

Connecting farmers to information

Imagine farmers around the world being able to use their mobile phones to acquire real-time market information and get access to various agricultural extension services.

Q Question from cassava farmer in Ethiopia

I will be planting cassava. Is there a recommended amount of fertilizer for both dry and wet seasons regardless if I conducted soil analysis?

R Response by the Farmers' Contact Center

We recommend NPK (12:24:12) application at the rate of 336 kg/ha 6 weeks after planting, followed by 16:8:24 16 weeks after planting.

Q Question by a rice farmer in the Philippines

Please send me information about rice seed variety NSIC RC 222. Thanks

R Response by the Farmers' Contact Center

NSIC Rc222 (also known as Tubigan 18) has an average yield of 6.1 t/ha and the maximum yield is 10 t/ha., 114 days maturity. Height is 101 cm. Intermediate to blast, bacterial leaf blight and tungro. Moderately resistant to brown plant hopper and green leafhoppers.

Q Question by a tomato producer in Uganda

I have 50 kilograms of tomatoes that I would like to sell at the market in Jinja. My farm is near Bukoyo. Can somebody pick up my produce? What is the current market price of tomatoes?

R Response by the Farmers' Contact Center

We have a truck with capacity for your produce passing by your village this Friday. We will connect you with the trucker to arrange for a meeting point. The kilo price for tomatoes in Kampala is 2,836 Ugandan Shillings this week.

Information and communication have always played a crucial role in agriculture. Ever since people have grown crops, raised livestock, and caught fish, they have sought information from one another.¹ Information and communication technologies (ICTs) can offer smallholder farmers a wealth of opportunities to acquire accurate and timely information on material supply and prices, as well as knowledge about existing technologies, best practices, and innovation. With this information, farmers can make better-informed production and marketing decisions, and participate more actively in value chains.² As such, ICTs provide an essential tool for farmers to overcome the commercialization barrier by improving the local infrastructure, strengthening business services and increasing farmers' skills and knowledge.

Today, mobile communication has become the most prevalent form of communication in almost every country in the world. The number of mobile cellular users increases steadily, and the mobile communication subsector continues to be the fastest growing industry around the globe. In 2012, three-quarters of the world's inhabitants had access to a mobile phone.³

Ensuring universal service and access to ICT is a top national objective in many countries. However, a review of the relevant statistics reveals a strong rural-urban divide in ICT service access. Reaching out to farmers in remote rural areas is a major challenge. In many countries, governments struggle to formulate and implement appropriate policies to create an enabling environment for farmers to use ICT as a means to commercialize their businesses.⁴ Rural areas lag behind in terms of access, affordability, and quality of ICTs. The lack of electricity in rural areas is arguably the biggest barrier to increasing access to ICTs. Electricity shortages force many mobile operators to use expensive diesel generators, which drive

up costs, making service less affordable for generally lower-income rural dwellers. At the same time, a lack of electricity makes it difficult to recharge phones.⁵

What the ICT data focus on

ICT is defined as any device, tool, or application that permits data exchange or collection through interaction or transmission.⁶ ICT is an umbrella term that includes devices and services ranging from radio to satellite imagery to mobile phones and electronic money transfers. Given the popularity of mobile phones around the world, ICT data focus on mobile networks, as well as farmers' opportunities to access information through the use of mobile phones. Mobile cellular phones support voice communications as well as text messaging and Internet access, at increasingly higher speeds, including broadband. At the same time, mobile phones open channels for market information and extension services, which are crucial to enable farmers and traders to make informed decisions about what to grow, when to harvest, or which markets produce should be sent to and at what price.

Five data sets were developed with the objective of measuring access to ICT services in the 10 pilot countries, as follows:

1. *Number of mobile cellular subscriptions per 100 inhabitants.* These data measure the number of subscriptions to a public mobile telephone service using cellular technology.
2. *Number of active mobile broadband subscriptions per 100 inhabitants.* These data measure the number of mobile broadband subscriptions and dedicated mobile broadband subscriptions to the public Internet.

