Final Technical Report of eARN Africa Project

eAgriculture Research Network: Effectiveness of ICT-Based Interventions in Linking African Farmers to Markets (Grant No. 105295)

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Project countries: Kenya, Uganda, Benin, Madagascar, Malawi and Ghana

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Table of Contents

Project Synthesis

Poor access to market information is an important impediment to the commercialization of smallholder agriculture in Africa. Yet agriculture remains the engine of growth and rural development in Africa. Agricultural commercialization requires greater access to efficient input and output markets by farmers which in turn depends on the access to information. Attempts to improve smallholder farmer access to efficient markets have recently shifted to the use of ICT-based interventions. Recent studies have documented widespread use of ICT-based applications in agriculture in Africa. For instance a scoping study commissioned by IDRC and the background studies conducted during the eARN Africa proposal development stage found many ICT applications in agriculture in Africa. This study aims at systematically analyzing the existing ICT-based interventions to determine what works and what does not in the context of smallholder agriculture and if ICT contributes to commercialization of smallholder agriculture and household food security in Africa.

Research problem

Smallholder subsistence producers form the majority of both the rural poor in Africa. However, smallholder farmers face significant challenges in accessing markets for both agricultural inputs and outputs. Enhancing returns from agricultural production through improved access to markets is therefore vital for the realization of poverty reduction goals of African countries. Improved market access can result in production of marketable surplus and increase in household income and can therefore spur commercialization of agriculture and hence directly impact on farmers' livelihoods.

Access to agricultural information by the poor subsistence or semi-subsistence smallholder farmers also has the advantage that it can enhance productivity. However, majority of smallholder farmers tend to have very poor access to agricultural information both from the public sources as well as private sources. Consequently, there have been efforts to use ICT-based interventions to reach

farmers with timely information in Africa. Indeed, many ICT-based market information service projects have been implemented in several developing countries in the last one decade. A study commissioned by IDRC in 2007 found that 31 such project had been implemented in Kenya alone. Despite these efforts, and the application of ICTs in African agriculture, only a few studies had attempted to investigate the effects of such interventions prior to the eARN Africa project. At the same time, none of the past studies had systematically examined the effect that ICT-based agricultural information service (MIS) projects have had on smallholder agriculture and their successes and/or failures in a broader context that encompasses, among others, the different cultures, commodities, and farmer types. eARN Africa was thus designed with a broad goal of examining the effectiveness of ICT-based projects in linking African farmers to markets.

Project objectives

The specific objectives of the eARN Africa project were:

1. To analyze existing ICT-based initiatives and the environments within which they are applied.
2. To examine the factors influencing the awareness and adoption of ICT-based market information services
3. To assess the effects of participating in ICT-based market information projects on smallholder farmers
4. To examine the effect of participation in ICT-based market information service project on the performance of agricultural markets
5. To critically analyze the challenges encountered by the ICT-based market information service projects for linking smallholder farmers to markets
6. To use the findings to influence ICT policy and practice in each participating country
7. To enhance collaboration among African researchers and to build research capacity of project partners and young researchers.

8. To use the findings to influence ICT policy and practice in each participating country.

Research methods

This project used both quantitative and qualitative techniques to address the study objectives 1-5 which required empirical investigations. Qualitative methods were used to investigate the environment in which ICT-based projects are deployed and the challenges such project face. Quantitative methods were, on the other hand, used to investigate the factors affecting awareness and participation in ICT-based projects and the impact of participation in ICT-based projects on households as well as on the performance of rural agricultural markets. We discuss each method in more details below.

Qualitative methods

This study used Yin's case study methods to address objectives 1 and 5 of the project. Addressing these objectives required that the *how* and *why* questions relating each ICT project implementation, progress, outcomes be answered in order clearly understand the environment in which the selected projects were deployed and also the challenges that such projects have faced. These kinds of questions are usually best handled using case study methods. Thus each study country used the Yin study methodology to address Objectives 1 and 5 of project.

Yin in the 2005 edition of his book, "Case Study Methods", outlines the steps that should be followed in systematically analyzing a research case. It especially emphasises the importance of gathering evidence from multiple sources and then triangulating the evidence in order to allow the analyst to test specific empirical hypothesis based on theory. The eARN research team developed a case study guide during the Kampala project implementation workshop that aided in the collection of evidence from multiple sources. Annex 1 presents this case study guide. The guide was used to collect information for each of the two selected projects in the six study countries focusing on the environment in which the selected ICT projects were deployed, the challenge such

projects faces, how and with what effect the projects responded to identified challenges and the strategies used by successful projects to overcome the challenges.

Quantitative methods

These methods are usually used to address the *what* questions in empirical research. These methods were used in this project/study to investigate the factors affecting awareness and participation in ICT—based projects and the impact of such projects on smallholder farmers and also on the performance of rural food commodity markets. These issues were the subject of Objective 2, 3, and 4 of the eARN Africa project.

This project used household decision models in addressing Objective 2. In particular, it used regression analysis to estimate binary choice regression models so as to isolate the factors that affect awareness of ICT-based projects by farmers and also whether or not farmers use market information services (MIS) provided by such projects. The same regression techniques were applied in addressing part of Objective 3 relating to the factors that affect decision to participate in ICT-based projects. The study then used the Poisson, Negative Binomial or Ordinary Least Squares (OLS) regression techniques to investigate the extent of use MIS by smallholder farmers. The extent of use of MIS was modelled either as a discrete count variable (hence amenable to Poisson or Negative Binomial Regression analysis) or continuous variable (hence amenable to OLS regression).

Examining the effect of participation in ICT-based projects on smallholder farmers (Objective 3 of the eARN Africa project) was extremely important to this project. It is this objectives that aimed at addressing the major goal of the eARN Africa project namely, whether ICT-based projects are effective in linking African farmers to markets. Hence the project team identified agricultural commercialization as the proxy for market linkage and, in measuring impact, examined how participation in ICT-based projects affected this proxy. Agricultural commercialization is defined as the share of total agricultural production marketed by the household. The literature distinguishes between input commercialization (the share of purchased inputs used by the household)

and the share of total household production (for both crops and livestock) that is sold. This project used both definitions and hence assessed both input and output commercialization.

The impact of ICT-based MIS projects on the performance of rural agricultural markets was assessed in Ghana, Kenya and Malawi only. These were the only countries where data was available to support the kind of analysis required to address this objective. In both Ghana and Malawi, co-integration analysis was used to assess the effect of ICT-based project on performance of agricultural markets. Cointegration analysis captures how prices in one market (i.e., destination market) change when there are changes in prices in another market (especially source market). In Kenya on the other hand, simple measures of price volatility and spread namely coefficient of variation and marketing margins were used.

Methodological challenges

One of the major methodological challenges the project faced was with regard to the quantitative method to use in examining the impact of participation in ICT-based projects. Three methods have been applied in the literature for the kind of issue and nature of data as we had in the eARN Africa project. These methods are the instrumental variable approach, the Heckman method and the propensity score matching technique. The first 2 methods have recently come under heavy criticism because of their restrictive assumptions. The eARN research team thus opted to use the propensity score matching technique. This technique has gained popularity the recent past as an impact assessment and project evaluation technique especially where the analyst does not have baseline data, as was the case in eARN Africa project.

The propensity score matching (PSM) technique matches a treatment individual in the dataset with a control individual who has the same counterfactual characteristics (except for participation) and then computes the difference in outcome variable (e.g., share of produce marketed in our case) for reach of the pairs. The differences are

then averaged over the sample to give average treatment effect on the treated which is a measure of the impact of the treatment (intervention).

The challenge to the team was that this method was unknown to the partners and was fairly technical both theoretically and even empirically. The team therefore had to undergo specialized training on how to use the method, but not with some delays in getting the planned outputs. The project invited an expert to centrally train the research team on PSM during the midterm workshop before the project could tackle Objective 3 fully. There was one more challenge with regard to using the method. In some of the countries, notably Benin and Uganda, the data collected was not amenable to PSM technique because there was no proper distinction between the treatment and control. In Uganda, the problem arose due to the manner in which the data was collected by the country partners. Specifically, the Uganda team collected data from the villages/areas covered by the ICT project but failed to stratify the sample by participation in ICT project. In Benin, on the other hand, the projects being examined did not have sufficient number of treatment individuals to support the analysis. However, Benin used PSM to access the effect of ICT ownership and use on smallholder farmers.

Project Activities

The eARN Africa project conducted a number of activities in order to achieve the study goals. These activities are listed and described chronologically below

1. *Project implementation and methodology workshop*

This was the first activity held under the eARN Africa project workshop. The goal of the workshop was to plan the implementation of the project. The workshop had a secondary objective of looking at the research proposal again and examining whether the proposed study methods were appropriate. In doing this, the workshop recommended that the team be careful in how it conducted an evaluation of the ICT-based projects selected for study in each country. This workshop also developed the

case study guidelines to be used in conducting detailed case studies in each participating country.

The implementation workshop also invited experts in communication for influence from the Overseas Development Institute (ODI) and also an expert on electronic data capture from University of Nairobi to train the team members. The ODI expert trained the eARN Africa research team on how to plan to communicate research findings to influence policy and practice and the strategies to use in doing so. Some of strategies that the team was exposed to included targeting different audiences with different information packages. The University of Nairobi expert on the other hand trained eARN team on how to collect information using electronic hand held device that would eliminate the need for data entry and ease the transfer of data.

The lesson learned from the ODI training on planning the study with end users in mind greatly improved the way the eARN team reached out to different audiences with the information. A number of the communication strategies eARN team learned during the ODI training were implemented. For instance, the team learned the need disseminate the information to farmers, scientific community, and policymakers using different channels. Indeed, the team used a variety of channels to relay information to different audiences. These included workshops targeting policymaker and scientific community (e.g., the national workshops and symposia), targeting farmers (e.g., radio talk shows in Ghana) and newspaper account of the project (Uganda), targeting ICT practitioners (e.g., national workshop held in Kenya), targeting policy implementers (e.g., invitation of government representatives to the end-term workshop), targeting the academia (e.g., journal publications – all countries—and poster in Ghana).

Figure 1: e-ARN Africa inception Workshop participants discussing empirical methods in one of the sessions

2. Case studies

Immediately after the Kampala workshop, each country team launched detailed case studies following the guidelines developed at the workshop. Each country team focused on two ICT-projects proposed during the proposal writing and validated during the implementation workshop. The projects were DrumNet and Kenya Agricultural Commodity Exchange (Kenya); BROSDI and WOUGNET (Uganda); Food Security and Nutrition Joint Taskforce and Malawi Agricultural Commodity Exchange (Malawi); The Last Mile Project (MLMI) and Project for Promotion or Rural Revenues (PPPRR) (Madagascar); TradeNet and Market Access Promotion Network (MAPRONET) (Ghana); Center Songhai and Resimao (Benin). The case studies were conducted in most countries in 2 rounds. The first round ended prior to the midterm workshop held in Cotonou (Benin) in June 2010 while the second round

ended in June 2011. The second round of case studies was recommended by the scientific advisors in order to help the teams collect some additional information that could be used to explain the findings of the quantitative analyses. Unlike others, the advisors especially felt that Malawi and Uganda needed to collect more information through case study interviews to help explains some of the findings.

3. eARN Africa China symposium

The China symposium was held at the International Association of Agricultural Economists (IAAE) meeting in Beijing – China in August 2009. The aim of this symposium was to bring experts in ICT studies together to present their experiences. The second objective of the symposium was present the planned studies under eARN Africa project to international audience participating in the IAAE meetings in order to introduce the project and also obtain comments and suggestions on the proposed study methods. The symposium was attended by a broad range of audience including World Bank, FAO, international research organizations, universities and Gates Foundation among others.

The major achievement of the China symposium was the introduction of eARN project to the international community of agricultural economists, scientific/research organizations and the broad development community comprising the World Bank, United Nations, FAO, The Gates Foundation and the African Development Bank. The key outcome of the workshop was awareness of project by development agencies and researchers. Due to this some of the agencies, notably the World Bank, requested and used information/findings from the eARN project to incorporate in their reports. For instance the World Bank used the eARN project findings in Ghana and Kenya to prepare the Worl Bank source book on ICT and Agriculture.

