is key to all information solutions. However, focusing on developing new alternatives in the smallholder context may suggest new solutions for the developed world as well.

One of the most notable aspects of our trip was how often those responsible for projects did not really know 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. For many projects, the only evaluation 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 this problem. Service providers in the capital were feeling successful because they were creating materials and producing new seed varieties needed in the rural areas. The shortcoming was that no one was measuring the ultimate effectiveness of these inputs. 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.

One particularly good example of formative evaluation, however, is the FAO's Disaster and Recovery Department's use of near real-time data collection in Zambia. The FAO is using a digital-paper system to collect information and cell phones to transmit the information via a series of SMS messages. Digital paper (seen to the left) is a special type of paper that 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 think this use of digital paper is an excellent example of a low-cost system for collecting near real-time information. While it would have cost about the same 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 develop their database reporting tools further so that information coming into the system can be analyzed more effectively. Currently, information is often misinterpreted because Zambia's diverse administrative zones are not always clearly aligned. Thus patterns of disease that might be discovered are lost. We suggested that a GIS system for mapping the data might be a good solution.

The only place we saw true formative evaluation was at the major cell phone provider, Celtel. Celtel both measures 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 improve infrastructure services to these areas. They also looked for towers that were 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 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 should be noted that the best example of formative evaluation we saw is being undertaken by a commercial venture. As a profit-making endeavor, it has a vested interest in making sure that its practices are 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

Based on our interactions on the sites visits to South Asia and Africa, it appears that farmers in South Asia frequently use too much fertilizer and farmers in Africa use too little. In Zambia we attended a number of presentations indicating that African farmers were using too little fertilizer and lime and that soil fertility is a major issue in Africa. Another important issue relates to government subsidies. Government subsidization 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 soil productivity can be greatly improved. An obvious question is why farmers are not using more fertilizers. One reason seems to be that even with government subsidies, fertilizer in many African countries is still more expensive than in South Asia. Another reason is that farmers lack information about how much fertilizer needs to be applied.

Zambia has a nationwide standard of fertilizer use called "four by four." The argument for using this cookie-cutter model is that it is a baseline amount from which every Zambian farmer can benefit. We also heard that very few of the farmers were able to follow this recommendation. What is clear is that farmers currently do not 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, crop being grown, soil pH, and the current conditions of the soil. Something as simple as having the wrong pH or not having water to activate the fertilizer can result in the fertilizer being wasted. While soil testing is available to farmers through various outlets, only a few thousand farmers, almost all of whom have larger land holdings, take advantage of these services. What is needed is some sort of soil testing device that provides information on the critical soil factors and recommendations based on farmer-controlled variables. Our meetings with farmers indicate that farmers do not always choose to achieve the maximum output due to reasons

of food security, payment schedules, and various opportunity costs. The important thing is that farmers are fully informed as to their options. They will more likely make the best decision based on enhanced information.

One of the principle barriers to the greater use of fertilizer in Africa is its high cost. Fertilizer is not just expensive, it is 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.

Viability of Smallholder Farmers

Finally, another issue we debated with officials in Mali and Zambia is the future viability of the smallholder farmer. Some people argued that the operations of subsistence, resource-limited farmers are simply not viable and thus less worthy of support than larger, more commercially successful farmers. Others claimed that the issue is not so much the size of a farmer's operation as it is access to information and education that may allow them to choose profitable crops and engage in additional value chain activity.

We offer this observation in the spirit of searching for sustainable solutions. We note that although there is a strong trend to urbanization in much of Africa, the absolute number of people living in rural areas is forecast to grow. This means less land to allocate among a growing rural population, in which case the question of viability becomes even more acute. Does the future of the smallholder farmer lie in improving their productivity? 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 larger towns and cities?

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.