3. *Market structure of the telecommunications subsector in the 10 pilot countries.* The rapid spread of mobile cellular networks worldwide would most likely not have been possible without competition. Therefore, these data measure the market structure of the telecommunications subsector in the 10 pilot countries.
4. *Public sector role to support the development of ICT infrastructure.* These data measure government strategies and mechanisms in place, such as subsidies and incentives, that support ICT infrastructure development.
5. *Existing ICT-enabled market information and e-extension⁷ services.* These data measure the existence of market information and e-extension services that make use of ICTs and are available to farmers in the country.

What the initial pilot results show

Access to targeted ICTs can help farmers to grow their businesses and increase their revenues. However, many countries still struggle to establish and implement appropriate policies to create an enabling environment for these services to be developed and improved. Collecting and analyzing data on access and usage of mobile phone and broadband Internet, business needs and the major constraints of farmers are crucial to formulate effective policies. Preliminary findings in the pilot countries show that mobile cellular usage rates and mobile broadband usage rates vary substantially across countries, impacting the potential role of ICTs. In addition, many countries lack strategies to support the development of targeted ICT-enabled services, for example, in their poverty reduction strategies.

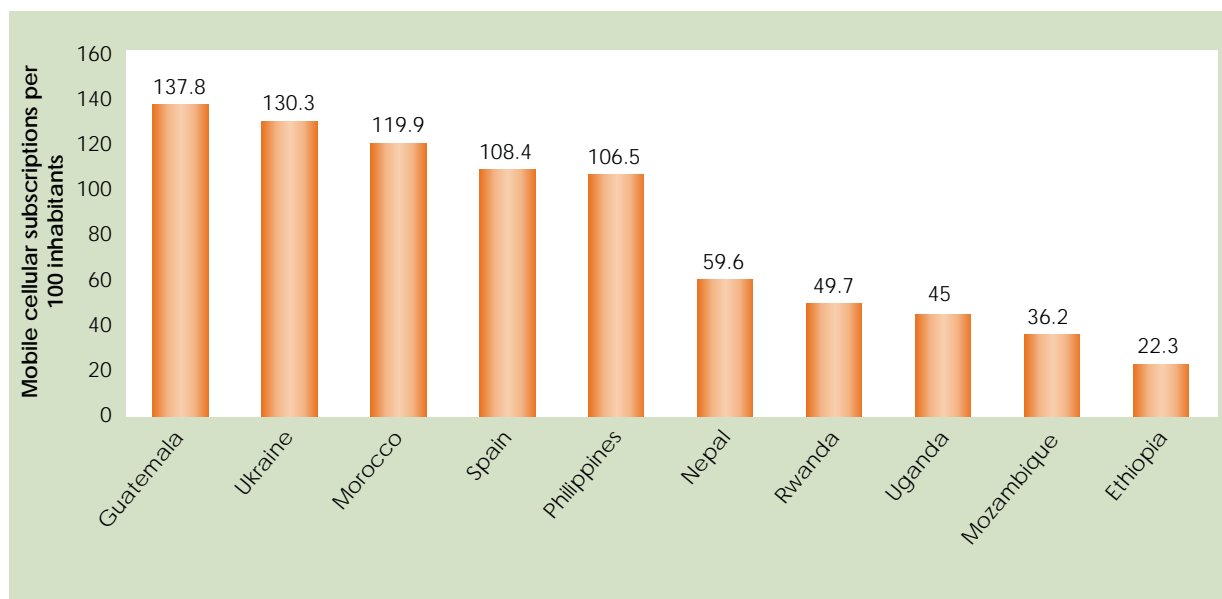
One of the main challenges encountered during the pilot was that insufficient data exists to provide a comprehensive picture on ICT pricing in all pilot countries. Most countries now have at least partly privatized the telecommunication sector and, as a consequence, there is not a standard tariff; there are many different offers available in all countries, ranging from prepaid to post-paid offers, billed on a per-minute, per-30-second or per-second basis.