The presentations made during the China symposium along with the presenters are listed below. Three of these presentations were developed into journal publications and published in the International Journal of ICT Research and Development in Africa.

1. Harsha de Silva: "Using mobile phones to link fresh export vegetable farmers to high value markets: Experiences from Sri Lanka"

2. Megumi Muto (for Jenny Aker): "The digital provide: The role of mobile phones in improving efficiency of grain marketing in Niger"

3. Blessing Maumbe & Julius Okello: Application of ICT in African agriculture: Comparative experiences from Kenya and South Africa

4. Julius Okello & Edith Adera: Using ICT to integrate smallholder farmers into agricultural value chain: The case of DrumNet in Kenya

5. Irene Egyir & Julius Okello: The eARN project: Goals, status, and the way forward.

4. *Development of Survey tools*

The writing of household and trader survey tools started during the Kampala workshop. At the workshop, the eARN team constituted 2 sub-teams to specifically drive the writing of the two tools. The household survey sub-team was headed by Prof. Ramatu al Hassan (University of Ghana) while the team in charge of spearheading the writing of the trader survey team was headed by Dr. Julius Mangisoni. The tools took a very long time to complete due mainly to the difficulty of reaching consensus on the kind of data to be collected and sometimes due to communication problem (especially emails) in some countries. Thus the household survey tool was not completed until April 2010 when the household interviews were supposed to be starting. The trader tool delayed even longer partly because of the non-responsiveness of Dr Mangisoni. Despite the delays, both tools were written well. The household and trader survey tools are included as Annex 2 and Annex 4, respectively. In addition, we attach as Annex 4 a tool used in collecting village level data by country team members. The village level data was used o understand meso-level variables that are likely to influence farmers and traders decisions in the use of ICT-based market information services

5. *Pre-testing of the survey tools*

This activity took one week in all the countries and was intended to pilot-test the tools and adapt them to country conditions through local fine-tuning. Each team thus proceeded to do interviews of farmers to check the appropriateness of the questions, whether farmers had difficulties understanding some of the questions, and whether there was logical flow in the questions. Following the field pre-testing of the questionnaires, the eARN team organized a blog in which difficulties encountered during the pre-testing were shared and solutions explored and adopted. An email correspondence by the coordinator detailing the key issues that were discussed during the blog and the way forward as well as the survey strategy was circulated immediately afterwards.

Following the revision of the survey tools, the creation of data entry templates commenced. The templates were done centrally to ensure that data collected by all countries were uniform and could be analyzed to generate uniform outputs. The templates were created in Statistical Package of Social Sciences (SPSS) software. This created some challenges. First, some team members had no working knowledge of SPSS. Second, most of the partners did not have the SPSS software. In both cases the affected members resorted to using other data entry and analysis packages and sometime experienced problems in transferring the data from SPSS to those other packages.

6. *Household and trader data collection*

Data collection was done at about the same time in all the countries. All except Benin[1] started data collection in April 2010 and completed the exercise in May 2010. Collection of trader data then followed immediately in all the countries. There were no incidences of interruption of data collection by bad weather in any of the partner countries. Even Madagascar where monsoon rains had started collected the data without disruption from the rains. Data entry in all the countries was monitored by

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[1] Benin started data collection one week after the rest of the team members

the Research Assistants under the supervision of the country coordinators. The data entry was done separately by each partner country.

7. *Data analysis and drafting of country reports*

Analysis of the collected data started in June in all the study countries. Analysis was done by both the researchers and research assistants (RA). As recommended by the project, senior researchers worked with the RA to build their capacity in data analysis and interpretation of the results. A major problem arose at this stage in Malawi when the country coordinator silently abandoned the project leaving the analysis largely in the hands of a research assistant. This however did not emerge until during the midterm workshop when it was learnt that the Malawi results and report were generated solely by the RA. Subsequently, the project Coordinator was forced to step in to provide backstopping to the Malawi research Assistant. For instance, the Malawi RA was retained in Nairobi for 1 week to work with the coordinator to revise the write workshop papers. Later, the coordinator travelled to Malawi to provide technical guidance to the RA in completing the Malawi project reports, among other things. Despite these problems, the Malawi findings are to a great extent fine, largely due to backstopping support from the coordinator.

In most countries, drafting of the preliminary reports commenced while data analysis was on-going. This was because the countries were racing to prepare preliminary reports for presentation at the midterm workshop. Most of the analysis and reporting dealt with case studies and especially questions 1, 2, 4 and 5. Only Kenya used propensity score matching technique to address question 3 prior to the midterm workshop. Others did not know how to apply the method and waited until after the midterm workshop. A more complete analysis and revision of the reports took place after the midterm workshop following training on SPSS and propensity score matching technique.

8. Midterm workshop

The eARN Africa workshop was held in June 2010 in Cotonou – Benin. The major aim of this workshop was to present and discuss preliminary results from the country analyses, train team members on how to use SPSS and conduct impact assessment using propensity score matching technique and to discuss strategies on how to complete the analysis and communicate the findings. Training on propensity score matching was conducted by an expert from University of Kiel (Germany) while training on SPSS was conducted by Kenyan eARN Africa Research Assistant. Both are experts in these respective areas. The team, on realizing that one of the scientific advisors is an editor of a major journal in the field of agricultural and food policy, requested a training session on how to publish research findings. This training was offered by the editor of *Food Policy* journal Dr Colin Poulton. The midterm workshop was attended by eARN Africa researchers and well as invitees from Benin's ministry of agriculture, ministry of information and also by participants from ICT projects.

A major recommendation of the midterm workshop was that all countries conduct a second round of trader survey to collect some additional data that was needed to complete the analysis of transaction costs. However, logistics only permitted second round survey to be conducted in Kenya, Malawi Benin and Ghana. In Uganda, the country agricultural economist had left the project while in Madagascar, the study area was too far from Antananarivo making the second round survey too costly.

9. Impact assessment of the ICT project

The real analysis geared at assessing the impact of ICT-based projects started after the midterm workshop and the training on SPSS. This period was characterized by heavy and active engagement by email correspondence among researchers and also exchange of ideas. This process continued into November 2010 when teams were to submit draft papers for publication.

10. eARN Africa Cape Town symposium

The project convened a symposium at the African Association of Agricultural Economists (AAAE) meeting at in Cape Town South Africa in October 2010. The aim of the symposium was to present the results of the eARN Africa studies and seek feedback from AAAE conference participants. It was also intended to disseminate the results to a broad audience of African agricultural economists and ICT practitioners attending the conference. Indeed, the participants of the symposium consisted of scientists, ICT practitioners, representatives of development agencies (e.g., Agricultural Bank of South Africa, the World Bank, Rockefeller Foundation, and FAO). eARN Africa researchers from Kenya, Ghana, Malawi and Kenya presented different aspects of eARN Africa project and received valuable comments that were used to improve country reports and papers. The papers presented at the workshop along with presenters is presented below

- ✓ Okello, J. J., and O.K. Kirui: Effect of participation in ICT-based MIS projects on smallholder farmers' commercialization: Evidence from Kenya.
- ✓ Egyir, I.S., R. Al-Hassan and J. Abaka : Effect of ICT-based market information services on performance of agricultural markets: Experiences from Ghana.
- ✓ Rahelizatovo, N and H. Ratovo: Factors affecting awareness and participation in ICT-based agricultural information services projects in Madagascar.
- ✓ Kirui, O.K. and J.J. Okello: The impact of ICT-based mobile phone-based money transfer services on smallholder farmer commercialization: experiences from Kenya.

11. eARN Africa Write Workshop

The write workshop was held in January 2011 in Nairobi and aimed at providing the eARN Africa researchers a quiet environment to improve upon the papers they had drafted. These draft papers were sent to reviewers prior to workshop and the reviewers invited to discuss the review comments and provide suggestions on how

to improve the papers. Two consultant reviewers were hired by eARN Africa for this purpose: an expert in market studies (Prof Mark Olunga Odhiambo) and one on quantitative methods (Prof. Chris Ackello-Ogutu).

12. Endterm Workshop

The endterm workshop was held in Accra Ghana in June 2011. It was the final workshop of the entire project and was intended to provide a forum to critique the results of the case studies, household survey and market survey conducted in each country. The workshop was also intended to provide a forum for the researchers to interact with policy makers and ICT practitioners. Hence the project invited a high ranking policymaker from each of the study countries to the workshop. It also invited ICT project implementers and NGOs involved in the implementation of ICT-based projects. Thus the midterm was used as forum to disseminate the research findings.

13. Capacity building

Although this was the last objective of this project, it turned out to be the one with the greatest achievement. The project supported postgraduate training of several students. The list of students that were financially supported by the project is below.

i. **Benin**
   Student Name: Sesihouede Mindehiya Desire Agossou
   Thesis title: Assessment of the effects of ICT initiatives on
                     agricultural producers 'market access conditions
   Status: Graduated

ii. **Kenya**
   Student name: Oliver K. Kirui
   Thesis Title: Assessment of the use and effect of mobile phone-based
                     money transfer in Kenyan agriculture
   Status: Graduated

   Student Name: Sylvester Ochieng
   Thesis Title: Impact of ICT based projects on agricultural productivity
   Status: Not yet graduated

iii. **Madagascar**

Student name: Andriamihamina Lilas

Thesis Title: Challenges encountered in using ICT to enhance agricultural market performance in the Analanjirofo region

Status: Graduated

Student name: Andrianarisoa Miora Romy

Thesis title: ICT and rural household income improvement: Case study in the Analanjirofo and Atsinanana regions

Status: Graduated

Student name: Andriamaroniaina Minohasina

Thesis title: Promoting microfinance institution services using ICT in the Analanjirofo and Atsinanana regions

Status: Graduated

Student Name: Domohina Ralaiharimino

Thesis title: Use of ICT and factors contributing to smallholder farmers' vulnerability: the case of Analanjirofo and Atsinanana Regions

Status: Graduated

iv. **Malawi**

Student name: Sarah Tione

Thesis title: Linking smallholder farmers to markets through modern information and communication technologies: analyzing effectiveness of the technology on maize marketing efficiency in Malawi

Status: Graduated

v. **Ghana**

Student name: Mitchris Chapman Kodam

Thesis title: Role of radio agricultural programmes in agricultural information and technology dissemination: Cases of three community radio programs

Status: Graduated

Student name: Shamwuna Salifu

Thesis title: Effect of Mobile phones on transactions costs and maize market performance in Ghana

Status: Graduated

vi. **Uganda**

Student name: Ssekabira Haruna

Thesis title:	Adoption of ICT-based market information services by smallholder Soroti, Uganda
Status:	Yet to graduate

In total, the project supported Master of Science training for 11 students. Of the 11 students, 9 have graduated with an M.Sc degree in agricultural economics. Four of these graduates are females. Figure 2 presents some of the eARN Africa supported graduate students from University of Antananarivo. The project also identified a PhD student (3rd male student in Kenya) interested in using the data generated under eARN project to do his doctoral degree in Agricultural Economics. The student is currently preparing his proposal under the guidance of Dr. Julius Okello, the eARN coordinator, and will be registered at the University of Nairobi. The potential student wishes to examine the role of new generation ICT tools in facilitating agricultural trade in Africa.

Figure 2: Picture showing some of the students supported by eARN Africa project

University of Antananrivo graduates of eARN Africa project

A summary table showing the students that have completed their postgraduate training under the eARN Africa project is presented below.

