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New Business Models for Sustainable Trading Relationships

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Information and communication technologies for development

This paper is part of a publication series generated by the New Business Models for Sustainable Trading Relationships project. The partners in the four-year project – the Sustainable Food Laboratory, Rainforest Alliance, the International Institute for Environment and Development, the International Center for Tropical Agriculture, and Catholic Relief Services – are working together to develop, pilot, and learn from new business models of trading relationships between small-scale producers and formal markets. By working in partnership with business and looking across a diversity of crop types and market requirements – fresh horticulture, processed vegetables, pulses, certified coffee and cocoa – the collaboration aims to synthesize learning about how to increase access, benefits, and stability for small-scale producers while generating consistent and reliable supplies for buyers.

For further information see:
www.sustainablefoodlab.org/projects/ag-and-development and
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Information and communication technologies for development

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Executive summary

New ways of using IT technologies and communication systems are transforming lives across the world. There had been concerns that the digital divide was accelerating the global class structure, creating wider gaps between the haves and have-nots. If this was the case 10 years ago, the recent changes in mobile subscriptions alone have significantly closed that gap. Mobile services are a reality in virtually all corners of the world. For many millions of smallholder farmers and traders, mobiles phones have become an essential "tool of the trade", strengthening existing business ties and opening up new opportunities with huge reductions in transaction times and cost.

This paper asks "How is information and communication technology (ICT) being used in agricultural development?" It outlines, using case study examples, how ICT applications for the agriculture sector range from the highly-sophisticated, fully-integrated chain-wide agri-business service packages used by the most commercial farmers, down to basic voice and text messaging that is being used very effectively by less resourced smallholder farmers and traders for all stages of the food production process: harvesting, processing, logistics to sales and marketing. To take advantage of this marketplace, the private sector, NGOs and governments are investing in a range of new tools to link farmers with assets, services and markets.

Five years ago, most ICT services for agriculture were confined to the top segment of farmers. The rapid rise in ICT technologies is now spreading into the smallholder agriculture sector and being used by a growing number of agricultural companies, development organizations, non-governmental organizations (NGOs) and farmers.

Despite the massive uptake of mobile phones by agricultural producers, there are few quantitative studies that provide hard evidence of a link between technology and poverty reduction. Those studies that have explored this, however, found that farmer access to market information through radio, mobile phones and internet resulted in higher farm-gate prices and a better bargaining position with local traders.

To make good on the promise of ICT transformation, however, the paper suggests that organizations from the public and private sectors will need to create new types of partnerships and business networks with the millions of smallholder farmers in the developing world. Some general recommendations for ensuring these technologies contribute to sustainable and equitable development include:

- Promote investment policies that give communications companies incentives to cross subsidize investments from higher profit areas to expand infrastructure into less commercial rural areas.
- Support income levies within the commercial communications markets so that a percentage of profit is made available for public goods services.
- In more remote areas combine wireless technologies with electrical power sources that can be used by communities to support other vital sectors, such as health and education.
- Promote and support the development of content in local languages to improve the accessibility and inclusiveness of ICT applications.

- Support adult literacy and numeracy programs in rural areas to expand access and use of ICT-based services to low income, more marginal areas.
- Promote and facilitate the establishment of broad public–private partnerships in the implementation of projects that support both public services and less commercial areas.
- Promote use of, and investment in, open source technology, so that developers and users are not constrained by licensing issues.

Mobile services are a reality in virtually all corners of the world. For many millions of smallholder farmers and traders, mobiles phones have become an essential "tool of the trade"

1
The ICT transformation in emergency and development programs

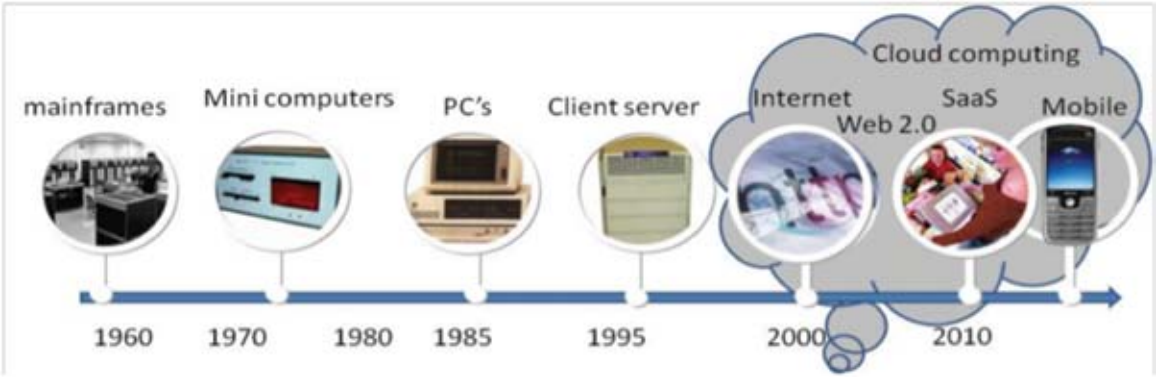
Over the past 30 years, the rapid development and integration of information and communication technologies (ICT) has transformed the way we live and do business. From humble beginnings in the 1960s, basic computer and telecommunication systems have revolutionized business operating systems. In the past 20 years the use of computerized systems has infiltrated virtually every sector of modern living across the globe and this revolution is now making its way into the development sector.

Many of the key events that have led to the IT revolution are based upon the maintenance of "Moore's Law", which predicts the doubling of computer processing power every 18 months. This has enabled the miniaturization of computing hardware from mainframes to personalized computers (PCs) in the 1970s, the shift from desktop to mobile technologies at the turn of the century, and most recently the rise of a dazzling array of mobile devices linked to cloud computing[1] (Figure 1).

The continued roll out of high-speed connectivity is rapidly creating a wired and wireless society, which is fuelling innovation and supporting our ability to share information and access new services and applications that add value to our lives and business ventures, at ever more affordable rates.

The driving force behind this huge innovation stream for faster, smarter, cheaper and more customized ways of connecting people to information services is the desire we have as individuals, families, groups, networks, firms, corporations and governments to understand our world more clearly, function more efficiently, and boost our skills and creativity.

Figure 1. Changes in technology over the past 50 years



Source: Thomas 2009

1. Cloud computing provides computation, software applications, data access, data management and storage resources online, without requiring cloud users to know the location and other details of the computing infrastructure.

How is ICT innovation working in the developing world?

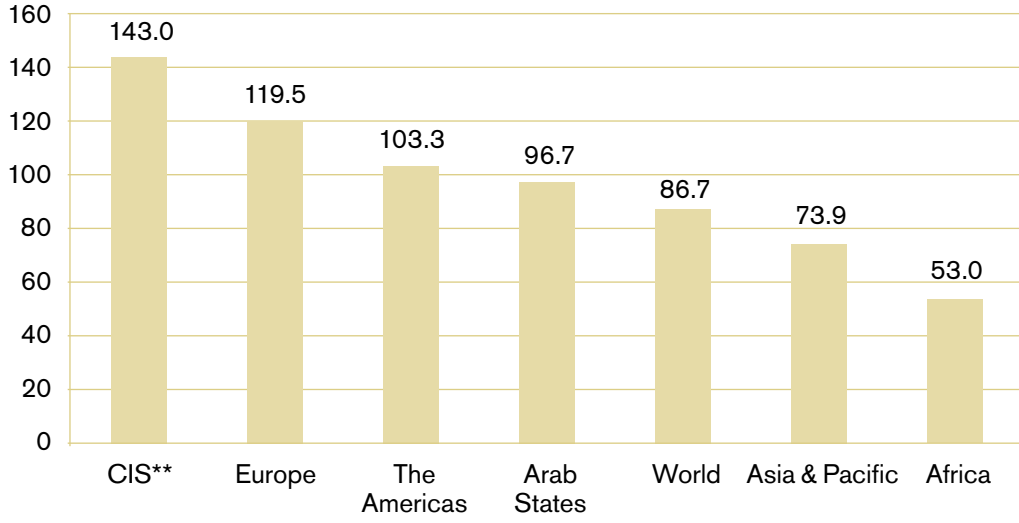
During the 1980s and 1990s, major corporate, consumer and telecom markets focused on the lucrative markets of industrial nations. However, as growth in these markets flattened off, a combination of leading and new ICT companies turned their attention to the "emerging markets". Many companies have maintained growth by reselling older technologies into these new markets, often referred to as the bottom of the pyramid (Prahalad 2004). As industrialized nations upgraded and deepened their markets, first generation technologies were repackaged for the rapidly emerging economies of Asia, Latin America and Africa. New companies from the emerging markets further energized the sector with business models that significantly reduced cost and increased access for the lower-income market segments. Frugal innovation has also allowed for mass market opportunities.