Another lesson learned is that penetration rate data provide a better picture of the use of mobile devices than data coverage, as mobile cellular coverage only measures the theoretical ability of the population to subscribe to a network, irrespective of whether or not they actually do. Furthermore, some data points that the team was intending to collect were unavailable, for example, data on mobile cellular and broadband subscriptions dissected by urban and rural locality, and dissected by gender.

Mobile cellular subscriptions versus country population

An International Telecommunications Union (ITU)⁸ report recommended that “complete mobile coverage of all rural areas worldwide by 2015, or even earlier, should become a clear policy target and would appear achievable with the right policy emphasis.” However, high mobile signal coverage does not equate with usage. While it is estimated that more than half of rural areas in Africa are covered by a mobile signal, existing ITU data suggest that few rural households in the region have a mobile subscription. Where there is a large gap between population coverage and penetration, it suggests that bottlenecks in access are more due to affordability than to infrastructure shortcomings.⁹ Governments must strive to ensure that solutions are found to make mobile services affordable for people living in rural areas.¹⁰

FIGURE 11.1: Number of mobile cellular subscriptions exceeds country population in half the pilot countries



Source: *Enabling the Business of Agriculture* database.

Note: International Telecommunications Union (ITU) data were consulted to cross-check findings from the fieldwork in the pilot countries.

Figures on national mobile cellular subscriptions are available for all 10 pilot countries, either through the regulators, the operators, or both. These figures could be disaggregated into urban and rural usage, though data are not typically compiled in this manner. In fact, in none of the pilot countries were available data dissected by the rural and the urban space. The World Bank¹¹ and the ITU collect and publish data on mobile cellular penetration figures on a national basis. These figures were consulted to cross-check the findings from the fieldwork in the pilot countries.

According to these findings, Ethiopia has the lowest mobile cellular usage rate—only 22 out of 100 Ethiopians subscribe to a mobile cellular network. These figures are in high contrast to Guatemala, Morocco, the Philippines, Spain, and Ukraine, where the number of mobile cellular subscriptions exceeds each country's population. In Nepal, Rwanda and Uganda,

there are about as many subscriptions to a mobile cellular network as half these countries' populations (figure 11.1).

Highly variable mobile broadband subscriptions

Evidence indicates that Internet access using mobile phones is a growing worldwide trend. Mobile broadband access can be an attractive solution in rural areas since it requires less investment than installing fixed broadband connections. Mobile broadband use rates, or the percentage of the population within reach of a 3G mobile cellular signal, therefore, will be an important metric to monitor.¹²

None of the pilot countries collect data on broadband Internet use rates by rural and urban locality. Existing data suggest, however, that broadband access in rural households remains very limited in many developing countries or

is not available at all. In many industrialized countries, on the other hand, rural connectivity is on par with urban connectivity.

For the pilot countries, Ethiopia comes in last in terms of mobile broadband usage rates, followed by Mozambique and Rwanda. By the year 2012, mobile broadband subscription rates did not exceed 10% in any of the developing pilot countries for which data is available. At the same time, there are remarkable differences between the industrialized countries, with penetration levels ranging from a relatively low 5.5% in Ukraine, to more than 50% in Spain (figure 11.2).

Telecommunications sector liberalization

The ongoing spread of mobile cellular networks, including into rural areas, has been driven by the telecommunication sector liberalization worldwide, with particular emphasis on developing competition in the mobile cellular market.¹³