Table 1: Status of eARN Africa supported postgraduate students

Items Countries	Number of students	Gender F=Female M= male	Number completed	Yet to complete	Comments
Benin	1	M	1	0	M.Sc
Ghana	2	M, M	2	0	Both M.Sc
Kenya	2	M, M	1	1	2nd yet to complete
Madagascar	4	F, F, F, M	4	0	All M.Sc
Malawi	1	F	1	0	M.Sc
Uganda	1	M	0	1	Has submitted thesis for examination

Apart from the students, eARN Africa project strengthened the capacity of research assistants (RAs). In all the countries, the RAs were involved in the design of the survey tools, in the data collection and analysis, in drafting the country reports and in preparing workshop presentations. The RAs were also involved in presenting study findings during national workshops. The Project also paid for the RAs to attend the eARN Africa write workshop in Nairobi in January 2011. During the workshop, the RAs were exposed to high level modelling, theoretical background of the eARN project, the process of reviewing scientific papers, and scientific writing alongside the senior researchers. This exposure greatly enhanced the writing and data analysis capacity of the RAs making them very marketable and competitive in the job market. Indeed, four of the eARN Africa RAs have since got well-paying jobs with international agencies and research organizations including United Nations Development Program (UNDP), International Crops Research Institute for Semi Arid Tropics (ICRISAT), International Maize and Wheat Research Institute (CIMMYT), and International Institute for Food Policy Research Institute (IFRPI). In their emails of appreciation to the Coordinator one RA wrote, "I attribute my success in getting a job at UNDP to eARN Project. The moment, I mentioned about eARN Africa, the interview changed from question-answer session to a discussion session. The panellists now wanted me to teach them how to use propensity score matching technique". Another RA wrote: "When I mentioned that I have been

working as a research assistant in eARN Africa project, I saw some of the panellists nodding in affirmation with smiles in their face. Suddenly, things just softened". Yet another RA who got a job at ICRISAT said in his email "The papers I co-authored and published while in eARN Africa really made a difference. They were all I needed to prove my quantitative skills".

The project has also built the capacity of the senior researchers in the project in new techniques of assessing the impact of an intervention. One senior researcher for instance remarked at the write workshop, "I feel like I have been in classroom again. This workshop has reminded me that learning never ends". Another researcher/partner continues appreciate his involvement in eARN Africa project. He told his colleagues: "The most important thing I gained under eARN project is learning how to use Propensity Score Matching technique. I have, since leaving eARN Africa, written two papers using the technique". At the end-term workshop, one Advisor said, "through eARN Africa I have learned that there is a new way of assessing the impact of a project, namely by applying propensity score matching".

The eARN Africa project has also enhanced the writing skills and publication records of many of the senior researchers. One senior researcher openly acknowledged his struggle to write a paper that is publishable in a journal. He narrated how one senior member of his faculty has labeled colleagues like him who are unable to publish as "power-point professors" because of the tendency for such colleagues to go around presenting their consultancy reports to donors using power-points. Through the eARN Africa project, this senior researcher published two journal papers in a long time.

As the project Coordinator, I too learned greatly, especially in the area of coordinating a large project and managing people of diverse culture and profession. I have also learned how difficult it is to work with extremely busy people with challenging work schedules. Clearly, there was some learning (i.e., capacity building) for all categories of people involved in the eARN Africa project.

National workshops

All the country partners with the exception of Uganda and Malawi held two national workshops over the period the project. The first workshop was a project implementation workshop held in Kenya, Ghana, Benin, Malawi, Uganda and Madagascar. The workshops were convened to introduce the eARN Africa project in each of the study countries and also to solicit the "buy-in" of policymakers and ICT practitioners in the project. During these workshops, the eARN project goals were presented and the study methods discussed with aim for soliciting comments and suggestions on how to improve the study.

The second round of national workshops were feedback workshops in which the study findings were presented to broad audience including policymakers, ICT practitioners, researchers, farmers and agricultural extension staff. These workshops were successfully conducted in Kenya, Madagascar, Ghana and Benin. Figure 3 below presents a feedback workshop session at Toamasina in Madagascar

Figure 3: Feedback workshop session in Toamasina (Madagascar)

Participants of Madagascar feedback workshop follow the presentations

eARN Africa Project Outputs

A number of outputs were generated during the project. These included

 i)   Powerpoint Presentations

 ii)   Workshop proceedings

 iii)   eARN Africa project country research reports

 iv)   Journal manuscripts

 v)   Journal publications

 vi)   Book chapters

 vii)   Posters

We briefly discuss each of these outputs below

Power-point presentations

Over the life of the project several presentations have been made in eARN Africa workshops, international symposia and other international forums. Some of these presentations formed part of the dissemination efforts. Below, we list the tittles of presentations that were made in the international symposium and fora

1. Okello, J. J. (2010). Effect of participation in ICT-based MIS projects on smallholder farmers' commercialization: Evidence from Kenya. Presentation made at the African Association of Agricultural Economists conference, Cape Town, South Africa, 23 September 2010

2. Egyir, I.S., R. Al-Hassan and J. Abaka (2010). Effect of ICT-based market information services on performance of agricultural markets: Experiences from Ghana. Presentation made at the African Association of Agricultural Economists conference, Cape Town, South Africa, 23 September 2010

3. Rahelizatovo, N and A. Abel. (2010). Factors affecting awareness and participation in ICT-based agricultural information services projects in Madagascar. Presentation made at the African Association of Agricultural Economists conference, Cape Town, South Africa, 23 September 2010

4. Kirui, O.K. and J.J. Okello. (2010). The impact of ICT-based mobile phone-based money transfer services on smallholder farmer commercialization: experiences from Kenya. Presentation made at the African Association of Agricultural Economists conference, Cape Town, South Africa, 23 September 2010

5. Okello, J.J. (2010). Linking smallholder farmers to markets through ICT-mediated transactions. Presentation made at *Africa's New Frontier: Innovation, Technology, Development* Conference, Ottawa, Canada, February 4-5, 2010.

6. Okello, J.J. (2010). Linking farmers to markets using new generation ICT tools: Experiences from Kenya. Presentation made at Tegemeo/ICRAF workshop, Nairobi, Kenya, May 13, 2010

7. Okello, J.J. (2010). Effectiveness of ICT-based interventions in linking African farmers to markets. Presentation made International Development Research Center Nairobi, November 11, 2010

8. Okello, J.J. (2011). Effectiveness of ICT-based interventions and tools in linking African farmers to markets. Presentation made at the 3rd European Forum on Sustainable Rural Development, Palencia, Spain, march 29, 2011

9. Okello, J.J., G.W. Njiraini, K.K. Oliver & Z. Gitonga. (2011). Drivers of ICT use among smallholder farmers in Kenya. Selected paper presented at Africa Crop Science Conference, Maputo, Mozambique, October 10-13, 2011

Workshop proceedings and research reports

The project prepared a comprehensive report on the proceedings of the Kampala workshop mainly because of the nature of the workshop namely, a methodology workshop. The report was intended to provide a roadmap to project partners on what should be done during the implementation.

Each of the project participating countries prepared project research reports that detailed out how it addressed the study objectives. These reports are therefore very comprehensive and cover each study objective in details. They have acted as sources

of the journal manuscripts and published papers and book chapters, as well as posters, for the participating countries. The reports are provided separately due to size.

Journal manuscripts, papers and book chapters

The project team drafted several papers that were then subjected for external review and later, revision during the write workshop. It was agreed that all the teams should prepare manuscripts and send to the Coordination office for review and approval before they are dispatched to an appropriate journal for publication. This decision to first submit the manuscripts to the coordination office was taken in order to control the quality of the manuscripts sent out for publication under eARN Africa project.

The team prepared a total of 23 manuscripts from the trader and household surveys and the case studies. The distribution of the papers submitted were as follows

Table 2: Manuscripts prepared for Nairobi eARN write workshop of January 2011

country	Case study	Household	Trader	Total
Ghana	1	2	1	4
Benin	0	3	1	4
Kenya	1	2	1	4
Uganda	1	2	1	4
Malawi	0	2	1	3
Madagascar	0	2	2	4

These manuscripts (except those of the case studies) formed the input into the write workshop and therefore went through the first round of review by consultant reviewers namely Prof Mark Odhiambo and Prof Chris Ackello-Ogutu. They were

subsequently revised and revised again based on comments ad suggestion received during the endterm/feedback. A number of them have since been submitted to journals for publication.

A decision to submit papers/manuscript jointly to a journal for publication as a special issue was reached during the midterm workshop in Cotonou. The project thus submitted 5 papers to the International Journal of ICT Research and Development in Africa and the papers have since been published as a special issue in Volume 2 Issue 2 of the journal.

The endterm workshop had also recommended that the team tries to submit some of these papers for another special issue in *Food Policy* or *World Development* journals. The Coordinator and Ramatu (Ghana team leader) contacted *Food Policy* and *World Development* and received acceptance for a special issue by the former. A subset of the papers (9 in total) was proposed for joint publication as a special issue in *Food Policy*. However, most countries did not submit upgraded papers of sufficiently good quality to pass the rigorous review process under Food Policy. Nonetheless, the Coordinator managed to negotiate with the *Food Policy* Journal Editor to have a sub-special issue that comprised only 5 papers instead. The five papers have already been submitted to Food Policy journal and is currently undergoing review. The papers submitted to Food Policy were distributed as follows: Kenya, 2; Ghana, 1; Benin, 1 and Malawi, 1. The papers proposed by Uganda and Madagascar did not meet the threshold quality requirements of *Food Policy* Journal and are therefore being channelled to the eARN Book.

The project has to date published the 14 papers either as journal publications or book chapters. The titles of the papers so far published are:

1. Egyir, I.S., A. Ramatu, and J. Abakah. 2011. The effect of ICT-based market information services on the performance of agricultural markets: Experiences

from Ghana. Special Issue of *International Journal of ICT Research and Development in Africa*

2. Katengeza, S.P., J.J. Okello, and N. Jambo. (2011). Use of mobile phone technology in agricultural marketing: The case of smallholder farmers in Malawi. Special Issue of *International Journal of ICT Research and Development in Africa*

3. Lwasa, S., N. Asingwire, J.J. Okello and J. Kiwanuka. (2011). Awareness of ICT-based projects and the intensity of use of mobile phones among smallholder farmers in Uganda: The case of Mayuge and Apac districts. Special Issue of *International Journal of ICT Research and Development in Africa*

4. Okello, J.J. (2011). Use of information and communication tools and services by rural grain traders: The case of Kenyan maize traders. Special Issue of *International Journal of ICT Research and Development in Africa*

5. Okello, J.J., O. K. Kirui, G. W. Njiraini and Z. M. Gitonga. Drivers of use of information and communication services by farm households: The case of smallholder farmers in Kenya. *Journal of Agricultural Sciences*

6. Asingwire, N and J.J Okello. (2011). Challenges facing smallholder farmers' ICT-based market information service projects: The case of BROSDI and WOUGNET in Uganda. *International Journal of Economic Research*

7. Katengeza, S. J.J. Okello and R. Mensa. (2011). Factors influencing awareness and use of ICT-based market information services for farming business in Malawi. *International Journal of Economic Research*

8. Katengeza, S., B. Kiiza and J.J. Okello. (2011). The role of ICT-based market information services in spatial food market integration: The case of Malawi Agricultural Commodity Exchange. *International Journal of ICT Research and Development in Africa*

9. Okello, J.J., E. Ofwona-Adera, O.L.E Mbatia, and R.M. Okello. (2010) Using ICT to integrate smallholder farmers into agricultural value chains: The case of DrumNet project in Kenya. *International Journal of ICT Research and Development in Africa*

10. Okello, J.J., R. Al Hassan and R. M. Okello. (2010). A framework for analyzing the role of ICT on agricultural commercialization and household food security. *International Journal of ICT Research and Development in Africa*

11. Okello, J.J., R. Okello and E. Ofwona-Adera. (2009). "Awareness and use of mobile phones by smallholder farmers in Kenya". In Blessing Maumbe (Ed), *E-Agriculture and E-Government for Global Policy Development: Implications and Future Directions.*

12. Kirui, O.K., J.J. Okello and R. A. Nyikal. (Forthcoming). Awareness of mobile phone-based money transfer services in agriculture by smallholder farmers in Kenya *International Journal of ICT Research and Development in Africa*

13. Ratovo, A., N. Rahelizatovo, J.J. Okello, F. Rasoarahona, and J. Rasoarahona. (Forthcoming). Ownership and use of mobile phones for agricultural transactions by traders: the case of the Analanjirofo and Atsinanana Regions – Madagascar. *Journal of Agricultural Extension and Rural Development*

14. Okello, J.J. (Forthcoming). ICT-based market information services (MIS) projects, deployment environment and performance: Experiences from KACE and DrumNet projects in Kenya. In Blessing Maumbe (Ed). E-AGRICULTURE AND RURAL DEVELOPMENT: GLOBAL INNOVATIONS AND FUTURE PROSPECTS

Posters

In addition to the above journal papers, the project has also prepared and presented two posters in international forums

1. Egyir, I.S., A. Ramatu and J.K. Abakah. (2011). ICT-based market information services sho modest gains in Ghana's food commodity markets. Poster presented at 2011 Tropentag Conference, University of Bonn, Germany, October 5-7, 2011

2. Okello, J.J. (2010). Does use of ICT-based market information services (MIS) improve welfare of smallholder farm households: Evidence from Kenya. Selected poster presented at American Applied Agricultural Economics Association 2010 Annual meetings, Denver, Colorado, July 25-27, 2010.