The roll out of "leapfrog technologies" in developing countries — whereby low-cost mobile phones are adopted instead of fixed-line telecoms — has led to massive uptake of new technology, which has transformed these societies. According to a recent Accenture and Vodafone report (Vodaphone and Accenture 2011) there are over 3.5 billion mobile connections in Africa, the Middle East, Latin America and the Asia-Pacific region (Figure 2). The current drive for additional connectivity through satellite and fiber optic cables is further accelerating the deployment and integration of mobile and web-based technologies.

How is the technology being used?

In emerging markets, mobile phones are the computing and communication product of choice. Market projections suggest that smart phones or some form of mobile device, such as the tablet,

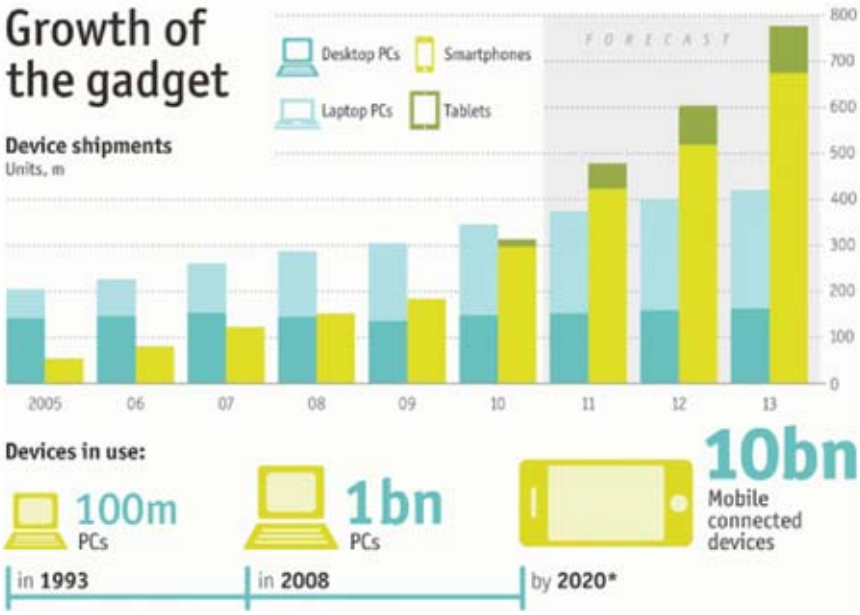
Figure 2. Mobile cellular subscriptions per 100 inhabitants 2011*



* Estimate
**Commonwealth of Independent States

Regions are based on the ITU BDT Regions, see: http://www.itu.int/ITU-D/ict/definitions/regions/index.html

Figure 3. Global trends in preferred internet gateway device



Source: Giles 2011

will become the global "point of access" choice (see Figure 3). The convenience and affordability of mobile technology has enabled millions of people in lower-income countries to become connected. The new-found ability to communicate has been particularly important in providing links between rural and urban communities, for family and business counterparts.

For many millions of smallholder farmers and traders, mobile phones have become an essential "tool of the trade", strengthening existing business ties and opening up new opportunities with huge reductions in transaction time and cost.

For the most part, smallholder farmers and local traders are using their phones within informal networks, and at this time there are few systematic services for rural communities.

As with the industrialized nations, however, the uses, applications and service options based on ICT solutions are rapidly changing as the private sector, NGOs, communities and governments gain more experience with the technology and start to build more effective and affordable services that link urban and rural communities within new types of social and business networks.

This process of social and technology change is both disruptive and innovative, causing many to rethink how people, systems and services can be configured to be faster, cheaper, better, and more equitable.

2
How is ICT being used in agricultural development?

In many emerging economies agriculture remains a major source of employment and income. An expanding and urbanizing global population means there will be continued and growing demand for agricultural products and services. To support an additional two billion people in the next 20–30 years will require raising the productivity of existing land and also bringing more marginal or distant lands into the mainstream agricultural system. This will create significant new opportunities for what are now poor rural communities, but how and when such communities connect into mainstream markets on a regular basis will depend on many factors. However, communications will be an important catalytic factor.

In terms of growth opportunities for agriculture with support from ICT solutions, a recent report from Accenture identified 12 ways in which mobile technologies could increase agricultural income by an estimated US$138 billion across 26 target countries, including developing countries, by 2020 (Vodaphone and Accenture 2011).

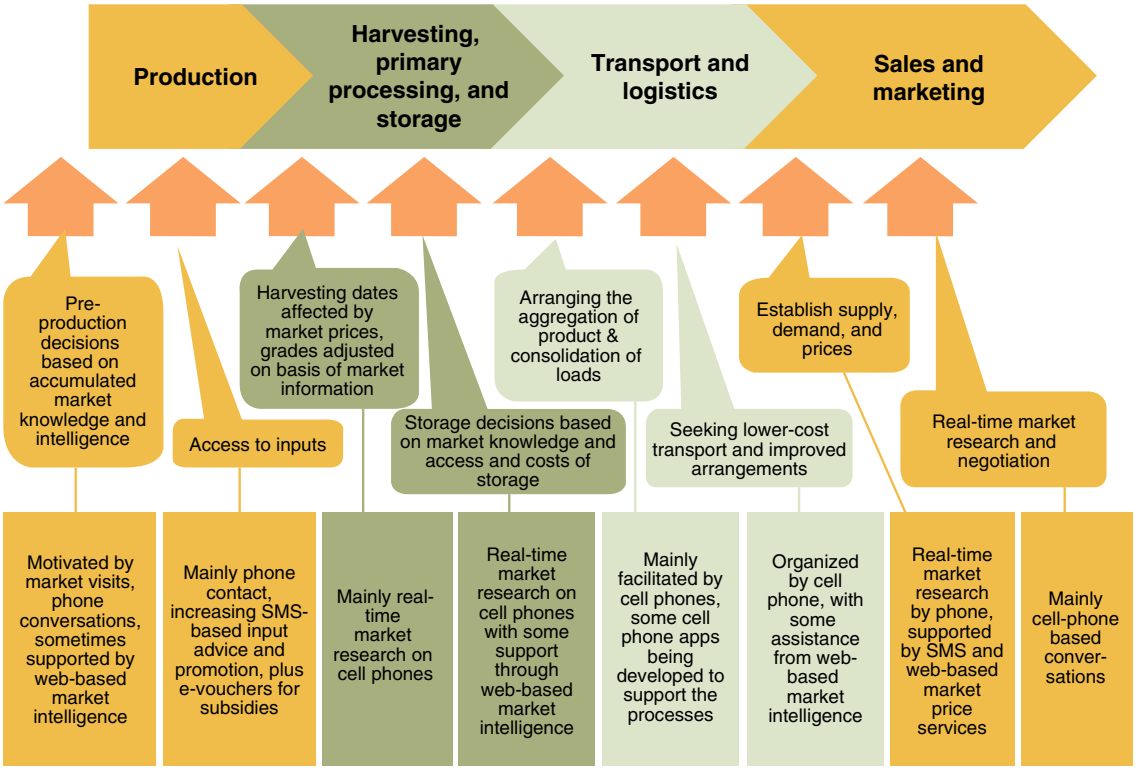
Given such incentives, it is not surprising that use of ICT in agriculture is proliferating to capture new market opportunities. Many applications that were built for other areas, such as health or land research, are now being adapted to support other sectors such as agriculture. The result is that thousands of service providers and technology teams are racing to find new applications and new solutions for the farming community. In addition to the technology, these companies also need to figure out successful business models that meet the needs of this emerging customer base and provide profits to the service providers. A critical feature of the ICT marketplace is the pace of change, its ability to scale up and the prospect of considerable dividends for investors who support the most successful products.

In the agricultural sector, ICT applications range from the highly-sophisticated, fully-integrated chain-wide agri-business service packages used by most commercial farmers, down to basic voice and text messaging that is being used very effectively by less resourced smallholder farmers and traders. To take advantage of this marketplace, the private sector, NGOs and governments are investing in a range of new tools to link farmers with assets, services and markets. Figure 4 shows how different types of information products are being used within various market chains, from the pre-production phase through harvesting, processing, logistics to sales and marketing.

ICT applications being used within agriculture include the following, and the sections which follow give specific examples of some of these uses:

- Voice and text communication
- Research using GPS for locating, targeting, mapping, and tracing of people, assets, products and resources
- Distance learning
- Analytical tools and calculators
- Monitoring and impact analysis
- Financial support via mobile transfers, mobile savings, mobile-investing
- Agricultural market platforms for trading, transfer and barter

Figure 4. How ICT applications can be used throughout the food system



Source: World Bank 2011

- Chain-wide production, trade and financially-integrated systems
- Appendix A lists many more ICT applications that are being used and adapted by both vendors and users in developing countries to support agricultural production and marketing.