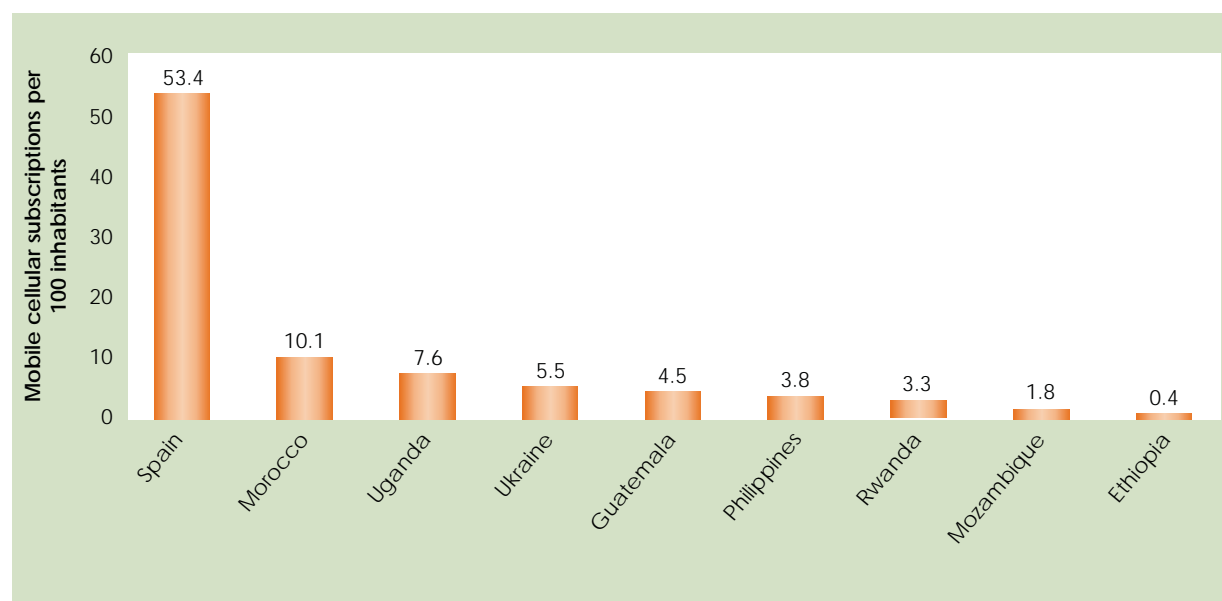
The national governments in the 10 pilot countries have evidently provided an environment that enables private sector participation in the telecommunications sector, although Ethiopia is an exception as it is the only country with a government monopoly in the sector. The exclusive control over the market has, by implication, notably hindered the growth of ICTs in Ethiopia. As outlined in the previous sections, Ethiopia lags behind in terms of mobile cellular use as well as mobile broadband usage rates.

Public sector's role

A number of governments in the 10 pilot countries have recognized ICTs as a vital part of agricultural development and have put special emphasis on increasing ICT access rates in rural areas.

The governments of Nepal and Uganda, in particular, have designed rural telecommunication development funds to be financed

FIGURE 11.2: Mobile broadband usage rates across pilot countries



Source: *Enabling the Business of Agriculture* database.

Note: International Telecommunications Union (ITU) data were consulted to cross-check findings from the fieldwork in the pilot countries. For Nepal, data for mobile broadband usage rates are not available.

from a charge of 2% and 1%, respectively, on operators' gross annual revenues. The authority invests the deposited amount in the development, extension and operation of telecommunications infrastructure in those areas where service provision would otherwise not be feasible or unlikely to be provided by operators in the following years without a subsidy.

ICT-enabled market information and e-extension services

Agricultural mobile applications (“apps”) and other programs are widely available in many developing countries and are offered by private as well as public sector providers. These services focus on improving agriculture supply chain integration and have a wide range of functions, such as providing market information, increasing access to extension services and facilitating market links.

Market information systems aim to reduce information asymmetries in the agricultural value chain and empower farmers with up-to-date market information. In addition, they can provide direct links to markets (by bypassing intermediaries) and increase farmers' incomes through their informed ability to negotiate trades, and thus develop commercialized farming activity.¹⁴ Market information systems gather and distribute commodity prices to farmers and traders, making use of various media channels, with mobile phones and the Internet being increasingly popular.