Core findings of the eARN Project

The primary objective of this study was to assess the effectiveness of ICT based interventions in linking farmers to markets. This objective was examined using commercialization (defined as share of agricultural production sold and share of purchased inputs used) as a proxy for market linkage. Using this method, the study found that ICT interventions did foster market linkage in some countries but not others. In particular, the study found that farmers that participated in the ICT-based project in Kenya and Malawi participated more in (i.e., were linked to) both output and input markets. However, such evidence was not found in the other countries. The case studies conducted as a major component of this study to identify the challenges such projects face and how they address them offer explanation for these findings. In Kenya, the ICT infrastructure was significantly much more developed and the calling/text message costs much lower than in other countries. In Malawi, on the other hand, the national farmers' organization (NASFAM) housed the ICT-based initiative thus bearing the costs of promoting the project services and at the same time subsidizing its costs. Consequently, the usage of the ICT-based services was much higher these countries. The study however found that even in Kenya and Malawi (as in other countries) the environment in which ICT-based projects are deployed has significant influence on their performance. The factors that were especially important in determining how such project performed included: i) the socio-economic characteristics of the targeted farmers (areas), ii) the legal environment, iii) physical environment and, iv) cultural environment.

Another major objective of this study was to examine the effect of ICT-based market information service projects on the performance of agricultural markets. The finding of this study with regard to this objective is that such projects reduce transaction costs of participating in grain markets hence improves market performance. The most common type of transaction cost reduced in most of the study countries were the search and screening costs (i.e., it becomes easier with such projects to find a seller/buyer, know and compare prices in distant markets), negotiation costs (costs

of agreeing on the terms of exchange) and, monitoring costs (i.e., costs of following up on the transaction agreements/arrangements. Studies conducted in Ghana, Kenya and Malawi where data was available also revealed that markets covered by ICT-based projects were integrated (implying that prices in such markets move together and were different only due to transportation costs).

A more detailed summary of the key findings of the eARN Africa projectare as follows

1. The physical, socio-cultural, economic and legal environment in which ICT-based projects are deployed and their design affect their outcomes (performance and sustainability). Flexible designs improve the odds of success and sustainability of such projects. Overdependence on donor support and failure to plan for exit reduce the odds of success

2. Awareness of ICT-based market information service (MIS) projects and services are driven by farmer-specific factors (age, education/literacy, farming experience, membership in farmer organizations), infrastructural factors (e.g. access to electricity), asset endowment (land size, value of household non-land physical assets, value of livestock assets, household income), country-specific factors. Differe factors affect awareness in different countries. However the factors that seem to cut across most countries age, education and asset endowments.

3. Participation in ICT-based MIS projects strengthens farmer linkage to markets to different extents: increases the share of agricultural production (crop and livestock) that is sold implying that farmers that participate in such projects have greater participation in the market. It also increases the per-capita household use of productivity enhancing purchased inputs (seeds, fertilizer & pesticides). However these effects are not universal. Indeed, we find strong evidence of these effects only in Kenya. There is also evidence, although weak, that participation in ICT projects increase input market linkage in Ghana. Kenya seems to stand out probably because ICT-based

projects are widespread and mobile phones services are much better developed.

4. There is evidence that participation in ICT-based projects improves household food security in some countries but not all: It increases per-capita agricultural income and reduces the extent of food insecurity (duration of food deficit) in a participating household. The project finds strong evidence of these in Kenya. In Uganda, however, we only find evidence of a link between participation in ICT product and reduction in duration food deficit.

5. Markets covered by ICT-based projects perform better, though dismal in some countries: they are characterized by lower price dispersion and lower transaction costs and are more integrated with other markets. Evidence of market integration is found in Malawi and Ghana and lower price dispersion in Kenya.

6. The effect of the use of ICT-based tools (especially mobile phones) by rural traders on transaction cost is nuanced. It reduces some of the components of transaction costs but not others suggesting that the nature of the market influence how use of such tools affect transaction costs.

Based on these findings, it can be concluded that:

1. ICT-based projects indeed help in linking African farmers to markets by increasing input and output commercialization depending on country-specific characteristics. In particular the pursuit development strategies that impede market forces or in which governments intervene in the market reduce the potential of such projects to strengthen smallholder farmers' linkage to market

2. ICT-based projects do improve the performance rural food commodity markets by reducing transaction costs and hence promote between different rural markets. Such projects also held reduce spatial price spread hence benefits consumers.

3. ICT projects present an opportunity to spur development in the small farm sector. It can break the endless circle of low investment, low productivity, and

low marketable surplus thus break the low equilibrium poverty trap. However achieving this will require supportive policies and a good deployment environment.

4. Promoting participation of small farm households in such ICT-based MIS projects and the use of MIS requires investment in improving the literacy and providing the right infrastructure. This requires the attention of the public sector.

eARN Africa Project Outcomes

The eARN Africa project has continued to attract the interest of major international development agencies. First, the French CIRAD invited eARN team to contribute papers for publication in a special issue of a journal. The theme of Journal special issue is "ICT and rural development".

Second, the eARN project contributed information towards an ICT in Agriculture e-source book published by the World Bank titled: "ICT in Agriculture: Connecting smallholders to markets, networks and institutions". The book was released in November 2011 and is available online at:

http://www.ictinagriculture.org/ictinag/sites/ictinagriculture.org/files/final_book_ict_agriculture.pdf

The book, just like other World Bank publications, has a global audience and is expected to influence both ICT policy and practice relating to agriculture globally. It provides scientific evidence on the kinds of ICT-based interventions that work in agriculture and those that do not. Some of this research-based evidence presented in the book drew from eARN Africa market studies in Kenya and Ghana and can be found Section 3 of the book title "Assessing markets and value chains".

Third, eARN Africa project was invited to present its findings at the 3rd European Forum on Sustainable Rural Development to be held in Palencia – Spain. The event at which eARN was invited to presents its findings was organized by CTA with the theme "ICTs for Mobilizing Farmers". Findings of the eARN project draw interest

from CTA and United Nations Center for Trade and Development (UNCTAD) and an invitation by UNDP for eARN team to contribute to 2011 yearbook. The annual report titled "Information Economy Yearbook 2011: ICTs as Enabler of Private Sector Development" is available online at www.**unctad**.org/en/docs/ier2011_en.pdf. Chapter 4 titled "Making PSD interventions more effective with ICTs" has sections on DrumNet and Kenya Agricultural Commodity Exchange, two ICT interventions in Kenya, that were directly contributed by the eARN Africa project based on findings of from the Kenyan eARN Africa project studies. UNCTAD is global policy publication and therefore the experiences from eARN studies are expected to influence ICT policy and practice globally.

Fourth, the findings of eARN Africa project have directly been applied by two governments in designing ICT strategies for agriculture and redesigning ICT projects. For instance in Madagascar, the government is using the findings of the eARN project to redesign the largest ICT project in the country known as Program for Promotion of Rural Revenues (PPRR) and scale it out nationally from just 2 regions in the south. In Benin, the government invited the country coordinator there to present the findings to a team that is currently designing strategies for the use of ICT in agriculture.

Fifth, the eARN Africa project built the capacity of both young and senior scientists in analysing problems relating to market access in Africa. In particular, it built the capacity of young scientists to design and implement household and market surveys and also analyse data and report findings. Notable outcomes of this process (and hence the project) are:

i)   Some of the students and research assistants mastered the training on data analysis and the use of project evaluation techniques (notably propensity score matching technique) and have recently been employed by research organizations and projects on impact assessment that needed these skills.

ii)   Some research assistants are using the skills earned while in the project to train other researchers and students on different aspects of empirical research including data analysis, the use and implementation of propensity score matching techniques, and general planning of household and trader surveys. The project therefore trained trainers.

iii)   All RAs that participated in the project co-authored at least one journal manuscript, some for the first time in their lives. Some of these manuscripts have since been published in scientific journals. One research assistant was so excited when he published his second paper in one year and said "being in eARN Africa Project has helped demystify scientific writing and the art of publishing in academic journals. I used to think that only the smart guys publish papers. Look, now I have published two papers.....and I intend to do more, even on my own". Another research assistant who has also published 2 papers in scientific journals said, "eARN Africa is a real mentoring ground. Nearly all of my colleagues have published nothing since graduating".

iv)   The attitude of senior researchers in the project towards scientific writing changed. All the senior researchers published at least one journal paper under the project. For some of the partners, this was the first publication in as long time as 10 years. For such partners the project helped them rediscover the art of writing and publishing in scientific journals.

v)   Some of the lesson learned from the eARN Africa project is being used in developing a project on value improvement for smallholder farmers in countries ncluding select eARN project countries.

Major challenge

A big project like eARN Africa cannot be without challenges. Some of these challenges have been highlighted in the previous section. However, one needs special mention. This challenge related to the manner in which the project account was managed by University of Nairobi. It turned out that Grants Office did not open a new vote for the eARN project but instead continued posting funds in the vote previously opened during the proposal

development phase of the project. This mistake cause serious delays in completing the final accounting processing and revising the final financial report. In addition, the manner in which the Grants Office handled the recovery of the overhead was sometimes ad hoc causing confusing during preparation of the financial report and delays in submitting interim reports. A detailed description of this problem was presented in the first technical report of the eARN Africa project.

Recommendations for further research and future project management

The study demonstrated that ICT-based initiatives can foster improved participation of smallholder farmers in rural grain markets. However, it did not assess the extent to which such initiatives foster linkage to distant (regional) markets. For instance, to what extent do farmers in one region (e.g., central Malawi) trade in another region that is similarly covered by the project (e.g., southern Malawi) for the case of MACE project. Understanding how ICT-projects affect this kind of trade can be essential for up-scaling a project from regional (within one country but 2 regions) to national and even international (e.g., between Kenya and Uganda). Secondly, the eARN Africa study concentrated at only 2 points along the value chain dealing with farmer and traders. It would be useful to study also how service providers (e.g., input suppliers, extension agents, brokers, etc) and consumers use ICT-based services and how such usage affects the performance of markets. University of Nairobi has proposed a study around the second aspect and submitted a concept note to IDRC for consideration. The study will especially examine how ICT-based information services can be used to improve the way that way that fresh vegetable markets operate and how such (ICT-based) services can be used to promote demand for quality vegetables (in terms of safety and hygiene, etc).

The eARN Africa project has generated massive amounts of data and information. A good amount of this data and information has been used. However, there is still a lot of useful information that can be teased from the country reports and even papers published so far. This requires time and effort. Yet, in the last months of this project attention shifted to closing the project with time being spent polishing the reports. The planned book could be

used to mop up some of the unused information to date. But a lot more information will still be left unused. Future projects should thus plan to set aside funds to ensure that useful information collected during the project does not go unused. eARN Africa still has a lot of information that require synthesis but no funds to accomplish this. Even the planned book requires editorial time (and in some cases writing time) and hence further funding.

Annex 1: eARN Africa case study guide

<div align="center">

Guidelines for Undertaking Case Studies

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The case studies are designed to fulfil objectives 1 and 5 of the eARN project:
- To analyze existing ICT-based initiatives and the environments within which they are applied
- To critically analyze the challenges encountered by the ICT-based market information service projects for linking smallholder farmers to markets.

Case studies will draw primarily on key informant interviews, project reports and focus group discussions. One interview can provide information for both of these objectives, so for the most part the two objectives are considered together in what follows.