Text communication networks

In 2005, Ken Banks set up a system in South Africa for the authorities to communicate with the public about wildlife conservation issues without relying on the Internet. This system could send, receive, and organize text messages through a mobile device using only a phone and a laptop. This system transformed into Frontline SMS, which was released as a public open source application in 2008. Since that time, Frontline has been downloaded more than 20,000 times and is being used in 70 countries to help groups of people to organize around a specific theme and share small amounts of information on a regular basis. Frontline SMS is now being used for positive social change in all major sectors with specialized teams supporting the use of Frontline SMS in disaster response, human rights monitoring, community radio, health, education, agriculture and credit.

Mapping products and resources

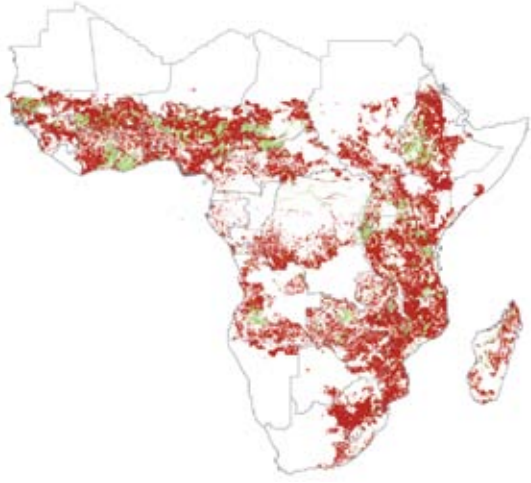
Although GPS has been around for more than 20 years, the release of Google Earth in 2004 brought the ideas of global positioning systems (GPS) into everyday life. The world suddenly had a relatively simple map that could be used by millions to link data about people, project activities and assets to a dynamic visual presentation. Many companies are engaged in developing a package of GPS-mapping, mobile phone survey instruments that are linked to cloud computing analytics. This is a powerful combination of technologies, which enables data aggregators to administer surveys or gather information in remote areas, use the cellphone system to record the location of the data source and then synchronize this information into an online database.

A more sophisticated use of spatial data use and analysis is provided by the HarvestChoice team from the International Food Policy Research Institute (IFPRI). This team has built a series of spatial datasets that study agricultural production for staple food crops and linked this with poverty mapping and food security. The datasets and associated analytical tools are used to generate strategic, policy-oriented information about the potential payoffs from interventions designed to enhance the productivity of smallholder farming systems. In one study they evaluated production levels of poor smallholder farmers in sub-Saharan Africa (SSA). The simulation shown in Figure 5 maps the area of land allocated to maize, the production levels in low input conditions and the crop response under intensified conditions (where fertilizer and hybrid seed are used).

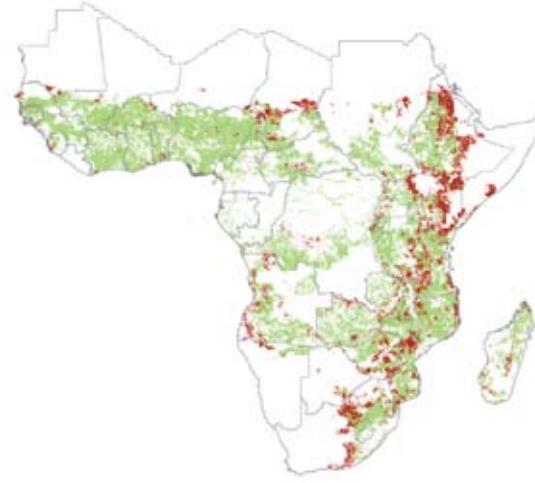
Results for maize farmers in SSA, shown below, indicate that, without further intensification, only 15 per cent of current maize growing areas have the potential to reliably produce more than 3 tonnes per hectare (t/ha), a yield level required to sustain the cereal needs of a typical smallholder household (Figure 5, Map 1). However, with well-managed intensification, up to 82 per cent of the current maize area shows the potential to reliably support the 3 t/ha household needs. This type of analysis is being used by researchers, donors and increasingly by governments and NGOs to make investment and project design decisions in agriculture and set monitoring targets

Figure 5. Mapping maize yield potentials

Map 1. *Maize area with > 3 t/ha in majority of years under low-input (green areas)*



Map 2. *Maize area with > 3 t/ha in majority of years under high-input (green areas)*



Source: Harvest Choice Labs. Available at http://labs.harvestchoice.org/2011/08/yield-reliability-room-for-improvement/

for the likely gains that could be achieved through implementation of such policies and investments. At present these meta level of analyses provide more strategic and policy level information, but in the near future, this type of information will be integrated with local ICT based technologies, so that more customized recommendations will be available to farmers.

Distance learning

A critical barrier to change in any system is having access to information that allows people to learn about new technologies, and also learn new skills so that they can use these technologies. The education gap is a major challenge for many poor countries that are seeking growth opportunities. In the past 20 years there has been a massive global push to support the rights to education. However, the scale of the education gap is daunting and with continually growing populations there is a persistent resource battle to reach this unlettered, innumerate population. In the countries of Mali, Burkina Faso and Niger, less than 30 per cent of the population is literate.

One of the options for reaching millions of students at affordable rates is to use ICT. There are many options from basic literacy methods available on a cellphone (Aker 2011) to sophisticated "learning management systems" (LMS) which support a teacher to set up a virtual classroom, load course materials and enroll students. The students read or "interact" with the course materials, many of which now use multi-media formats. The students take quizzes to test their levels of comprehension of the lessons and take exercises to test their ability to use the knowledge.

Figure 6 shows a screen from a Catholic Relief Service (CRS) course on agricultural marketing

Figure 6. Screen from a CRS distance learning marketing course

Source: Screensaver from Catholic Relief Services.

basics used as part of the training materials to support field agents in learning about buying and selling agricultural goods.

Teachers can talk with students using phone or email on a regular basis in one-on-one sessions to support the virtual classes.

Virtual learning tools are now widely used in higher education classes and there are an increasing number of courses offered through Virtual schools and universities. The virtual learning environment is attractive, in that courses can be standardized to meet specific learning goals, the courses can be initiated by students at any time, which reduces costs and enables students to work to their own timetable.

Within the development realm, there is a considerable effort to provide distance learning tools for basic education, but also to provide training to project and partner staff. Companies such as Agilix (www.agilix.com) are working with NGOs to build distance learning capability, which will allow course participants in projects overseas to work on courses. This can be done in remote offline situations, with students only having to go online to exchange questions and test scores with supervisors. Similarly, Google has created the Moodle online open source LMS, and the occasionally connected Poodle LMS to support distance learning in remote locations.

Analytical tools and calculators

To support the needs of individual farmers and farmer groups, there is also an emerging trend in "applications" that can be used to analyze specific farm options. The International Rice Research Institute (IRRI) is building an application to provide farmers with fertilizer recommendations. This application will be deployed on a tablet or phone and used by an extension agent or loan agent to provide specific farm fertilizer recommendations for rice. The system works through a short questionnaire, and a powerful online, cloud-based analytical system uses the farm data to generate a custom recommendation. IRRI plans to extend the service by building a Rice Doctor application that assists extension agents to diagnose problems with farmers in their fields and provide customized recommendations. This approach is being adopted by a number of the international agricultural research centers (www.cgiar.org) as a means of disseminating agricultural knowledge more widely to the farming community.

CRS is field testing a basic business planning tool and profitability calculator: Farmbook. This enables field agents to register farmers, and build business plans and evaluate the profitability of specific products in their business plans. This tool also provides customized business information to an individual farmer or a farmer group, and helps farmers to make more informed decisions on which crops to grow and where to sell their products. There is likely to be a major proliferation of such farmer-focused calculators in the future, especially when farmers start to buy more sophisticated phones with dataplans and are prepared to pay small amounts of money for specific, localized responses. These applications will enable farmers seeking certain types of information to download a related application and fill in a data form. This will set in motion a process of online data analysis online, which will then send a tailor-made recommendation to the farmer.

Agricultural market platforms for trading, transfer and barter

To support farmer decision making, many countries have developed market information services. However, the success of these systems has been mixed and in many cases, services that were government funded have ceased to operate due to poor performance. To fill this vacuum, private sector companies are developing online and mobile based market information services.

Esoko is one of the pioneer mobile based market information services (MIS), and this company is developing a suite of marketing tools that enable farmers to access commodity market prices in all the major markets in a country, make offers and bids and also ask questions to a helpline. Esoko is developing services to support farmers through

weather alerts and transport links, and by enabling farmers to set up personalized alerts.