The role of ICT-enabled market information services and agricultural extension services is constantly evolving over time. The focus is moving from pure commodity price information to a variety of services such as marketing and business needs and skills, and good practices for all parts of the value chain. Many new tools such as apps with video diagnostic or geographic

information systems (GIS)¹⁵ are used to support farmers. A major challenge for governments is how to link different types of farmers with their different needs, market aspirations, and sets of skills to different types of markets. Moreover, how can the cooperation among different public and private sector actors on ICT services be strengthened? The different services available in the 10 pilot countries—focusing mainly on providing market information on prices and best practices—show the huge variety of such services, as table 11.1 illustrates.

Next steps

The objective of the pilot data collection was to identify relevant, measurable, and collectible data sets on ICT infrastructure and services. After analyzing the data collection results, the team narrowed the focus to 5 data points. This chapter presented the initial methodology and the findings for the core data points. Based on the lessons learned from the data collection and the feedback received, the topic and the questionnaire will be further refined for the next cycle and additional measurements may be considered.

With regards to developing ICT indicators, the team is analyzing the following options:

- The topic could continue to be an individual indicator and be extended to additional legal and regulatory aspects. For example, a focus could be on the affordability of agricultural ICT services. Another very important aspect is to analyze the variety of services offered, determining the kind of services and providers for each target group, as well as how the government supports the development of new tools. The team will continue to expand cooperation and exchange with international organizations

TABLE 11.1: ICT-enabled market information and e-extension services in the 10 pilot countries

Country	Name of Service/Product	Description/Summary
Ethiopia	Ethiopia Commodity Exchange (ECX)	ECX provides a virtual marketplace that is accessible online and by phone and SMS; it improves transparency on supply, demand and prices. ECX receives more than one million requests per month for market information, with 80% coming from rural areas. The producers are able to see the price difference between different grades and commodities, so they can make more informed decisions on what to plant and can see the quality premium and discount associated with postharvest production.
Guatemala	Distance Diagnostics through Digital Imaging (DDDI)	The DDDI system allows textural information and descriptive images to be submitted directly from extension offices for rapid diagnosis by resource professionals, such as on plant diseases.
Morocco	ASAAR	The information system, ASAAR, implemented by the Ministry of Agriculture and Maritime Fishing, provides stakeholders with information on prices and markets on its website and via an app.
Mozambique (and several other African countries)	Esoko	Agro-marketing/trade: The Esoko platform provides automatic and personalized price alerts, buy and sell offers, bulk SMS messaging, stock counts, and SMS polling. Markets, commodities, languages, and currencies are easily configured. Esoko also offers strategy, support and trainings to projects rolling out market information systems.
Mozambique	Sistema De Informação De Mercados Agrícolas De Moçambique (SIMA)	The Ministry of Agriculture has implemented an Agricultural Market Information System (SIMA). SIMA produces weekly (Quente-Quente) and monthly bulletins (Boletim Mensal). Through the system, farmers have access to domestic prices of 25 agricultural products in 27 producer, wholesale, and retail markets throughout the country, plus regional and international prices of selected commodities and market commentary. The information is disseminated by radio, local district agriculture directorates and by NGOs via email circulation.
Philippines	b2bpricenow	The b2bpricenow.com is an integrated e-commerce/m-commerce program that has an agriculture e-marketplace that provides up-to-the-minute price updates and other market information, as well as money movements.
Philippines	International Rice Research Institute (IRRI)	IRRI-developed websites and apps offer services related to rice information, such as specific recommendations on nutrients, pests, weeds, or water management, depending on the specific crop variety, yield from the previous season, and the site-specific field conditions.
Philippines	Agriculture Training Institute	The Agriculture Training Institute is an agency with a mandate to provide extension and training for farmers and extension staff, such as access to best practices and updated science and technology to improve agricultural methods and increase agricultural productivity. Within the agency is the Farmers' Contact Center, a call center (voice call, text messages, online forum) that caters to queries from farmers related to agriculture and fisheries technologies, agricultural marketing, pests and diseases. The service is being implemented by the Department of Agriculture through the Agricultural Training Institute, in collaboration with the partner institutions in the Department of Science and Technology, local government units, state colleges and universities, and other stakeholders in agriculture and fisheries extension.