Each country team should analyse **two** cases (i.e. studies of two ICT-based initiatives). We want to learn from both **success and failure**. There are three possibilities for achieving this:
1. Analysing one ongoing (successful) and one closed down or struggling project
2. Within a multi-location project, comparing locations where the project is doing well and those where it is struggling (e.g. limited uptake)
3. Where a project has been running for some time, asking not just about successes, but also about periods of difficulty and how the project adapted to these.

It will be valuable to contact people (staff) who have left a project and who might, therefore, give a detached/objective perspective on it – not just people who are still connected to it and so have an interest in its success.

Case study investigations should start with sources that can provide an **overview** of the intervention as a whole, especially senior managers (both current and previous), plus others (e.g. people in ministries, donor offices) who are familiar with the project. Discussions at this level should cover the following questions, among others:
- Who introduced the intervention? That is, was the intervention introduced as private business or by government, civil society organization, or a farmer/trader association?
- What are the primary goals of the project? who are the primary beneficiaries?
- What is the technology involved and how does it work?
- What is the scope of the ICT-based project (geographic, commodity focus)?
- What types of information are provided by the project? (information to assist planting decisions, current prices, historical prices, technical information, e.g. agronomy). What services were provided along with market information?
- How has the range of services evolved over time? Why is this?
- What are the costs (legal, operational, etc) of implementing and running the project?
- What are the terms of access to the services and the costs to beneficiaries of access?
- What are the sources and duration of funding?
- What are the prospects for sustainability once donor funding ceases? (Is there a viable business model?)
- Is there an intention to hand management of the local centres to the communities concerned? If so, what steps are being taken in pursuit of this?
- What aspects of the policy, legal and socio-political environment have had a major impact on the operation of the project? Have there been any changes in the operating environment during the life of the project that have benefited or impeded the project? If so, what were these?

- For multi-location projects: Has the project performed equally well across areas (in terms of uptake etc)? If not, what are the reasons for stronger/weaker performance in some areas than others?
- For an ongoing/successful project: Have there been periods in the project's life when success looked to be elusive? If so, what were the challenges that the project faced and how did it adapt to or overcome these?
- For a project that is struggling or has ceased: what were the achievements of the project? why could these successes not be sustained? What were the major challenges that the project faced?

Note that it is recommended that a case study does <u>not</u> start with a long summary of the **environment** in which ICT-based initiatives operate. These tend to be descriptive and unfocused, with limited links to the remainder of the study. Moreover, in many cases, our case study projects began when the operating environment was not particularly "enabling". However, as projects have demonstrated success, the policy environment has sometimes changed to support such initiatives in future. This in itself is a worthwhile finding.

Instead, the chosen approach is to allow key informants to highlight elements of the environment that have been relevant to the performance of the project (as above). However, there are some pieces of secondary information that should be included in all studies, e.g. (national) mobile and internet penetration[1]. Case study authors should also seek to highlight aspects of the agricultural or telecoms sectors that are distinctive within their case study countries and which may open up opportunities for ICT-based initiatives to succeed (or fail). For example:
- Kenya: diversified agro-ecology; strong agribusiness sector (e.g. horticultural exporters, tea industry, expanding supermarkets, large farm sector); expanding microfinance industry; strong and innovative mobile phone companies (e.g. Safaricom – M-PESA)
- Uganda: sustained policy push for greater private sector participation in agriculture sector (PMA); leader in decentralisation within Africa
- Benin: West Africa regional trade initiatives
- Malawi: dominance of maize on very small farms

Once an overview of the project and its environment has been achieved, the case study investigation should proceed to **specific locations** where the project has had a presence, if possible one where the project is doing (or did) well and one where it is struggling (or struggled). These field visits should take **2-3 days per area**, during which time discussions can be undertaken with:
- Local project managers and staff (current and previous, if possible)
- Beneficiaries (possibly through focus groups)
- Other local stakeholders (e.g. local government officials, NGOs, traders that have some involvement with the project)

Discussions at this level can cover areas already mentioned above, where full answers have not been acquired. In addition, they are particularly useful for covering the following sorts of issues:
- At the outset, what types of information were provided by the project? (information to assist planting decisions, current prices, historical prices, technical information, e.g. agronomy). What services were provided along with market information?
- Which or these services were / were not demanded by beneficiaries, and why?

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[1] These specific pieces of data are available from: XXX

- How has the range of services evolved over time? (N.B. the range of services could evolve *either* because services initially provided were not demanded *or* because successful provision of information has encouraged commercialisation, which in turn has stimulated demands for new types of information)
- What types of people are accessing the project's services? Why are these people particularly interested in them?
- What types of people are not accessing the project's services? Why is this?
- Is there an intention to hand management of the local centres to the communities concerned? If so, what steps are being taken in pursuit of this?
- What difficulties has the project encountered?

When exploring difficulties that a project has encountered, always start with positive experiences to get interviewees on your side. Then explore reasons why successes could not be sustained or why it has proven more difficult to achieve success in some areas than others. Conversations about difficulties can be open-ended, but it is worth bearing the following checklist of possible factors in mind during the conversation:
- Unfavourable or changed operating environment
- Poor management (N.B. managers themselves are unlikely to tell you this, but other stakeholders might, especially at local level)
- Technological issues (e.g. inadequate infrastructure, limited network coverage, unreliable power)
- Characteristics of the locality (major crops grown, crops exported outside the area, farm sizes; poverty levels, literacy, cultural factors)
- Ability to respond to changing demands for information
- Financial sustainability
- Community management or ownership

A general principle of informal survey methods, including those used in these case studies, is to seek corroboration of key points from two or more sources (this is called triangulation). Remember that individual informants may have their own biases. For example, current staff need to show success, whilst past staff may be bitter about the circumstances under which they left – although they may not! Hence, don't just take everything that everyone says at face value. Be ready to probe and question (gently)!

Finally, we want to finish the reports on apparently successful cases with lessons for replication and scaling out, so be thinking about this as you go along!

16/06/2009

Annex 2: Household survey tool

eAgricultural Network for Africa (eARN Africa) Project
Effectiveness of Electronic-Based Interventions in Linking African Farmers to Markets

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Survey quality control

Date of interview: ……………………………………   Start time................... End

time...........

Interviewed by:...

Country..

Checked by: .... Date checked:

………………………………

Date entered: ……………………………………............... Entered by:

....

1.0 Farmer and site identification

1. Respondent name (in full)……………………….….….……………………….. Phone number

…………………..…

2. District……………...   3. Region…………….….……………..

4. Village…….….………………………………………………….   5.GPS

Reading………………………………….

6. Distance to the nearest market centre (km)…..………   7. Name of

market……..……………………

8. Type of road to market centre[1] for selling produce and buying most of your agricultural inputs

…..………………………

9. Quality of road:[2]…..………………………….

10. Type of road to main market:[1] …..……………..….…………

11. Transport cost to the nearest market centre on public service vehicle (LOCAL

CURRENCY/person)………..……

12. Distance to agricultural field office (km) …………………………………………………..………….…...

13. Distance to nearest public phone service (km)………………………………

14. Distance to nearest mobile phone services (repairs/charging/top-up etc)

(km)…………………………….

15. Distance to nearest center that has internet facility (km) …………………………………………….

16. Distance to nearest center that has electricity (km)……………………………………….

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[1]. **Type of Road:**   1. Non-paved dirt road, 2. Paved dirt road, 3. Paved gravel road, 4. Paved asphalt (tarmac)

[2] **Quality of road:** 1. Bad, but passable all year round   3. Good (all weather)
                 2. Bad, and passable only parts of the year   4. Very Good (all weather)

[3] **Migration Status:** 1. Native   2. Migrant

17. Distance to the center with a nearest commercial bank ....

 Are you a member of any ICT-based agricultural project **1**. Yes   **0.** No

18. If YES to Q17, what is/are the name(s) of the project(s)?…………………………............…………………….

19. When did you join the ICT-based project (s)? *[if more than 1, list in order of project]*...

20. Have you a participated in <u>any other</u> agricultural project in the last 5 years   **1**. Yes   **0.** No

21. If YES to Q19, what is the main purpose of the project(s)?…………………………............……………….

2.0 Household composition and characteristics *[YYY is year before joining the ICT –based project]*

HH member identification (start with respondent)	Gender **Codes A**	Marital status **Codes B**	Age (yrs)	Education (yrs) **Codes C**	Was still in school in yr YYY **(Codes F)**	Relation to HH **Codes D**	Main occupation **Codes E**	Lives in the farm now? **Codes F**	Experience (Years of farming)	Was living in the farm YYY yrs ago? **Codes F**	Experience in other **main** entrepreneurial activity (Yrs)	Has mobile phone/ working Sim card **(Code F)**	Has email address **(Code F)**	Can read/write? **(Codes F)**
1.														
2.														
3.														
4.														
5.														
6.														
7.														
8.														
9.														
10.														

Codes A
1. Male
0. Female

Codes B
1. Married living with spouse
2. Married but spouse away
3. Divorced/separated
4. Widow/widower
5. Never married
6. Other, specify………..

Codes C
0. None (illiterate)
1. Adult education or 1 year of education
* Give other education in years of completed education

Codes D
1. Household head
2. Spouse
3. Son/daughter
4. Parent
5. Son/daughter in-law
6. Grand child
7. Other relative
8. Hired worker
9. Other, specify………

Codes F
0. No
1. Yes

Codes G
1. French
2. English
3. Local Language
4.Other………..

3.0 Farm and household asset endowments

Asset name	Number currently owned	Year bought/built	Current value (Kshs)	Number owned in yr YYY	Value if owned in yr YYY
1. Ox-plough					
2. Ox-cart					
3.Chemical Sprayer/pump					
4. Wheel barrow					
5. Bicycle					
6. Tractor					
7. Plough					
8. Harrow					
9. Planter					
10. Reaper					
11. Other tractor drawn equipment (specify…….............					
12. Store for farm produce					
13. Livestock kraal					
14. Other motorized vehicles (specify…...........................…….)					
15. Radio/radio cassette					
16. Mobile phone					
17. Television (TV)					
18. Computer/Internet					
19. Water pump					
20. Generator					
21. Refrigerator/freezer					
22. Landline phone					
23. Air Conditioner					
24. Sofa seats/coach					
25. Cooker					
26. Own House? 1 = yes; 0 = No					
27. Other….....................					

4.1 Land holding (acres) during 2009 planting seasons

	Long rain season		Short rain season *[Do not answer if there is only one season]*	
	Cultivated	Fallow (e.g. grazing)	Cultivated	Fallow (e.g. grazing)
1. Own used /Sharecropped (A)				
2. Leased/rented out/ (B)				
3. Borrowed out (C)				
4. Leased/rented in (D)				
5. Borrowed in (E)				
4. Communal land (D)				
5. Total owned (A+B+C)				
6. Total irrigated (owned)				
7. Total rain-fed (owned)				

8. How much land (total acres) did you own in year YYY?.................................

9. Are you able to gain access to **more land** when you need it?   **1**. Yes   **0**. No

4.2. Social Capital Endowment: Membership to farmer organizations/cooperative/clubs

1. Are you a member of farmer club/org/association?	1. Yes 0. No
2. If Yes Q1 Specify type(s) of farmer club/ organization/association	1. Community based org 6. Youth club 2. Farmer cooperative 7. Faith-based organization 3. Farmer society 8. Saving and credit coop 4. Farmers' club/group 9. Welfare/funeral club 5. Women's club 10. Other, specify…………….
3. Year first joined	
4 Functions of farmer organization/association	1. Produce marketing 7. Tree planting/Nursery 2. Input access/marketing 8. Soil & Water conservation 3. Seed production 9. Faith-based organization 4. Farmer research group 10. Input credit 5. Savings and credit 11. Other (specify)…………………………….. 6. Welfare/funeral club
5. Most important benefit derived from organization/association	1. Access to lucrative markets for produce 2. Access to inputs at low cost 3. Access to financial service 4. Access to important agric information 5. Support for social functions (funerals, wedding, out-door activities, etc) 6. Other (specify)………………………………………………………….
6.Does this group use ICT in meeting any of its functions?	1. Yes 0. No
7. If YES to Q6, which ICT tools are used? *[Circle all that apply]*	1. Radio 2. TV 3. Mobile phone SMS 4. Mobile phone VOICE 5. CD Rom 6. Email