Studies of the Esoko market information platform found that traders of agricultural goods in countries such as Ghana now spend up to 30 per cent of their disposable income on phone calls seeking new trade information and new linkages with partners, suppliers and buyers (Asihene and Jouanard 2009). Market surveys and econometric studies have shown that improved access to commodity price information is improving market integration within countries, and reducing price volatility as better price discovery is making buying and selling more efficient.

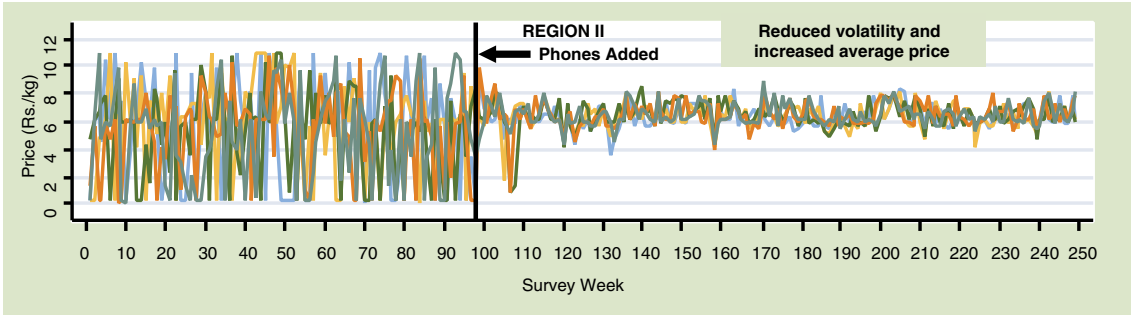
Does market information lead to increased income?

There are many qualitative studies which have found that farmers who use mobile phones to access market prices are able to negotiate with traders more effectively for better prices. These farmers make more informed marketing decisions about what to grow and in which market to sell, and focus group studies reveal that farmers are using their newly found access to market information on their phones, to record trends in market prices and make speculative decisions on storage and sales.

Despite the massive uptake of mobile phones by agricultural producers, there are few quantitative studies that provide hard evidence of a link between technology and poverty reduction. One study (Jensen 2007) describes how fishermen in Kerala, India, were using mobile phones to increase their incomes. Prior to mobile phones, these fishermen caught and sold their fish in home markets, on a first-come-first-sell basis. This system suffered from high price volatility and considerable waste, as fuel costs meant that fishermen who could not sell their fish at the first market were forced to dump their goods. Phones enabled fishermen to call into the markets whilst at sea and arrange sales before committing to a market. Jensen found that after the introduction of mobile phones, 35 per cent of fishermen sold in new markets, which dramatically reduced price volatility and minimized waste (Figure 7).

As a result of more efficient markets, fishermen's profits rose by 8 per cent on average and consumer prices fell by 4 per cent on average. These higher profits paid for the phones within two months, while the benefits are long-lasting, rather than one-off. As Jensen concluded, "Information makes markets work, and markets improve welfare," and clearly technology played a key role enabling the right types of communication.

Figure 7. Changes in fish price volatility with the use of mobile phones in Kerala.



Source: Jensen 2007

Another study from India (Goyal 2010) compared prices that farmers in Madhya Pradesh obtained when selling soybeans through regulated traditional markets with a network of 1,600 Internet kiosks (e-Choupals) set up by the International Trading Company (ITC).

Goyal showed that farmers' prices increased from 1–5 per cent when they had access to a wider range of market information at the e-choupal locations. The additional farm income from soybeans in Madhya Pradesh was estimated at about US$ 10–20 million per year. This income gain was a transfer from traders to producers as a result of producers' greater market knowledge and improved strength in negotiation.

More detailed studies also found that farmer access to market information through radio, mobile phones and Internet resulted in higher farm-gate prices, a result that supports the hypothesis that market information improves farmers' relative bargaining position with local traders (Svensson and Yanagizawa 2009). The result was consistent with qualitative evidence based on interviews with farmers in who received market information, which found that farmers who regularly used market information were able to gain a 12–15 per cent increase in sales prices compared with farmers who were not using this information technology. Their findings were also confirmed in another study (Subervie 2011) which found that farmers using an Esoko mobile market information system increased their income by 10 per cent when using data received from Esoko to support their business process and sales negotiation.

Integrated chain-wide systems

Within every developing country there are a number of developed country commercial agricultural operators who sell their goods into local, regional and international markets. Although the number of these fully commercial farmers is currently low, in places like sub-Saharan Africa they are using highly sophisticated ICT packages to support their planning, production, logistics and financial dealings. To support their needs a handful of companies has built data management systems that help these firms to optimize their operations along the value chain.

Muddy Boots has developed a number of products, including "QuickFire" and "Greenlight" (see Appendix A), that are used by these large commercial farming operators and exporters, such as Unilever, to manage produce sourcing from thousands of smallholder farmers. These sophisticated products allow users to track information on finance, logistics and food safety compliance along the entire value chain. This helps businesses address fundamental business, food safety and sustainability issues.

Another example that is focused on supporting smallholder integration within value chains is Cropster (see Appendix A), which is mainly working in the specialty coffee sector. Cropster seeks to support stakeholders in the whole supply chain by providing specialized information resources for coffee producers, roasters and distributors. The company provides high level analytics for each of the players in the chain, enabling them to upgrade their existing practices, but also to share their knowledge with their value chain partners in ways that helps optimize the entire chain-wide business model.

3

How affordable and appropriate are ICT services in the development of agriculture?

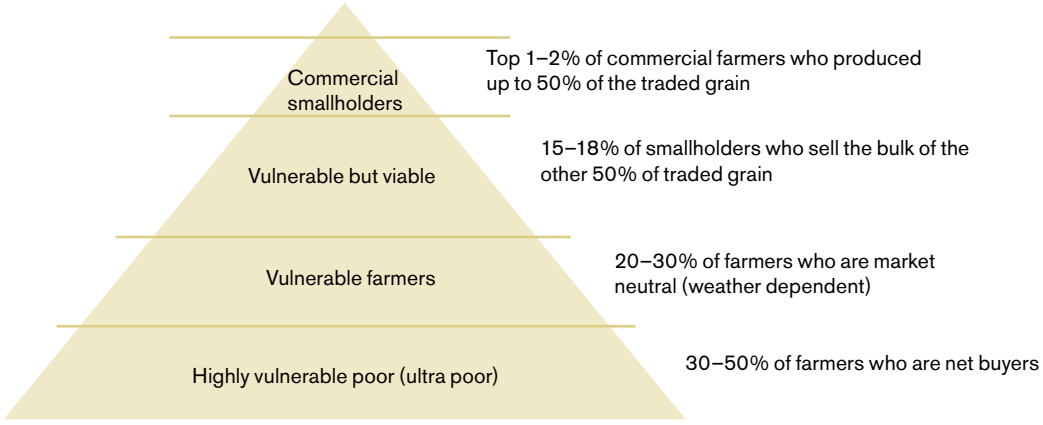
Five years ago, most ICT services for agriculture were confined to the top segment of farmers (Figure 8). These highly sophisticated farmers are found in virtually all "developing countries" and they have access to the same ICT tools as their counterparts in industrialized countries. These farmers benefit from chain-wide ICT systems that integrate production forecasting, financing, logistics and food safety / traceability systems.

NGOs use ICT technologies to support their internal financial and management systems, but up until recently had few field-based systems to support their local partners and the community-based clients. Similarly, governments have invested in a number of in pilot projects with ICT, but at this point in time few have scaled up practical applications in agriculture.

However, based on the previous information, it can be seen that the rapid rise in ICT technologies is now spreading into the smallholder agriculture sector and is being used by a growing number of agricultural companies, development organizations, NGOs and farmers. Within the last two to three years agricultural service providers, facilitators and investors have entered a period of multiple technology development and testing programs. Few agencies doubt the value of ICTs – the challenge is finding what works, where, what is reliable and how services can be integrated within sustainable business models.

During this testing and roll-out period, many are asking how relevant the ICT technologies are to the poorer farmers shown in Figure 8.

Figure 8. Maize farmer segmentation in East and Southern Africa



Source: Sitko et al 2011

The few surveys that have evaluated ICT use show that second tier farmers, i.e. smallholders who regularly sell a part of their produce into the market, now commonly use mobile phones to link with service providers and build relationships with their buyers. This farmer segment includes the better endowed smallholder farmers who are likely to lead in the use of new ICT applications and pay for such services.

The third and fourth-order farmers, who make up the bulk of smallholder farmers in developing countries, have increasing access to mobile phone technology, but many are yet to use the technology for their commercial activities. These farming families, however, make up the bulk of the unbanked rural community and they are increasingly using mobile money to receive funds from family members (Box 1). The literate farmers will be starting to use text messages for things like market information and as their phones become more sophisticated, they will start to receive more service offers, to support their farming needs.