Tentative Schedule of Activities for the WorldAgInfo Design Team
Mali, August 8-11, 2007[1]

Trip coordinated by MSU Mali (PROMISAM) Office

Dr. Nango Dembélé – Based in Bamako

John Staatz – Based in East Lansing

Saturday, August 4

- Arrival in Bamako

Sunday, August 5

- MSU office for briefing by MSU team on: (a) brief history of food and agricultural development in Mali, (b) information issues in Malian agriculture, (c) role of MSU food security project in helping smallholders, policy makers, and consumers, and (d) discussion of the Mali trip agenda
- Visit with farmers in the village of Manabougou, about 35 km from Bamako (on the road to Koulikoro).

Monday, August 6

- Ministry of Communication and New Technologies (Minister: Gaoussou Drabo) [confirmed]
- Ministry of Agriculture (Minister: Seydou Traoré)
- Visit to Food Security Commission:
  a. Commissioner (Mme. Lansry Nana Haidara)
  b. Food Security Commission Information Center: www.csa.org (Coordinator: Ibrahima Djiré)
- Market agricultural information system (Observatoire du Marché Agricole – OMA) headquarters: www.oma.gov.ml (Coordinatior: Salif Diarra)
- Institut du Sahel – Discussion regarding online databases: www.insah.org (Director General: Moustapha Amadou; webmaster, Aguibou Coulibaly)

Tuesday, August 7

- Round table discussion in Bamako among agricultural researchers, extension workers, and the users of research (farmers). Meeting held at the National Agricultural Research Institute (IER) headquarters [www.ier.ml (Director General: Bino Temé], involving IER, National Council of Agricultural Research, NGOs, Farmers' groups (comités des utilisateurs de recherché, women's associations, AOPP (Association of farmer professional organizations), SYCOV (cotton farmers' union), IPR/IFRA (Ag. School, with staff member focusing on livestock issues).
- Discussion with those working on rural connectivity issues, including rural internet center networks (CLICs) and linked village kiosks (cybertigi). Meeting held at and co-organized with Commissariat à la Sécurité Alimentaire (CSA).
- Working dinner with Nango Dembélé and John Staatz to recap the day's discussion

Wednesday August 8

- Travel to Office du Niger (Niono) area (Mali's largest irrigated rice area)
- Visit decentralized market information offices and meet with staff of local rural radio stations to discuss how the two organizations work together
- Meet with women farmers' association involved in horticultural production to discuss their information needs and current sources of information.
- Visit local rural internet center (CLIC)

Thursday, August 9

- Roundtable discussion with farmer associations, local NGOs involved in extension, IER researchers (from Niono rice research station) and Office du Niger workers regarding agricultural information needs of smallholders and sources of information, training needs, etc. Hosted at IER regional research center
- Return to Bamako.

Friday, August 10

- Meeting with USAID in Bamako to discuss its work in agricultural information
- Travel from Bamako to IPR/IFRA in Katibougou
- Meet with IPR/IFRA staff and students to discuss their use of information technology and their role as a regional training center for agriculturalists in Francophone Africa.
- Return to Bamako.
- Reception (Key stakeholders and MSU alums)

Saturday, August 11

- Meet with IPR/IFRA students (in Bamako) about follow-up survey on farmers' information needs and sources
- Wrap-up team meetings in Bamako

Schedule of Activities for the WorldAgInfo Design Team
Zambia Site Visit, August 13-19, 2007[1]

Trip coordinated by FSRP/MSU Cooperating with ACF Zambia

Dr. Jones Govereh – Based in Luska at FSRP

Dr. Michael Weber – Based in Lusaka FSRP

Dr. Klaus Droppelmann – Based in Lusaka at ACF

Sunday, August 12

- Overview briefing on Design Team visits. Review of Zambia briefing documents. (Jones Govereh and Michael Weber FSRP/MSU)

Monday, August 13

AM

- Welcome and overview of ACF and key Zambia Agriculture policy documents and donor activities in Zambia in agriculture
- Overview of FSRP research/outreach, and smallholder farming situation. Also overview of the importance of private extension and outgrower models (Cotton outgrower story including conservation farming)
- Presentation/discussion by Dr. Thomas Jayne on Smallholder Farming Constraints and Opportunities in Southern Africa, including data on Zambia
- Open Discussion