5. Non-labor input use in the 2009 **Main or Long rain season** *[Record separately by plots]*

Plot code (number starting from plot nearest to house)	Plot size (Acres)	Crop grown (Code A)	Crop variety Code B	Purchased seed		Fertiliser type 1		Fertiliser type 2		Cost of oxen and tractor hire (LOCAL CURRENCY)	Farm manure		Pesticides/herbicides		Cost of irrigation (LOCAL CURRENCY)	Crop Output	
				Qty (units)	Price/unit	Qty (units)	Price/unit	Qty/unit	Price/Unit		Qty (unit)	Price/Unit	Qty (units)	Price/unit		Qty	Units Codes C
Long Rains																	
Short Rains																	

Codes A
[Use the CROP CODE sheet]

Codes B
1. Improved
0. Local

Codes C
1. Kg,   2. Litre,   3. Bag,   4. Mini bag,   5. Basket
6. gorogoro   7. debe   8. Wheel barrow 9. ox-cart   10.bucket
11. Other (specify)……………………………………………………………

Codes D
1. Poor
2. Medium
3. Good

Codes F
1. Yes
0. No

Q 6.0 Labor inputs in 2009 planting seasons *[Enter days worked by plot]*

Plot code [From Table 5]	Ploughing & harrowing		Planting & thinning		Applying fertilizer (1st and 2nd)		Weeding (1st and 2nd)		Irrigation		Pesticide application		Harvesting		Threshing/shelling		Other (specify)…..	
	Family	Hired	Family	Hired	Family	Hired	Family	Hired	Family	Hired	Family	Hired	Family	Hired	Family	Hired	Family	Hired
Long Rains																		
Short rains																		

7.0 How did you utilize the crops you harvested in 2009?

Crop type (Codes A)	Production *[give units]* (Last Column Tabl 5.0)	Sales *[Give unit]*	Price Kshs/ unit	Consumption (Specify unit)	Saved as seed (Specify unit)	Gift, tithe, donations, paid as wages (Specify unit)
Long rains						
1.						
2.						
3.						
4.						
5.						
6.						
7.						
Short rains						
1.						
2.						
3.						
4.						
5.						
6.						
7.						

Codes A: *[Use CROP CODES sheet]*

8. Household Food security indicators (January to December 2009) *[Limit to staple crops only]*

	Maize	Rice	Beans	Bananas	Yams	Cassava	Other……........
1. During which month did you harvest this staple crop (**Codes A**)							
2. Did your stocks of harvested crops from last season last household consumption need until the following season (**Codes B**)							
3. If **NO** to **Q2** above, for how many <u>months</u> was the harvest enough to meet the household needs?							
4. During which month(s) did you have to buy this staple? (**Codes A**)							
5. How much (kg) did you buy to meet the deficit?							
6. How much (kg) did you borrow or receive as gifts?							
7. What was **the main** source of money used to buy the food items (**Codes C**)							
8. How much food aid (specify unit) did you receive during the year (including food for work)?							

Codes A
1. January	4. April	7. July	10. October
2. February	5. May	8. August	11. November
3. March	6. June	9. September	12. December

Codes B
1. Yes
0. No

Codes C
1. Sale of other crops	4. wage employment
2. Sale of livestock	5. Non-wage job
3. Remittances	6. Other, specify…….

9. Transaction characteristics during LAST sale of [CROP] in 2009 *[Record for the last transaction only]*.

Crop sold (Crop code)	Quantity sold (Table 8.0)	Price (Ksh/unit)	Buyer (Codes)	Travel time to point of sale (Codes)	Mode of transport (Codes)	Transport cost (Ksh) (for person & produce)	Time taken to sell (Codes)	Sales tax/charges (Kshs)
Long rains								
1.								
2.								
3.								
4.								
5.								
6.								
7.								
Short rains								
1.								
2.								
3.								
4.								
5.								
6.								
7.								

Crop sold	**Buyer**		**Mode of transport**		**Time Code**
[Use Crop code sheet]	1. Farmer group	5. Broker/middlemen	1. Own bicycle	6. Head load	1. Within a day
	2. NGO	6. Urban grain trader	2. Boarder-Boarder	7. Own truck	2. Within a week
	3. Consumer	7. Contracting firm	3. Hired truck	8. Taxi	3. More than a week
	4. Rural trader/transporter	8. Other ……………	4. Public transport vehicle	9. Other………	
			5. Donkey/oxen		

10. Livestock production activities. *[Record for January to December 2009]*

Livestock type	Stock at start of 2009	Value of stock at the beginning of 2009	Number sold in 2009	Price /head (Ksh)	Number bought in 2009	Stock at end of 2009	Value of stock at the end of 2009
1. Bulls							
2. Cows							
3. Heifers							
4. Calves							
5. Trained oxen							
6. Goats							
7. Sheep							
8. Donkeys							
9. Pigs							
10. Chicken							
11. Ducks							
12 Turkey							
13. Guinea fowl							

11. Livestock maintenance costs in 2009 *[Record for January to December 2009]*

Livestock type	Purchased feed	Veterinary services (Including AI, vaccinations and treatment)	Veterinary medicines	Housing repairs/maintenance
1. Bulls				
2. Cows				
3. Heifers				
4. Calves				
5. Trained oxen				
6. Goats				
11. Sheep				
12. Donkeys				
13. Pigs				
14. Chicken				
11. Ducks				
12 Turkey				
13. Guinea fowl				

12. How do you generally communicate with your customers about [ ]? *[Tick all that apply & rank them]*

Communication means *[Rank first 3;1=most important]*	Input price	Output price	Where to find inputs	How to use inputs	Where to sell
1. Travelling to market					
2. Sending letter/notes					
3. Sending messenger/ third party					
4. Telephoning (mobile or landline)					
5. Sending email					
6. Sending mobile phone SMS					
7. Other (Specify)..................................					

13. Arbitrage

1. Do you normally store your agricultural produce and sell later in the season? 1, Yes   0. No

2, If YES Q2, how long (in months), on average, have been doing so after harvest over the last 3 years ....

3. Name the major cash CROP for which you have been doing so...

4.. How much of this CROP, on average, have you been harvesting per season over the last 3 years? (kg)-------------)

5. How much, on average, of this crop were you harvesting per season in yr YYY? (kg)...

6. What proportion of the major cash CROP do you normally store for later sale?.....................

7. Were you used to storing your major cash crops for later sale in yr YYY?   1. Yes   0. No

14. Other sources of income (January – December 2009) *[Convert any in-kind payments into cash equivalent]*

Sources	Quantity (units)	Price/unit	Total income (Ksh)
Milk			
Eggs			
Other livestock product (specify................................)			
Rented out land			
Crop residues (e.g. stover)			
Rented out oxen for ploughing			
Off-farm labour income			
Non-farm agribusiness NET income (e.g., shop, tailoring, etc)			
Pension income			
Drought relief			
Remittances (sent from non-resident family living elsewhere)			
Marriage gifts (e.g., dowry)			
Sale of own trees/timber/firewood, etc			
Sale of CPR (charcoal, bricks, stones, sand, etc)			
Other (specify)……………………………….			

15. What are your major sources of information on each of the following?

Issue	Did you need info about [ ]? (Codes A)	Source of info (Codes B)	Means of accessing (Code C)	Year first used	Number of times source was used in 2009	Last time source was used, if not 2009 (month/yr)	Cost of accessing info from this source when it was last used (Ksh)
1. Planting/weeding							
2. New varieties of crops							
3. Pest control							
4. Disease control							
5. Postharvest handling							
6. Produce marketing							
7. Input availability							
8. Input quality							
9. Input price information							
10. Output price information							
11. Contract farming							
12. Market needs (quality, volume, etc)							
13. Farmer organizations							
14. Livestock husbandry							
15. Safe use of pesticides							
16. Using ICT for agric info							
17. Ag. credit/insurance							

Codes A
1. Yes
0. No

Codes B
1 Government
2. NGO
3. Private Company
4. Farmer Ass.
5. Other farmers
6. Agric training centre
7. Other

Codes C
1. Visit by government extension agent
2. Visit by project staff
3. Visit by group appointed staff
4. Seed traders/Agro-dealer/shopkeeper
5. Newspaper/magazine
6. Radio
7. Television
8. Mobile phone (SMS)
9. Mobile phone (Voice)
10. Internet/email
11. CD Rom/Video
12. Agricultural training centre
13. Neighbour/other farmers
14. NGOs (name)…………
15. Farmer clubs/organization
16. School
17. Other, specify………..

16. Farmer perception of production constraints and information needs

16.1. How influential were each of the following in your household's <u>decision to grow</u>………………. [*Insert major crop*] in 2009? *[Circle one per row. Probe for other reasons]*

	Very important	Important	Not important
Direct contact with buyers	3	2	1
Higher prices compared to those of other crops	3	2	1
Extension advice from government staff	3	2	1
Advice from family	3	2	1
Advice from neighbours & opinion leaders	3	2	1
Advice from project staff/club members	3	2	1
Training received on growing your major crop	3	2	1
Need to increase household income	3	2	1
Need to diversify household income	3	2	1
Need to maintain flow of income throughout the year	3	2	1
Maintaining household food self sufficiency	3	2	1
Access to inputs from the buyer(s)	3	2	1
Access to market information	3	2	1
Prices that are stable and certain	3	2	1
Other (Specify)........................	3	2	1

16.2. How influential were the following <u>sources of information</u> on your decisions regarding the MAIN crop you produced in 2009? *[Use **Codes** below the table]*

	Decision to grow crop	Finding inputs to grow crop	Knowing input price	Knowing output price	Decision to sell crop
Printed material (i.e., newspaper ,magazine, etc)					
Radio programs					
ICT market information project					
Mobile phone text message (SMS)					
Mobile phone call in (VOICE)					
Buyers/buyer agents					
Neighbouring farmers					
Family members/friends					
Farmers organisation/cooperative					
Television programs					
Internet/email					
CD rom					
Government extension staff					
Other (specify)..					

Codes **1. Not important   2. Important 3. Very important**

17.0 Information Related Costs along the Value Chain of Main Crops and Livestock

17.1 Main Cash crop:_____ [*Use Code Sheet*]

Information costs at a point in value chain	Travel costs (Ksh)	Telephone costs (Kshs)	Other transactions (e.g. payments to agents searching for buyers)
1. Decision on growing the crop			
2. Arranging finance			
3. Accessing land			
4. Acquiring land preparation services			
5. Obtaining info on type and availability of seed			
6. Arranging or negotiating transportation for seed			
7. Procuring and applying fertilizer			
8. Accessing water for irrigation			
9. Accessing labor for production (from land preparation to crop storage/sale)			
10. Acquiring packaging material			
11. Acquiring storage inputs/services			
12. Checking for market prices			
13. Identifying potential buyers			

17.2 Main Staple/Food Crop: [*Use crop code sheet*]

Information costs at points along the value chain of Main staple crop	Travel costs (Ksh)	Telephone costs Ksh)	Other transactions (e.g. payments to agents searching for buyers)
1. Decision on growing the crop			
2. Arranging finance			
3. Accessing land			
4. Acquiring land preparation services			
5. Obtaining information on type and availability of seed			
6. Arranging or negotiating transportation for seed			
7. Procuring and applying fertilizer			
8. Accessing water for irrigation			
9. Accessing labor for production (from land preparation to crop storage/sale)			
10. Acquiring packaging material			
11. Acquiring storage inputs/services			
12. Checking for market prices			
13. Identifying potential buyers			

17.3 Main Livestock:

Information costs at Point in Value Chain of Main livestock	Travel costs (Kshs)	Telephone costs (Kshs)	Other transactions (e.g. payments to agents searching for buyers)
1. Decision on rearing the livestock			
2. Arranging finance			
3. Accessing land			
4. Obtaining information on type and availability of breeding stock			
5. Arranging or negotiating transportation for breeding stock			
6. Procuring and feeding			
7. Accessing water for livestock			
8. Accessing veterinary services			
9. Accessing labor for production (from breeding to marketing)			
10. Acquiring packaging material			
11. Acquiring storage inputs/services			
12. Checking for market prices			
13. Identifying potential buyers			