The very poorest farmers will also benefit from linking into the ICT world; mobile money and e-voucher offers are available from government or development agencies to help them intensify their production or gain access food resources in difficult times (Box 1).

Box 1. Mobile money: a high-tech solution for cash-strapped communities

The M-Pesa (M for mobile, pesa is Swahili for money) financial service was first introduced in Kenya in 2007, where the service has become the main way of sending millions of small cash transfers from urban centers to rural communities. The service allows users to deposit money into an account stored on their cell phones and send balances using SMS technology to other users, who could redeem these deposits for regular money. In its first two years of operation M-Pesa reached nearly 40 percent of the adult Kenyan population. The M-Pesa service now operates in several countries, has more than 15,000 agents and supports over 9 million users. By facilitating the safe storage and transfer of money, it supports mass remittance flows and helps local trade, by making it easier to pay people with security, and to receive secure and rapid payment for goods and services.

For many millions of Kenyans, the ability to safely and almost instantly transfer funds to family members, friends and business partners, is a massive social change. This method is not only being used to support the financial and food security of social networks, it is also being used as a public network method to support people's food security needs, by transferring funds to buy food.

A similar system is being used in Zambia to disseminate "e-vouchers" to farmers (Sibanda 2010). Farmers who register receive prepaid mobile phone vouchers worth about US$ 50 to purchase inputs from agro-dealers. Farmer organizations may be able to develop similar arrangements with input suppliers. The World Food Programme has also used a similar system with scratch cards that enable food aid recipients to access their food rations from warehouses or local vendors in the scheme.

Source: World Bank 2011

Standardizing ICT products

At this point, there are few standardized off-the-shelf ICT products to support poor, smallholder farmers. However, there are many development groups and companies creating new applications to offer the development community. It is difficult to identify winners or standard applications at this time as the dust from creating and using new products is yet to settle. The development community is currently navigating through a somewhat chaotic period of ICT proliferation as would-be providers attempt to build and configure the right technology mix, at the right price, to meet the diverse needs of the agricultural sector. However, as services start to mature, NGOs and governments will invest in successful applications and rural communities in emerging economies will benefit from access to a more consolidated list of technology options; and those with a proven track record. It will be these technologies that will be scaled up to provide widespread improvements in natural resource use and market efficiency.

The result of this process will be to give farmers a better understanding of their production and market opportunities, and there will be a growth of community networks which will use information technology to link themselves into more robust and lucrative business relationships. NGO agencies will support this process by facilitating the development of effective rural social networks. In the future this will materialize into providing millions of clients with distance learning materials and services to build the capacity of local service providers and clients. Improved information tools will also provide service providers and investors with the ability to survey, analyze, characterize and map project areas and client options more quickly and effectively.

Democratizing development?

An important outcome from this new ICT-enabled ability to communicate, share and analyze information will be a general democratization of the development process in agriculture and other sectors, as client communities use the technologies to gain more voice in the development process. The ability to locate and interact with people in need may have profound effects on the way we invest in the relief and development domain. It is also likely that new types of investors will emerge as a result of being able to access remote rural communities more readily.

For the non-profit and for-profit investors who are seeking more direct channeling of funds, the right set of ICT systems will allow investors to:

- communicate directly with beneficiaries, clients and their local support service providers;
- invest in one-to-one, one-to-many, or joint investment opportunities to support a specific relief need or development goal;
- share information quickly with clients and service providers,
- transmit vouchers and or cash to people, communities and potential business partners with very low transaction costs;
- monitor progress of their investments in near real time; and
- earn interest against development loans.

Donors are already testing new ways of providing food and input support to community members via phone based e-vouchers and mobile money. In emergencies people can send funds via their mobile phones to local charities. There is a growing number of internet portals, such as Kiva and MyC4, who offer micro-investors the ability to invest in small business ventures.

Kiva and MyC4 allow charitable investors and philanthropic micro-venture capitalists to give or lend small amounts of capital, for example from US $20 to $500, to support entrepreneurs. The donations or loans are based on a portfolio of online business plans. The Kiva model works on the principle of providing loan options through micro-finance institutes (MFIs). An MFI will bundle a number of local business plans and then access Kiva funds to support the loans – there is no interest given to the investor. MyC4 has taken this one step further by providing a return on the investment and provides a clearer one-to-one relationship between investors and entrepreneurs. The rapid increase in mobile money transactions will lead to an expansion of these types of models.

Through this process, local civil society groups will receive more funding, and as their capacity matures they will take on more facilitation work, with less intervention from external agencies. We can also expect an increase in direct funding to communities and individuals who can express their needs. This will accelerate funding options, but it will also bring greater responsibilities to the recipients and will require that they learn how to manage these resources effectively and show investment progress.

Supporting the development sector

The ICT revolution is also changing how the existing relief and development sector works. To support the development sector, a new initiative has been formed called Nethope (www.nethope.org/). Nethope is a consortium of NGOs working with the ICT industry to promote web-based and mobile applications that support both relief and development programs. A recent Nethope initiative is the humanitarian marketplace, which is a portal designed to help NGOs access a range of new applications for testing. The site will allow for ratings and expert analysis on the usefulness of a select number of services. Nethope is also seeking to help the NGO community aggregate demand for certain applications and products to support bulk purchase and reduced costs for NetHope members.

Other initiatives that are helping to raise the profile of new ICT applications include the microLINKS portal (www.microlinks.org/ev_en.php) and Global Broadband portal (agriculture.gbiportal.net). Both of these initiatives are supported by the United States Agency for International Development (USAID), with the aim of providing development agencies with a constant flow of information about new ICT opportunities and about how projects are adapting technologies and processes to accelerate development impact.

Conclusion

The agricultural development sector is on the edge of an exciting but disruptive period that is being brought about through the application of new ICT processes and applications. From our early vantage point we have already seen a dazzling rate of change. There are a number of reports being released which show the potential of mobile and other digital products, and there is increasing evidence outlined in reports such as the World Bank annual *InfoDev Report on ICT4AG.*

To make good on the promise of ICT transformation, however, many organizations from both the public and private sectors will need to create new types of partnerships and business networks with the millions of smallholder farmers in the developing world. The following section lists some recommendations that may help to support greater use if ICT by development agencies and poor farming communities.

Given the rapid changing context and organic growth in the ITC4D sector, policy recommendations often have short-term relevance, but we list some policy recommendations to support better and more equitable access and rural development as follows:

- **Promote investment policies that give communications companies incentives to cross-subsidize investments from higher profit areas to expand infrastructure into less commercial rural areas.** Telecommunication companies have experienced extraordinary levels of profits with the deployment of wireless technologies in developing countries. As part of the contractual agreements, regulators should work with telecom providers to establish measures and incentives whereby, profits from the more lucrative urban areas are re-invested to provide basic coverage in the more remote rural areas; such that business success is combined with social equity, to provide the less endowed with access to modern services.
- **In more remote areas combine wireless technologies with electrical power sources that can be used by communities to support other vital sectors, such as health and education.** Many remote wireless stations and masts are located off the national electrical grid and are powered by generators. However, a large part of the energy generated is not used by the communications systems and could be used to support local power needs for vital services such as maintaining vaccine viability for people and animals, battery charging for local communications devices etc. Companies should work with local communities to manage such resources in ways that engage and support local community needs.
- **Support income levies within the commercial communications markets so that a percentage of profit is made available for public goods services**. To support greater access of ICT and targeting of services to the poorer communities, governments should identify telecommunications levies of 1 per cent of annual profit which should be set aside to finance public goods services, such as health messaging, market information and emergency alerts for marginal communities.

- **Promote and support the development of content in local languages to improve the accessibility and inclusiveness of ICT applications**. Cultural diversity of language is highest in more remote areas and greater efforts should be made to support communities in their local languages and dialects.
- **Support adult literacy and numeracy programs in rural areas to expand access and usage of ICT based services to low-income, more marginal areas**. Local language content will improve the accessibility and inclusiveness of ICT applications. It can also serve as an opportunity to capture and record local practices and knowledge.
- **Promote and facilitate the establishment of broad public-private partnerships (PPP) in the implementation of projects that support both public services and less commercial areas.** Both public and private actors are integrating a range of ICTs in agricultural value chains and collaboration between these partners can reduce costs and help extend the benefits to a greater number of individuals. The value of public-private partnerships for development-based ICT cannot be overemphasized. Developing new technologies is expensive and any service needs to be continually upgraded to stay relevant to the customer and functionally viable within the network options.