PM

- Zambia eBrain Forum Offices. Sebastian Musonda, eBrain Forum Program and Information Officer. Introduction and overview of eBrain Forum, including discussion of Thematic Groups [http://www.ebrain.org.zm/thematics.php] and the *Zambia National Information and Communication Technology Policy* (Final Draft) including overview of Section 6.8 on ICT and Agriculture and Section 6.10 on ICT in Tourism, Environment and Natural Resource Management.
- Open discussion/questions from WorldAgInfo Design Team
- Ministry of Education Meeting - Zambia Quality Education Services Through Technology (QUESTT) Project [**http://ies.edc.org/ourwork/project.php?id=3602**] (Educational Development Center (EDC)) funded by USAID as part of their support efforts in education.
- Visit Lusaka food markets. *CSO/FSRP 2007/08Urban Food Consumption Study Overview* [**http://www.aec.msu.edu/fs2/zambia/CSO_FSRP_Urban_Food_Survey_Overview_July17_2007.pdf**]

1. August 10, 2007 working version of the schedule

Tuesday, August 14

AM

- PANOS Institute Southern Africa Offices. Round Table Presentations and Discussions on Radio Forum Experiences and innovations to strengthen agricultural and natural resource extension and farmer learning. Participating in Round Table: NAIS National Agricultural Information (Mr Mukelebai, Director); MACO Extension; PANOS Institute, Southern Africa (Parkie Mbozi, Director)
- Zambia National Farmers Union (ZNFU) Offices. Mr. Hamusimbi Coillard. Review and discuss ZNFU's program of market information access via SMS [**http://www.farmprices.co.zm/**]. See ZNFU website: Commodity Price Information
- Discussion and overview of field activities to be seen on Wednesday in Kabwe

PM

- Working Lunch at Show Grounds with Representatives of Agriculture Lead Donor Group (SIDA, USAID, World Bank Zambia) and Other Donor Programs
- Zambia Agricultural Research Institute (ZARI). Mr. Davy Simumba, Project to Develop an Effective Information Flow Network for ZARI.

Wednesday, August 15

AM

- Ministry of Community Development and Social Services. Mr. Henry Nkhoma, Director of Community Development
- Depart Lusaka to travel to Central Province Kabwe
- Golden Valley Agricultural Research Trust (GART) and Conservation Farming Unit

PM

- Kabwe Radio Marantha, 103.5FM Community radio station. Mr Hangala, Station Manager.

Thursday, August 16

AM

- Field visits in and around Kabwe, including Ministry of Agriculture and Cooperatives (Kabwe District Office); Kabwe Agriculture Market Information Service (KAMIS); Kasanda Market demonstration on price collection; ZNFU District Farmers Association telecenter and information centers; National Agricultural Information Service (NAIS) Rural Radio Forum and Natuseko Womens Groups.

PM

- Ministry of Community Development Adult Literacy Training and Kabwe Skills Training Center
- Return to Lusaka

Friday, August 17

AM

- University of Zambia (UNZA). Round Table Discussion with staff and others on Information Communication Technology Applications in Zambia: Mr. Sikaaba Mulavu, Project Manager,

VLIR UNZA IUC Programme, and co-author of *Towards an African e-Index (SMS e-Access and Usage across 14 African Countries*. Also member of "Research ICT Africa." Dr. Akakandelwa Akakandelwa, Acting Head Librarian UNZA Library. E-resources and related development strategy of the UNZA Library. Include comments on ICT activities of the Library Association of Zambia. Collins C., Chinyama, Director Computer Center, UNZA. UNZA ICT Strategy

PM

- To be decided: COMESA ICT Program and/or Agricultural Support Programme Extension Efforts and Insights. Document about MOAAS
- Profit Project and Local Partners Quick Pay Zoona Project via cell phones.
- FAO Vet and Animal Information Transmission and Database?