18.0 Awareness and use of ICT technologies and services in agriculture

1. Are you aware of a project in this area that uses ICT for farming information?

           1. Yes   0. No   (*If NO to Q1, go to Q5*)

2. If YES to Q1, what is the name of the project? …………………………………………………

3. What ICT technology does the project use in providing information to farmers? (*Circle all that apply*)

    1. Mobile phone   2. Television   3. Radio   4. CD Rom/Video   4. Internet/email   5. Other…………

4. Are you a member of the project?   1. Yes   0. No

5. If NO to Q4, do you use any information from the ICT project?   1. Yes   0. No

6. If you use information from the ICT project, how do you obtain that information?

    1. Spouse member   2. Neighbor member   3. Friend member   4. Other ....   5. N/A

7. Do you ever obtain information from friends/family who in-turn get it from a member of an ICT project?

           1. Yes   0.No

8. Please complete the table below for each of the ICT-based information sources you have used in the past. *[Record only for ICT information used]*

	Is the info from [ ] timely? 1. Yes 0. No	Is the info reliable? 1.Yes 0. No	Is the info easy to use? 1.Yes 0.No	Initial cost of buying the equipment (Kshs)	Cost of getting information from this source (Kshs)	How does the cost of using this info source compare to your usual source of info? **(Codes)**
Type of media						
1. Radio program						
2. Television						
3. Mobile call-up						
4. Mobile SMS						
5. Radio call-in						
6. CD Rom						
7.Video						
8. Internet/email						
9. Other………						

Codes: 1. Same 2.Lower 3. Higher

19. Mobile phone usage

1. Do you use mobile phone?	1. YES 0. NO
2. If YES to Q1, who owns the mobile phone you use?	**1. MYSELF 2. SPOUSE 3. OTHER FAMILY MEMBER 4. FRIENDS 5. TRADER 6. OTHER…**
3. Which of the following features of a mobile phone can you use? *[Circle all that apply]*	1. Camera/video 2. SMS 3. Calculator 4.Call only 5.Internet/email 6. Other…
4. If phone is yours, which year did you buy it?	
5. Is it a prepaid or postpaid (contract) phone?	1. Prepaid 2. Postpaid (contract)
6. Do you make and receive calls using phone?	1. Make / receive 2. Receive only 3. Make only . 4 N/A
7. Do the people who let you use their mobile phone charge you for your calls?	1. Yes 0. No
8. How much on **average** do you spend in ONE MONTH for overall mobile phone usage?	Kshs………………
9. How much do you currently pay for sending an SMS?	Ksh……………….
10. How do you find the current cost of mobile calls?	1. Low 2. OK 3. High 4. Too high
11. If mobile calls were cheaper would you:	1. Make more calls 2. Make the same amount of calls 3. Not sure
12. Which of the following did you call in 2009? *[Circle all that apply]*	1. Spouse/partner 3. Friends 5. Agro-input trader 2. Other family member 4. Produce trader 6. Other…………………
13. If you called produce/input trader in 2009, what **percent** of your calls were used on them?	…………………… %
14. Which of the following did you **send** SMS to in 2009? *[Circle all that apply]*	1. Spouse/partner 3. Friends 5. Agro-input trader 2. Other family member 4. Produce buyer/trader 6. Other…………………
15. Which of the following did you **receive** SMS from in 2009? *[Circle all that apply]*	1. Spouse/partner 3. Friends 5. Agro-input trader 2. Other family member 4. Produce buyer/trader 6. Other…………………
16. If you sent SMS to produce/input trader in 2009, what percent of your SMS were used on them?	
17. Who pays your mobile expenses or bill?	1. Self 3. Parent 5. Employer 2. Partner 4. Other family member 6. Other ……………………
18. Does using the mobile phone save you travelling time & costs?	1. Yes 0. No
19. If YES Q18, how much savings in cost do you make on average each time you use the mobile phone?	Amount of savings: Time (minutes)………………… Cost.......................................

	Source/destination of call	Number of calls
20. One average, how many of calls did you receive from [ ] in ONE MONTH during 2009?	1. Family members	
	2. Friends	
	3. Produce buyer/trader	
	4. Agro-input trader	
	5. Financial service providers	
	6. Information services	
	7. Employees	
	8. Other	
21. On average, how many calls did you make to [ ] in ONE MONTH during 2009?	1. Family members	
	2. Friends	
	3. Produce buyer/trader	
	4. Agro-input trader	
	5. Financial service providers	
	6. Information services	
	7. Employees	
	8. Other	
22. How does your use of mobile for input acquisition compare with before	1. Lower 2. Same 3. Higher 4. I don't use mobile phone for such activities	
23. How does your use of mobile crop/livestock marketing compare with before	1. Lower 2. Same 3. Higher 4. I don't use mobile phone for such activities	

19. Desire to participate in ICT project
[Ask the these questions only if a farmer DOES NOT CURRENTLY belong to an ICT project]

You stated earlier that you do not belong to [ ] ICT project, please answer the following questions...

	Response	Codes
1. Have you ever been a member of a project that helps people to use ICT (e.g. mobile phone, internet, telecentre, radio programming)?		**1.** Yes **0.** No (*go to Q4*)
2. If YES to Q1 when did you join? (Year)		
3. When did you quit? (Year)		
4. If you have **never been** a member of ICT project, give reasons why. **(***Circle all that apply and RANK 3 most important reasons; 1=most important***)**		1. High registration/membership fee ……………… 2. Project leaders are corrupt …………………….. 3. I can get information from other sources ………….. 4. Project admits only friends and relatives………….. 5. Project is too demanding on quality………………… 6. Project takes too long to pay members……………… 7. Project is too far from me………………………….. 8. Project meetings take too long …………………….. 9. Because I do not have the ICT device they need……. 10. Not aware of such projects 11. Other,(specify……….....………………….)…………
5. Would you like to be a member in future?		**1.** Yes **0.** No
6. If **YES** to **Q5** above, explain why? (*Circle all that apply and RANK utmost 3; 1=most important*)		1. To gain access to reliable market…………. 2. To get output price information………………. 3. To get input price information……………….. 4. To get credit…………………………………… 5. Because my neighbours are members…………… 6. Other (specify………………..)…………….
7. If you wish to be a member of an ICT project, how much are you willing to pay to become a member?		Specify amount in local currency ....local currency
8. Do you currently get information from members of such ICT project?		1. Yes 0. No
9. If YES to Q8, which information?		1.Output price 2. Input price 3. Technical advice

20. Need and access to agricultural credit in 2009

Purposes for borrowing	**Needed credit?** (Codes A)	**If YES, did you get it** (codes A)	**If you** did not get **credit, explain why** (codes B)	**If** you got credit, **did you get the amount needed?** (codes A)
1. Buying seeds				
2. Buying fertilizer				
3. Paying labor				
4. Buy farm equipment/implements				
5. Buying oxen for farm operations				
6. Invest in irrigation				
7. Buy/lease land for farming				

Codes A
1. Yes
0. No

Codes B
1. Borrowing is risky
2. Interest rate is too high
3.Too much paperwork

4. No lenders in this area for this purpose
5. Lenders do not provide the amount needed
6. Other, specify…………………………….

21. Mobile phone-based money transfer

1. Are you aware of mobile phone-based money transfer methods? 1. Yes 0. No
2. If YES to Q1, which of the mobile phone-based money transfer methods you are aware of?
    1 M-PESA   2.ZAP   3.YU-CASH 4.Other (Specify…………………………) 5. Don't know

3. How did you first hear of mobile phone - based money transfer methods? [*circle all that applies*]
    1. Radio   **3**. Newspaper   **5**. Friends   **7**.Receiving money

    2. TV   **4**. Extension officer **6**. Family members   **8**.Other (Specify …………………...)

4. What is the distance (Km) to the nearest mobile phone-based money transfer agent.....
5. Have you ever used the mobile phone - based money transfer methods?   1. Yes 0. No
6. If YES to Q6, which of the mobile phone-based money transfer service do you use?
    1. M-PESA   2. ZAP   3. YU-CASH   4.Other(…………………………..)   5. Do not know

7. When did you first use mobile phone-based money transfer service? Month..... Year........
8. How many times did you use the mobile phone-based money transfer services in 2009?

    a.   Receiving money………   b. Sending money………………

9. How much money did you receive/send using mobile phone in 2009?

    a.   Received KShs……………   b. Sent KShs………………………

10. How much were you charged for the receiving/sending the last time you used mobile phone?

    a.   Receiving KShs…………… b. Sending KShs………………….

11. How much money did you spent on fare the last time you visited an agent KShs………………..

12. How much time (minutes) does it take from home to reach to the agent? ....

13. How long (mins) did you have to wait before being served by the agent in your last visit? ....

14. Whom did you send the money to in 2009 using mobile phone? [*Circle all the applies*]
    1.Spouse living away from household.   **4**. Other relative living away from household

    2. Parent living away from the household. **5**. Friend.

    3. Child living away from the household.   **6**. Other ....

15. For what purpose(s) did you send the money in 2009?*[Circle all that apply]*
    1.Regular support to recipient.   **5**. Repayment of debt   **9**. Food   .

    2. Farm inputs other than labor   **6**. Pay nonfarm labor   **10**. Health care.

    3. Pay utility bills (e.g., water, electricity) **7**. Pay School fee   **11**. School fees

    4. Paying farm labour,   **8**. Buying produce for trading **12**. Other..........................

16. How did you spend the money received via mobile phone in 2009? [*See table below for details*]

Purposes	Amount spent (Kshs)
1. Buy airtime for yourself	
2. Buy airtime for someone else	
3. Buy food	

4. Pay school fees	
5. Pay a debt (specify type…………………)	
6. repay a loan	
7. Pay hospital bill	
8. Pay utility bills (water, electricity)	
9. Buy seed	
i. Main cash crops grown in 2009	
ii. Main food staple grown in 2009	
10. Buy fertilizer	
i. For planting	
ii. For top dressing	
11. Paying labor	
12. Purchase farm equipment/implements (Specify……..…………………)	
13. Invest in irrigation	
14. Buy/lease land for farming	
15. Purchase of livestock in 2009	
16. Saved the money for emergencies	
17. Send money to someone else	
18. Transferred money to my bank account	
19. Other (others specify……………………………	

Thank you!!!

Crop Code Sheet

1. Maize
2. Rice
3. Sorghum
4. Millet
5. Cassava
6. Field beans
7. French beans
8. Bananas
9. Sweet potato
10. Cowpea
11. Groundnut
12. Soybean
13. Baby corn
14. Asian vegetable (specify....................)
15. Cotton
16. Sugarcane
17. Pineapple
18. Indigenous vegetables (specify....................)
19. Sukuma wiki
20. Carrots
21. Passion Fruit
22. Other..............................
23. Other............................

Annex 3: Trader Survey tool

TRADER SURVEY QUESTIONNAIRE

Survey quality control

Date of interview: ………………………………………… Start time................... End time...........

Interviewed by:...

Country...

Checked by: .... Date checked:

…………………………

Date entered: ………………………………………………....... Entered by:

....

1.0 Trader identification

1. Respondent name (in full)……………………………….…………………. Phone number

……………….…

2. District……………... 3.

Region……………..………………..

4. Name of main market where you operate…….…………………………. 5.GPS

Reading……………………….

5. Category of the market   1. Municipal/district   2. County/divisional   3. Village 4. Other…………………..

6. How would you describe the MAIN work you do as trader? *[Circle all that apply and rank utmost 3]*

      1.   Produce Assembler   -----------------------
      2.   Broker   -------------------------------
      3.   Wholesaler ---
      4.   Input trader ---------------------------------------
      5.   Processor   ---
      6.   Other (specify……………………………………………….) ---------------

7. What were the FOUR MAIN commodities/inputs you traded in 2009? *[List in order of volume. 1 = highest volume]*

      1………………………………………….
      2. …………………………………………
      3. …………………………………………
      4 …………………………………………

8. Do you have a phone that is working?   1. Yes   0. No   *[If NO to Q8, ask Q10]*

9. If YES to Q8, what type of phone do you have?
      1. Mobile   2. Landline (fixed)   3. Both types   4. N/A

10. Do you have your own working sim card (i.e., mobile phone line)? 1. Yes 0. No

11. Do you use ICT tools for trading? 1. Yes   0. No

12. If YES to Q11, when did you start using these tools for trading? Year…………………

13. Who is the provider of the market information service(s) you have been using? ………
………………………………………………………………….…………………..