  Working in this highly dynamic area offers new opportunity for greater public-private collaboration and, for many, services, scale and affordable systems will only be possible through such joint efforts. This process of PPP not only applies to government and private sector initiatives, but also to NGO and private sector initiatives. Blue skies research is required, and it is encouraging that some of the major technology companies such as Intel, Google and Microsoft are investing in pilot projects and technology teams, such as Open Data Kit, to provide the ground work needed to build more sustainable and innovative development based applications and services.
- **Promote use of, and investment in, open source technology,** which offers development communities and users the ability to work with and use applications that are not as constrained by licensing issues as the products released through more formal commercial channels.

Appendix A. Examples of ICT "4D" (for development) applications showing promise within the agriculture and marketing sector

These examples provide a limited snapshot of solutions being used, and illustrate their main purpose; level of technology required and target clients for each.*

Basic communications tools					
ICT Solution	**Technology requirements**	**Target user**	**Purpose**	**Advantage**	**Impact**
Communication via mobile phone voice	Basic ($20) mobile phones for voice.	Mass audience: including farmers, traders and all market chain actors and service providers.	First generation phone technology enables buyers and sellers to make contact and discuss negotiate on terms of offers, bids and sales directly. The mass penetration of the mobile phone network is a leading source of communication across developing nations, which is rapidly transforming service options.	Low-cost rapid means of connecting to remote people in target networks.	Farmers receive information on market prices, input supply, transport, loan options, having access to mobile phone for business is having a transformative effect on how people approach the production and sales of their goods.
SMS / Text messaging	Basic ($20) mobile phones for voice and text message services.	Mass audience of farmers, traders, mass client base.	The use of text messages is a lower-cost means of communication, costing from 4 cents to 20 cents per message. This method has the advantage of documenting and recording retrievable information.	Low-cost information service that enables recorded information flow.	For literate and numerate farmers, who can read short text messages and send text messages.

* This thinking is further backed up by a similar set of services and solutions identified by an expert panel convened in the Vodafone Accenture report.

Example applications to support basic communication and networking					
ICT Solution	**Technology requirements**	**Target user**	**Purpose**	**Advantage**	**Impact**
FRONTLINE SMS www.frontlinesms.com/	Free computer application that requires a manager with a computer, linked to the internet and a mobile phone network.	Network facilitator linked to user groups.	Supports management of text messages to multiple clients and users. The system can be used to maintain communication within a network, or a buyer–seller network. More advanced use of the service can develop a simple multiple question survey using the base program. Frontline is being used in agriculture and other sectors such as health, and micro finance to share data.	Low-cost rapid means of connecting to remote people in target networks. Little training required.	This service has split into several sub categories, such as Frontline medic which is focused on medical activities, Frontline credit, focused on credit activities. This service is commonly used to link various network s of actors, such as farmer groups, project groups, extension groups and sales teams.
Dimagi www.commcarehq.org/	Computer, linked to the internet, and mobile phones.	Agencies seeking to link remote field agents with central information centre in real time.	To provide users with a simple form generator, that can be exported to mobile phones for real time data collection.	Proven technology within health field, that is now expanding into other sectors. Offers case history product that enables field agents to build data profile for clients on their phones.	More than 30 partners worldwide with project histories available at http://www.commcarehq.org/users/
Agricultural information services linked to basic communications tools					
Example information system Solutions	**Technology requirements**	**Target user**	**Purpose**	**Advantage**	**Impact**
Digital help desks, call centers and information points	Data and call center, staffed by experts who provide services to clients with mobile phones.	Smallholder farmers requiring production and marketing support.	Provides clients with access to specific types of information that they can access through mobile phones, rather than relying on physical services that are becoming rare.	Provides rapid response options, effective for routine problem solving to large scale of farmers.	

Agricultural information services linked to basic communications tools					
Example information system Solutions	**Technology requirements**	**Target user**	**Purpose**	**Advantage**	**Impact**
Kencell	Help desk with subject matter specialist linked to farmer network through mobile phone helpline.	Kenyan farmers who have agricultural problems and want solutions via their handsets.	Call center with systems in place to receive calls and respond with network of agricultural experts. The call center provides basic extension support to farmers who are unable to access information through traditional face to face extension services.	Rapid service that can be accessed by farmers at low cost, linking them to expert knowledge.	Limited evidence to date of the success of this technology, too early to tell. Sustainability of help lines not fully tested.
Market information	Cloud based service, which provider can access via basic computer linked to internet for loading data. User accesses data via mobile phone.	Rural farmers and traders, who have limited access to market information.	Provision of market information to millions of smallholder farmers and rural traders. Types of information include commodity prices, weather alerts, input service reports, and crop monitoring alerts.	Reduces information asymmetry and supports farmer ability to negotiate for improved market sales prices.	Several studies in the recent *World Bank ICT for Agriculture*, showing regular gains being made by farmers and farmer groups who can access, understand and use market information, see ICT4Ag year book.
Reuters Lite **www.reutersmarketlight.com**	Cloud based information service. Farmers access service via mobile phone, basic and low cost smart phone.	Smallholder farmers and traders, currently being used in Maharashtra, Punjab and Rajasthan States in India.	Reuters Market Light is mobile phone-based personalized professional information service specially designed to support the farmer community. Farmers receive crop production advice, weather forecasts, local market price information, local and international commodity information in their own language.	The decision-enabling nature of the information has a direct impact on the livelihood of farmers.	Reuters Market Light is estimated to have been used by over 2 million farmers through using and sharing in over 15,000 villages. Individual farmers have reaped significant return on their investment achieving up to INR 200,000 ($ 4000) of additional profits, and savings of nearly INR 400,000 ($8000) by using RML.

Agricultural services linked to basic communications tools					
ICT Solution	**Technology requirements**	**Target user**	**Purpose**	**Advantage**	**Impact**
Example MIS service Esoko **www.esoko.com**	Esoko is a market information service based in Ghana that provides internet based MIS platforms to mobile phone users.	Platform operators include Private companies, Governments, NGO's, in Burkina Faso, Ivory Coast, Ghana, Madagascar, Malawi, Mali, Nigeria and Sudan.	Enables organizations to provide market information services, such as spot prices, input prices, bids and offers, weather and production information to producer networks via their mobile phone. Producers that are associated into networks which can personalize information updates such as input options and prices, weather updates, pest and disease forecasts, production updates.	Service can target information to selected users, (farmers and traders) and build a business model around a 2 way communication system.	Farmers receiving regular market information improve their networking and price negotiating skills. This increases their sales prices, improved decision making, such as what to grow, where to sell, how to transport, how much to aggregate. All of these factors reduce transaction costs and increase sales revenues.
Manobi **www.manobi.net/**	Manobi, is phone based market information service design to support +$2 a day farmers, in national export markets.	Areas of operation Senegal, Mali, Ivory Coast, Niger.	Manobi has developed a range of mobile and web-based applications focused on improving value chains. T2M enables farmers to check market prices on their mobile phones via SMS, WAP, MMS, or mobile internet.	Information is designed for low literacy. The information is updated by a team of market researchers who map and enter it into their mobile phones.	Manobi claims that the income of gum growers using the _GIS + T2M platform have increased by 40-50% and that farmers using T2M have doubled their income.
AMISTSA **Regional Agricultural input market information system** **www.amitsa.org/**	Computer with internet to load information on input supply information platform, linked with clients via basic mobile phones and or computer.	Producers who want to access / buy agricultural inputs.	Systematized information resource that provides farmers with information regarding input types, prices, and nearest source of availability. Service provides farmers with information that allows them to identify and call vendors and procure required inputs.	Database that enables vendors to advertize their inputs and producers to locate and buy inputs.	Helping to link farmers with basic inputs and input networks, through provision of information on prices and products.

Data collection, analytical services, impact evaluation					
ICT solution	**Technology requirements**	**Target user**	**Purpose**	**Advantage**	**Impact**
Digital data forms and database management	Basic computer to set up digital forms and provide access point to cloud based database. Field information input through computer or other mobile device.	Networks that want to collect and share information.	Shift from paper based forms, to offline or online data forms that submit data into databases. These forms are mainly for closed question survey methods. Errors reduced through embedded data filters.	Accelerates data collection and avoids transcription errors. Useful for data gathering and M&E options.	Mobile database management is outcompeting paper based approaches. Providing timely transfer of data to database from remote locations, saving costs, time and lives.
SurveyMonkey	Computer linked to service account. Require computer to prepare survey instrument. Filled in online, through other computers and mobile devices.	Survey teams for production of the market response surveys. Target online clients who fill in the survey forms.	Cloud based survey tool with user fees based on level of usage. Used to create forms that are linked to a cloud database. Survey monkey provides a rapid means of creating a survey, for circulation, filling and basic analysis.	Free - Low cost, pay as you go type of service, or basic SaaS system providing license use to different levels of customers. Rapid survey method, with quick results reporting.	Millions of people use SurveyMonkey, including 100% of the Fortune 100 companies.
IFormBuilder **https:// iformbuilder.com** Cloud-based survey product for apple mobile devices	Any Computer with iforms account and application, system requires internet link to prepare digital forms. Users require mobile devices smart phones, tablets and ipods to fill forms.	Data collectors, such as Field workers, who collecting data in range of remote areas.	Provides users with a means of creating a digital form that is automatically linked to an online database. Users can collect data offline and send to database when they return to a wifi zone.	Provides tools to build standardized forms, automatically linked to a database. Forms can be filled in offline and synched with database on return to connectivity. Supports rapid data entry, transfer and analysis. Reduces re-entry error and accelerates information use.	Being used in over 80 countries for PM Work Orders, Inspections, Surveys, Site Audits, Mobile Dispatch, Hotel Inspections, Clinical Studies, Lead Capture.