(Continued next page)

Country	Name of Service/Product	Description/Summary
Uganda	Application Laboratories, "AppLab"	AppLab is an anti-poverty technology program that the Grameen Foundation manages. AppLab aims to help smallholder farmers obtain accurate, timely, and actionable agricultural information through a network of community knowledge workers (CKWs) comprising rural community members. The program uses mobile technology to deliver agricultural information both to and from smallholder farmers. Through the network of CKWs throughout Uganda, the Grameen Foundation aims to revolutionize agricultural knowledge sharing and, in turn, improve yields, reduce losses and increase incomes of poor smallholder farmers throughout the country.
Uganda	Farmer's Friend	Farmer's Friend (powered by Google SMS and the Grameen Foundation) offers farmers an affordable and targeted means by which to search for agricultural tips through an SMS-based database. Keywords in the request for assistance are matched against the database, and the farmer receives a reply with a tip related to the relevant query terms.
Uganda	Foodnet and Farmgain	Data on prices, traded volumes, market flow, growing conditions, and other relevant information are collected from villages and market centers and, together with relevant national and regional information, are disseminated in local languages by local FM radio stations. The project receives and disseminates instant reports through SMS on changing market prices. Both the national and localized market information projects are fully integrated, using a central information processing facility, thereby reducing cost and augmenting local information with national and regional market information of relevance to the local target area.
Uganda	Google Trader	Agro-marketing/trade tool by Google, Grameen Foundation, and MTN Uganda: Google Trader helps buyers and sellers find each other. Users can broadcast a message by sending an SMS, allowing them, for example, to list the products that they are selling or to find space on a truck to take their goods to market.
Uganda	Infotrade	Infotrade provides critically analyzed information collected from 20 district markets in Uganda that cover a total of 46 commodities. Data is collected three times a week, verified, and then posted on a website. Information can be accessed by email or directly on a mobile phone.
Rwanda	Agricultural Information and Communication Centre (CICA)	CICA is an agricultural management information system (website) created by the Rwandan Ministry of Agriculture to collect, share and disseminate agricultural information and knowledge.
Rwanda, Uganda (and several other African countries)	East Africa Exchange (EAX)	EAX is a regional commodity exchange that was established to link smallholder farmers to agricultural and financial markets, secure competitive prices for their products, and facilitate access to financing opportunities. EAX is registered throughout East Africa Community partner states.

Sources: Q. Zhenwei et al. 2012; *Enabling the Business of Agriculture* database.

and institutions, such as the ITU, to further refine the methodology.

- Another option would be to embed ICT as a cross-cutting topic into other program topic areas, similar to what will be done with the gender and environmental

sustainability topic areas. Possible areas that are already partly included in the topics are ICT-enabled market information services (access to markets), mobile banking (access to finance), or e-extensions (fertilizer and seed).

Notes

The underlying research and design of the connecting farmers to information topic benefited from valuable comments provided by Sara Boettiger, Aparajita Goyal and Eija Pehu.

- 1 World Bank 2011b.
- 2 Shenggen et al. 2013.
- 3 World Bank, press release, July 17, 2012; <http://www.worldbank.org/en/news/press-release/2012/07/17/mobile-phone-access-reaches-three-quarters-planets-population>.
- 4 ICT4Ag 2014.
- 5 ITU 2010.
- 6 World Bank 2011b.
- 7 The term “e-extension” refers to the provision of extension services through the use of modes of information and communication technologies (ICTs), such as a mobile phone that is used as a platform for exchanging information, for example, through short messaging services.
- 8 ITU 2010.
- 9 UN Partnership on Measuring ICT for Development 2005.
- 10 ITU 2010.
- 11 World Bank 2014b.
- 12 ITU 2010.
- 13 Ibid.
- 14 Karugu 2010.
- 15 A geographic information system (GIS) is a computer system for capturing, storing, checking, and displaying data related to positions on Earth’s surface. GIS can show many different kinds of data on one map and enables people to more easily see, analyze, and understand patterns and relationships.