2 Socio-economic characteristics of the trader

1. Please complete the table below as per **current status**

Gender	Age (Years)	Years of schooling	Literacy (**Codes**)	Main source of income	Total HHD income in 2009	How long have you been a trader	How long have you been trading in MAIN input/ commodity
Codes: 1. Male 0.Female			**Codes:** 1.Can not read or write 2.Can only read 3. Can read and write 4.Other (specify)	**Codes:** 1.Farming 2.Permanent employment 3.Temporary employment 4. Input trading 5.Output trading 6. Other………			

2. Please complete the table below as per the time just before you started using ICT for trading activities (i.e., year YYY) *[Fill this table only if the respondent uses ICT in trading activities]*

Age in YYY (Years)	Years of schooling up to YYY	Literacy (Codes)	Main source of income in YYY	Total HHD income in YYY	How long HAD you been a trader up to YYY	How long HAD you been trading in MAIN input/ commodity up to YYY
		Codes: 1.Can not read or write 2.Can only read 3. Can read and write 4.Other (specify)	**Codes:** 1.Farming 2.Permanent employment 3.Temporary employment 4. Input trading 5.Output trading 6. Other………			

3. How much NET income did you earn from trading activities in 2009? Ksh ………………………

4 On average, how much NET income were you earning before you started trading? Ksh …………

4. Asset endowments

1. Please complete the table below for the item you own which may help you in your business
[Separate multiple entries with a semicolon. Fill last two columns only if ICT is used in trading]]

Asset name	Number currently owned	Year bought	Current value (Ksh)	Number owned in yr YYY	Value if owned in yr YYY (Ksh)
7. Oxen/donkey					
8. Ox-cart					
3. Bicycle					
10.Motor vehicle (s)					
5. Commodity/input store (own/rented)					
6. Radio/radio cassette					
7 Mobile phone					
8. Television (TV)					
9. Computer/Internet					
10. Landline phone					
11. Standard weighing scale					
12. Trading premises (e.g., shop, store or warehouse)					
13. Other ………………					

2. If you have a rented business premise (e.g., shop and/or store) how much is the monthly rent?
    1. Shop rent (Ksh/month)………………………
    2. Store rent (Ksh/month)……..……………

5. Purchases and sales of commodities/inputs

1. Please complete the Table below for the THREE MAIN MARKETS in which you traded the MAIN commodity/input during the last season 2009

1.1 **Source** markets for MAIN commodity/input *[Main commodity = Commodity No. 1 in Q8 pg 1]*

Name of market	Quantity bought (specify units)	Average price/unit Ksh/unit	Main seller **(Code A)**	Main transport type used **(Codes B)**	Average transport cost/unit	Distance to market (Km)	Type of road to the market **(Codes C)**	Average market fees/unit

Codes A 1. Farmer   2. Assembler; 3. Wholesaler; 4. Agent/broker; 5. Retailer 6. Other (specify………………..)

Codes B: 1. Truck/pickup 2. Public transport 3. Motor-bike 4. Bicycle 5. Donkey/oxen 6. Headload 7. Other …...
Codes C: 1. Non-paved dirt road 2. Paved dirt road 3. Paved gravel road 4. Paved asphalt (tarmac)

1.2 **Destination** markets for MAIN commodity/input

Name of market	Quantity sold (specify units)	Price/unit (Ksh)	Main buyer [Code A]	Main type of transport (Codes B)	Average transport cost/unit	Distance to market (Km)	Type of road to the market (Codes C)	Average market fees/unit (Ksh)

[Use codes in Q1.1]

1.3 Complete the table below for the **last transaction in 2009** involving the MAIN commodity traded in 2009

Name of MAIN commodity	Volume bought (units)	Buying price/unit (Ksh)	Distance to source market	Type of road to source market	Volume sold (units)	Selling price/unit (Ksh)	Distance to destination market	Type of road to destination market

6. Transaction costs incurred during the last transaction in 2009

1. Please complete the table below with the financial and time outlays involved in your last transaction in 2009
[Ask for the MAIN commodity traded during LAST TRANSACTION in 2009]

Market Name	Search/screening costs (cost of finding/ selecting buyer or seller)			Negotiation cost (cost of agreeing on price/quality/volume)			Monitoring cost (e.g., inspection, etc)		
	Call cost	Transport cost	Time spent	Call cost	Transport cost	Time spent	Call cost	Transport cost	Time spent

Q1 Continued……

Market (as above)	Enforcement costs (cost of following up on terms of trade)			Costs of renegotiating terms of trade		
	Call cost	Transport cost	Time spent	Call cost	Transport cost (fare)	Time spent

2. Please complete the Table below for the THREE OTHER major commodities you **traded with** other traders *[Record for last transaction in 2009]*

Commodity (Other than MAIN)	Volume bought (units)	Buying price/unit (Ksh)	Distance to source market	Type of road to source market	Volume sold (units)	Selling price/unit (Ksh)	Distance to destination market	Type of road to destination market

3. Please record the AVERAGE SEASON prices (Ksh/unit) of FOUR MAJOR commodities you traded in long and short rain seasons of 2008/2009 *[Ask of prices in traders main market]*

Commodity	Average prices (Ksh/unit) in respondent's main market			
	Long-rain 2009	Short rain 2009	Long-rain 2008	Short-rain 2008

7. Use of ICT tools in trading activities *[Ask only if respondent uses ICT for trading]*

1. Please indicate ways in which you used ICT tools below, if at all, you use for acquiring market information? *[Tick all that apply]*

ICT tool	ICT tool used to acquire information on……?				
	Price	Volume	Quality	Where to buy	Where to sell
Radio					
Mobile phone VOICE					
Mobile phone SMS					
Landline phone					
Internet					
Video/CD Rom					
Television					
Other ………………					

2. Who is the provider of the ICT services you obtain from the tools below

| ICT tool used by provider | [List all services provided via these ICT tools and 3 MAIN providers below] | | | |
	MIS service types (**Codes**)	Provider 1	Provider 2	Provider 3
Radio				
Mobile phone VOICE				
Mobile phone SMS				
Landline phone				
Internet				
Video/CD Rom				
Television				
Other ………………				

Codes

    1. Input price   2. Where to find inputs   3. How to use inputs

    4. Output price   5. Where to find output 6. Where to sell output

3. How ELSE do you normally obtain market information *[Circle all that apply]*?
    1. Travelling to the market
    2. Sending letter/notes
    3. Sending messenger/third party
    4. Walking to neighboring traders
    5. Walking to neighboring farmers
    6. Other (Specify……………………………..)

4. Please consider ONE TYPICAL week during the last season of 2009 and complete the table below based on that week?

ICT tool	Average number of times used per week during 2009	Average time (mins) per usage	Average cost per usage (Ksh)	Cost saving relative to travelling to market to obtain information (%)
Radio				
Mobile telephone VOICE				
Mobile phone SMS				
Landline phone				
Internet				
Interactive video/CD Rom				
Television				
Other (specify)				

5. What benefits have you obtained from using ICT tools in your marketing activities? *[Circle all that apply]*
   1. Able to get information on prices in my local market
   2. Able to get information on produce/input availability/volume in my local market
   3. Able to get information on prices in other/distant markets cheaply
   4. Able to get information on availability and volume of produce/input in other/distant markets
   5. Able to trade in distant markets
   6. Reduced tendency for intermediaries/brokers to cheat on prices
   7. Able to negotiate prices on phone rather than travel to where commodity is
   8. Able to followup trading partners using phone call & SMS to get them to honor agreements
   9. Able to renegotiate new prices, volume or quality without travelling to trading partner
   10. Other (specify)……………………..

6. What marketing problems did you face before you started using ICT tools for trading? *[Circle all that apply]*
   1. Traders cheated on weights
   2. Traders cheated on prices
   3. Took time to get market information e.g. prices and quantities
   4. Unable to compare prices in different markets
   5. Unable to know about availability/volume of produce/input in different markets
   6. Unable to negotiate price with many buyers within a short duration
   7. More difficult and costly to followup a trading partner after sell/purchase of commodity
   8. More costly to renegotiate price, volume, quality because I needed to travel to trading partner
   9. Other (Specify)………………………………

8. Use of mobile money transfer services

1. Do you use mobile money transfer services in your transactions? 1. Yes 0. No

2. If YES to Q1, what are the purposes for which you use mobile money transfer services in your business and the amounts transferred?

Purposes	Used service for…? *[Tick if used]*	Amount spent in last season of 2009 (Ksh)
20. Buy airtime for myself		
21. Buy airtime for someone else		
22. Pay business debt		
23. Repay a business loan		
24. Pay utility bills (water, electricity) for my business premises		
25. Buy commodity/input I trade		
26. Pay my workers		
27. Save the money for emergencies		
28. Send money to business partner		
29. Transferred money to my bank account		
30. Send money to non-business friend/family		
31. Receive payments from business partners		
32. Receive money from non-business friends		
33. Bank/save money on regular basis		
34. Other (specify…………………………)		

3. Which money transfer services are you currently registered in *[Circle all apply]*
1. M-PESA 2. ZAP   3. YU-CASH   4.Postapay 5. Other(……………………..) 5. N/A

8. Distance variables

1. Distance to nearest public pay phone (Km)………………………….……….
2. Distance to nearest center with electricity (Km)……………………….…………
3. Distance to nearest transporter of commodities/inputs (Km)………………….
4. Distance to mobile phone services (e.g., repair shop) (Km) …………………....
5. Distance to nearest mobile money transfer service (Km)…………….……….
6. Distance to nearest center with a bank (Km) ……………………………………
7. Distance to nearest informal moneylender (Km)………………….…………..

THANK YOU!!!!

Annex 4: Village level data collection tool

Village level tool

A. Non-labor input prices/costs

[Record for last/second planting season of 2009]

	Nearest village market		Nearest main market	
	Name of market	Av. price (Ksh)	Name of market	Av. price (Kshs)
1. **Fertilizers**				
1.1				
1.2				
1.3				
1.4				
2.**Pesticides/herbicides**				
2.1.				
2.2.				
2.3.				
2.4.				
3.Oxen hire				
4. Donkey hire				
5.Ox/donkey-cart hire				
6.Truck hire/charge				
7.Bicycle charge				
8.**Seeds**				
8.1				
8.2				
8.3				
8.4				
9. Other…….				

B. Labor inputs costs

[Record the wage rate by activity for second/last season of 2009]

Activity	Rate (country currency/day)	Activity	Rate (Ksh/day)
1.Ploughing		6. Irrigation	
2.Harrowing		7.Chemical application	
3.Planting		8.Harvesting	
4.1st weeding		9.Shelling/threshing	
5.2nd weeding		10.Other………………	

C. Physical infrastructure features *[Please circle one where necessary]*

1. Distance to main market…………………………………..
2. Fertility of the soil **1**. Low **2**. Medium **3**. High
3. Nature of roads   1. Poor 2. Average 3, Good
4. Access to irrigation water?   **1.** Yes   **0.** No
5. Is there a public pay- phone booth in the village   **1.**Yes   **0.** No
6. Is there private pay-phone booth in the village   **1**. Yes   **0**. No
7. Is there electricity in the village   **1** Yes   **0**. No
8. Mobile-phone money transfer services in the village? **1**. Yes   **0**.No
9. If YES to Q9, which m-banking service …………………………………..

D. Output prices for crops grown

[Record for major crops and poultry products in last/second season of 2009]

Crop	Price (Ksh/unit)		
	Beginning of season	Mid season	End of season
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			

Prices of poultry products

Poultry product	Price (Ksh/unit)		
	Beginning of season	Mid season	End of season
1. Milk			
2. Eggs			
3.			
4.			