Data collection, analytical services, impact evaluation					
ICT solution	**Technology requirements**	**Target user**	**What it does**	**Advantage**	**Impact**
Epi surveyor **www.episurveyor.org/user/** **www.datadyne.org**	Mobile phone for survey inputs and computers for data downloads and analysis.	Focus on health services, since 2003, Governments, NGOs, researchers, businesses, and others have used DataDyne for mobile data collection, analysis, reporting, and communications.	DataDyne is a social business based in Kenya, Chile, and the USA that creates web and mobile software to benefit NGOs, governments, researchers, and businesses worldwide.	EpiSurveyor lets anyone create an account, design forms, download them to phones, and start collecting data in minutes, for free.	Being used by USAID, CDC, WHO, World Bank, Red Cross, Unicef, John Snow, International Rescue, UNESCO. Award winner 2012 Computer World Honors Laureate.
COSA Committee on sustainability assessment **http://sustainablecommodities.org/cosa**	Online M&E / impact data management and analytics service, that users can access through an online account.	Producers and companies seeking capacity for large scale monitoring and evaluation systems. This method was initially designed to provide M&E support for certification schemes, with facilitators and farmer groups.	COSA is a non-profit consortium of institutions developing independent measurement tools to analyze social, environmental and economic impacts of agricultural practices, particularly those with sustainability programs. COSA has 4 components: 1. Survey Builder capacity 2. Data gathering processes using on/off-line gathering software) 3. Database with options for broad access for statistical programs 4. Portal for dissemination of data with the International Trade Center.	COSA offers an impact analysis tool kit, with customized support services to build and refine survey instruments, assist with indicator selection and assist with the design of basic database development. The COSA team is aiming to offer local company support in developing countries and consultancy support for data analysis and storage.	The tools developed by the COSA project are applicable to a diverse range of commodity supply chains and regions globally. • Coffee work conducted in: Colombia, Guatemala, Tanzania, Honduras, Kenya, Peru, Costa Rica, and Vietnam. • Cocoa: Ghana and Côte d'Ivoire. • Tea, Cotton, Palm Oil, and Soy are forthcoming.

Data collection, analytical services, impact evaluation					
ICT solution	**Technology requirements**	**Target user**	**What it does**	**Advantage**	**Impact**
Kimetrica	Online Monitoring and evaluation system.	Broad range of NGO's and development agencies.	The software includes easy-to-use tools for all the key aspects of non-profit project design, including log-frame development, budgeting, work-planning, and it helps to produce project proposals and other standard project documents. You can publish all projects on the web.	Buyers can sign up for a range of services, bronze, silver and gold which offer different costs and levels of service sophistication. Kimetrica also offer training and consultancy services to use the technology effectively.	Kimetrica is being used by a range of NGO's and development programs. For a full list of partners see: http://www.kimetrica.com/clients-partners.php
On-board calculators	Computers / mobile devices with calculator applications that support specific farmer analytical needs.	Field agent working with farmer groups.	Information tools that allows field agents to target client to provide information that can be used to generate more complex information, such as medical diagnoses, agro-chemical application rates, water flow, profitability.	The use of on-board calculators means that data analysis can be done in the field providing direct value to clients at the site of their enterprise operations.	
Farmbook (CRS)	Netbook computer with local application, which synchronizes with cloud based database and reporting facilities.	Field agents working for NGO or Governments linked to project managers.	Provides field agents with a standardized computer program that enables field agents to collect and analyze information offline and load data into an online database. Application provides (i) farmer registration, (ii) Business planner, profitability calculator, crop forecaster, farm visit log and impact analysis.	Allows field agents to undertake data collection, analysis and results to farmers in the field. The data collected includes basic monitoring and evaluation data, thus improving efficiency of performance monitoring.	Beta versions being tested in the field with partners.
SSCM (IRRI)	Data entry device, computer or smart phone linked to online service and database.	Field agent working with farmer groups. Loan agents supporting farmer clients.	Application has been calibrated in specific areas to provide fertilizer recommendations to rice farmers, based on a limited set of questions and basic field analysis.	Provides farmers with rapid production recommendations, with limited number of onsite tests.	Beta versions being tested in the field with partners.

GPS (global positioning system) using satellite positioning services				
ICT solution	**Technology requirements**	**Target user**	**Purpose**	**Advantage**
GIS Mapping	Locations are recorded using stand alone GPS meters, or through mobile phone triangulation. Point data is mapped onto a computer or mobile device.	Field agents and project staff, seeking to locate activities and spatially track this on digital. Mapping now often can be done in real time.	GIS systems allow positions of operation, and landscape information to be recorded on a digital map with associated data, this information can be layered to provide location specific analysis over time and provide the basis for analysis and scenario building of layered data.	Enables intervention teams to record, display and analyze spatial information related to interventions, such as points, tracks and area based information.
GPS hand held units	Standard commercial products such as Garmin or Magellan are used to capture GPS locations.	Field agent, investor, spatial analyst.	GPS unit enables field agents to accurately locate a position which can then be transferred into digital mapping software.	Accurate digital position can be used to identify a location, area, tag activities, assets and investments to a specific location.
Smart phones as locating devices	Smart phone with global positioning capability.	Any phone user with network access.	Smart phones provide similar location coordinates, but are less accurate than GPS as they work on triangulation of mobile cell towers rather than satellite positioning.	Cheaper means of locating points using more readily accessible technology.
Tagging and tracing with barcodes	GPS or smart phone and barcode generator, printer and barcode reader.	Field agent and spatial analyst.	The combination of GPS tagging and a barcode reader, provides ability to place a unique digital identification number or bar code with people or products and then use this identification to record service delivery to an ID or trace the flow of goods through a supply chain or network. This system is used to trace produce to record quality and food safety issues.	Service delivery to tagged clients provides greater opportunity for accountability and efficiency in service provision, product tagging supports food safety tracing in supply chain.

GPS (global positioning system) using satellite positioning services				
ICT solution	**Technology requirements**	**Target user**	**Purpose**	**Advantage**
Remote sensing	Methodology that allows analyst to collate and analyze information through satellite tracking.	Field agent who links specific service to spatial location.	Satellite systems provide opportunities to gather and map information at a global level. Precision of satellite imagery, is also supported by spectral analysis that provides for detailed analysis of weather systems, landscape cover and crop performance.	Provides analysts with ability to survey and map large areas, with limited need for ground truthing of information.
Examples of GPS (global positioning system) using satellite positioning services				
Google Earth **www.google.com/earth/**	Computer, or mobile device with link to the internet.	Basic and advanced GIS mapping users.	Google Earth, provides an easy to use mapping solution that allows users to explore, create, and connect on the Google Earth Outreach website. Users can use the Google gallery of public-benefit maps, create maps with the help of online tutorials and tools. Connect with others in the community and apply for software grants in the Google Earth for Non-profits Grant Program.	Google Earth s available for the desktop in three different versions: Google Earth, Google Earth Pro, and Google Earth Enterprise. The software provides users with basic maps, satellite imagery, 3D buildings, 3D trees, terrain, street View, planets and much more.
ESRI (Environmental Services Research Institute) **www.esri.com/**	Computer or mobile device to link to ESRI, software or cloud based solutions, and GPS device to record locations.	Project managers and analysts, who develop spatial maps with GIS tagged activities.	ESRI ArcView Software provides spatial analysts with a sophisticated program to build digital maps with multiple data layers that can be used to analyze and model the effects of interventions on future outcomes.	Provides a digital canvass to plot locations of activities, analyze spatial trends and share spatial information with partners and investors. Sophisticated analytical properties that enable users to integrate spatial data and analytical programs to model trend and forecasting systems.
CIAT Climate change mapping	Software application that enables users to analyze effects of climate change for specific crops in designated locations.	Agencies involved in long term production and climate change experts.	To develop scenarios showing the changes in suitability of specific crops in target areas over designated timeframes. This application is being used to determine the suitability of certain countries to coffee production in 20-30 and 50 year time horizons.	Provides producers and policy makers with information on potential production suitability scenarios as a result of climate change.