Saturday, August 18 (Wrap up)

Other Ongoing Activities and Resources Available Online for Potential Use by the Design Team

1. International Institute for Communication and Development (IICD) Portals for work and support in Mali and Zambia, among other African countries.
2. PANOS West Africa
3. PANOS Global Network - Aims to ensure that information is effectively used to foster public debate, pluralism and democracy. Works with the media and other communicators to help developing countries shape their own agendas. Particularly focuses on amplifying the voices of poor and marginalised people. Does a lot of innovative work with rural radio forums.
4. PANOS - Radio listening clubs in rural African communities (Including a Guide Book)
5. Radio Farm Forum and Afronet: Learning from Successful ICT Projects in Zambia By: Raja Bobbili and Marta Luczynska
6. Fair Access to Internet in Africa - Report by Link Center, Jensen, M, and RIA! network members, JHB, 12 February 2004
7. UN-ECA- African Network of the Global Alliance for ICT and Development
8. UN-ECA Overview: Regional ICT Best Practices Forums - West Africa
9. NEPAD e-Africa Commission - The purpose of the NEPAD ICT programme is to accelerate development of ICT infrastructure and ICT skills. It is also intended to bridge digital divide in Africa and between Africa and the rest of the world.
10. COMESA ICT and Information Technology. Also Food & Agricultural Marketing Information System (FAMIS)
11. e-Agriculture.org - A global initiative to enhance sustainable agricultural development and food security by improving the use of information, communication, and associated technologies in the sector. Multi Donor Support
12. Web2forDev - Participatory Web for Development (25-27 September 2007) Networking, collaborating and exchanging knowledge in agriculture, rural development and natural resources management. Web2ForDev 2007 is the first conference devoted to exploring the ways in which international development stakeholders can take advantage of the technical and

organizational opportunities provided by Web 2.0 methods, approaches and applications. Multi Donor Support.

13. infoDev - Information for Development - Focusing on information & Communication tools to combat poverty. infoDev works to promote better understanding and effective use of information and communication technologies (ICTs) as tools of poverty reduction and broad-based, sustainable development. Multi Donor Support.
14. Rural ICT Toolkit -infoDev Publication
15. IAALD Blogspot - Agricultural information news from IAALD (International Association of Agricultural Information Specialists)
16. CGIAR ICT-KM Program - Connecting People, Technology and Knowledge for Agricultural Innovation
17. OECD-DAC Network on Poverty Reduction: "Good Practice Paper on ICTs for Economic Growth and Poverty Reduction"
18. CTA Update - Issue 37: Podcasting A new way to reach rural communities - June 2007 (CTA is an ACP-EU institution working in the field of information for development.)
19. ICT DevLibrary - Commonwealth Telecommunications Organization's (CTO) ICT Development Digital Library thatrovides a unique collection of ICT-for-development reports and documents for policy-makers and practitioners in developing countries.
20. Building Digital Opportunities (BDO) Programme - Information and Communication Technologies (ICTs) and Poverty Reduction in Sub Saharan Africa A Learning Study (Synthesis) By Richard Gerster and Sonja Zimmermann, October 2003
21. The cost and benefits of ICT's for direct poverty alleviation by Kenny, C, World Bank, 2002
22. ICT4Africa/Country Report Zambia (From WikiEducator)
23. ICT4Africa/Country Report Mali (From WikiEducator)
24. Soul Beat Africa Search on articles for Mali
25. Soul Beat Africa Search on articles for Zambia
26. Zambia Page on Information Communication Technology (ICT) on the FSIP for Africa Portal http://www.aec.msu.edu/fs2/test/links.cfm?Country=53&Topic=22&Lang=en
27. Mali Page on the Information Communication Technology (ICT) on the FSIP for Africa Portal http://www.aec.msu.edu/fs2/test/links.cfm?Country=31&Topic=22&Lang=en