Distance learning products and platforms					
Example ICT interventions	**Technology requirements**	**Target user**	**Purpose**	**Advantage**	**Impact**
Distance learning	Computer that links to operates distance learning software or links to online distance learning system.	Students of all types, including agency program managers and field workers, seeking skills upgrading.	Distance learning platforms allow users to take a training course on their computer at any time. This type course facilitator.	Reduces training costs, enables students have flexibility work times and progress is monitored through supervisors remotely.	Millions of students are now taking online and offline e-courses.
Agilix www.agilix.com/ Brainhoney ToGo	Computer, with capacity to link with internet.	The platform is used by training agencies to support remote students and staff. Content needs to be generated to support process.	Agilix is an innovative, effective, and scalable set of educational products and solutions. Agilix provides a flexible course content manager that can be used by students and staff seeking skills upgrading.	Simple to use content manager that allows non technical user to build basic courses, that has on/offline capabilities. Agilix is (i) Student-Centered (ii) Standards Aligned Formative Assessment (iii) Efficient, Effective Virtual Programs (iv) Build Your Own Learning System (v) Online/Offline Learning.	Agilix has an expanding range of training products, which are providing tens of thousands of courses to millions of students.
LINGOS http://lingos.org/	Computer, with capacity to link with internet.	The platform is used by training agencies to support remote students and staff. As with all such platforms, it requires content.	Community of NGO member agencies, e-Learning courses from LINGOs members, LINGOs and its content partners Personalized Learning Management System (LMS) and other learning technology tools.	LINGOS, is a consortium of over 65 international humanitarian relief, development, conservation and health organizations. LINGOs provides the latest learning technologies and courses from our partners so these non profits can increase the skill levels of their employees, and therefore increase the impact of their programs.	Widely used by the NGO community.

Distance learning products and platforms					
Example ICT interventions	**Technology requirements**	**Target user**	**Purpose**	**Advantage**	**Impact**
Moodle and Poodle	Moodle needs to be installed on a web server somewhere, either on one of your own computers or one at a web hosting company.	Trainers and students.	Moodle is an Open Source Course Management System (CMS), also known as a Learning Management System (LMS) or a Virtual Learning Environment (VLE). It has become very popular among educators around the world as a tool for creating online dynamic web sites for their students.	Open source, supported by Google. Easy to use, strong support team.	Registered sites, 65,996 Countries, 218 Courses, 5,861,603 Users, 56,923,364 Teachers, 1,284,640 Enrolments, 27,521,751 Quiz questions, 112,608,513
FAO learning platform	Computer with capacity to link to internet.	Extension staff and managers.	FAO has developed a series of training courses focusing on food security and basic production systems.	Basic courses to support food production, postharvest storage and food security issues.	
Mobile e-commerce products and services					
Mobile e- money	Sophisticated banking software system. Clients link to system via mobile phones and accounts.	Rural or urban clients that want to transfer money to distant recipients at low cost.	Financial service that allows transfer of digital financial credits between users, via phones accounts. Credits can be redeemed at specific kiosks or banks into cash by recipients.	Rapid, safe transfer of funds into areas with either no or limited banking facilities.	Huge, one of the fastest growing industries in developing countries, especially Africa.
Example mobile money application					
M-Pesa www.safaricom.co.ke/	M-Pesa offer a direct mobile money transfer service within Kenya. Users only require funds and a mobile account to load and transfer funds to other mobile phone users.	Target clients are rural recipients, who are receiving funds from business partners or family.	The transfer of physical cash for business or consumption reasons, is time consuming, costly and risky. Mobile money offers a way of sending funds to specific clients, quickly and securely at low cost.	Rapid, low cost financial transfers, provide trade finances to penetrate to areas beyond traditional banking areas.	M-Pesa was first launched by the Kenyan MNO Safaricom, in March 2007. M-Pesa has grown astoundingly quickly, capturing 6.5 million subscribers by May 2009 with 2 million daily transactions in Kenya alone. This solution is now being used in Tanzania, South Africa and Afghanistan with options in other countries.

Example mobile money application					
Example ICT interventions	**Technology requirements**	**Target user**	**Purpose**	**Advantage**	**Impact**
Mobile transactions **www.mtzl.net/**	Depending on the transfer system, clients may require a phone, a scratch card or an identify number.	Farmers linked to formal buyers. Farmers linked to formal buyers. World Food Program.	Money transfer systems that supports electronic payments and vouchers. Provides farmers with a cashless solution for accessing inputs in areas not well covered by financial service providers. The scratch card has also been used by the World Food Programme to enable users to access food rations through approved vendors.	Ability of farmers to link to input suppliers without need for direct cash delivery. Improved tracking of beneficiaries, lower transaction costs for delivery team and 30% reduction in ghost beneficiaries, compared with paper-based systems.	Several thousand cotton growers are using this system in Zambia. Over 200 agents in every region in Zambia MTZL business clients include Dunavant, World Food Programme, CARE, FAO, CFU, Kiva, SDC, Celtic Freight, IRD and Mothers 2 Mothers.
Digital investment portfolios					
Digital investment portfolios	Online application that offers business plans for investor support.	Investors for funds, local entrepreneurs and farmer groups for Business plans.	Ability of a donor or investor to send investments to identified and vetted clients, to support their food security or business needs.	Direct means of investing in people who have basic business plans online.	
Example investment portfolio platforms					
KIVA **www.kiva.org/**	Computer linked to internet for investor.	Micro investors.	Online charity that clusters business plans and offers them to investors in an online investment process.	Links small business entrepreneurs in developing countries with citizen support from anywhere in the world.	Total Kiva loans: $250,010,650 Number of Kiva Users: 1,001,838 Number of Kiva Lenders: 631,564 Women entrepreneurs: 80.84% Current repayment rate: 98.89%

Example investment portfolio platforms					
Example ICT interventions	**Technology requirements**	**Target user**	**Purpose**	**Advantage**	**Impact**
My C4 **www.myc4.com/**	Computer linked to internet for investor.	Micro to meso investors.	Online micro-investment business, that offers business plans which micro-investors can place venture capital at a designated rate of interest.	Links small business operators to investors on profit basis.	18,736 investors from 112 countries have lent €14,043,248 to 7,175 small businesses in seven African countries.
Chain wide information platforms					
	Technology requirements	**Target user**	**Purpose**	**Advantage**	**Impact**
Chain wide information services	Sophisticated software platform that links multiple chain actors into a single software platform.	Business partners within a value chain.	Software system developed to track and manage business information through value chain partners. Integrates, production, processing, logistics, financial and sales data with business performance metrics.	Common methods of measuring production and marketing performance that can be shared to strengthen business relations.	
Examples of Chain wide information platforms					
Muddy Boots **http://en.muddyboots.com/**	Computers linked to online application.	Typically partners engaged in high value export value chains involving several formal partners, including retail.	To create business data solutions throughout the supply chain that underpins the future of sustainable food and farming and fulfils our customers' expectations every time.	Real time ability to monitor product and financial flows within the value chain. Credible method for providing a high level of food safety compliance.	Solutions such as the Quickfire program is used by large number of producers, logistics and retailer companies to track Clients include Unilever, Home Grown (Finlays), within multi-million dollar supply chain activities from farm to retail shelf.

Examples of Chain wide information platforms					
	Technology requirements	**Target user**	**Purpose**	**Advantage**	**Impact**
Cropster **http://www.cropster.org/**	Computers linked to online application.	Coffee and Cocoa farmers linked to specialized processors and retailers within specific business alignments.	Provides solutions for small and medium sized businesses in the agricultural supply chain. Helping to improve information access, data transparency and to make well-informed decisions in production, product quality, logistics and price information between aligned value chain partners.	Linkages of production, quality, finance, and logistics data using spatially analyzed data using an inclusive value chain business model.	Supporting a growing number of coffee and cocoa companies and cooperatives in Latin America and NGOs working to support value chain upgrading for smallholders. Client companies include Intelligensia, TCHO, Gut So!, Gimme Coffee, Square mile. CIAT for research and NGO's such as CRS.
Caretrace **http://www.caretrace.com/**	Computers linked to online application.	Farmers, retailers and customers.	Caretrace is a simple website that allows retail customers to discover the amazing stories behind their products. Watch videos, explore maps and view photos. Select a product on the right to get started.	Allows user to select a product to find out where it came from, how it was made and who made it. You can also find out what projects your product has helped to fund.	Product is being used by the retailer Waitrose, as a means of connecting consumers to producers.

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