Mobile technologies for food security, agriculture and rural development

Role of the public sector

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WORKSHOP PROCEEDINGS

Mobile technologies for food security, agriculture and rural development

Role of the public sector
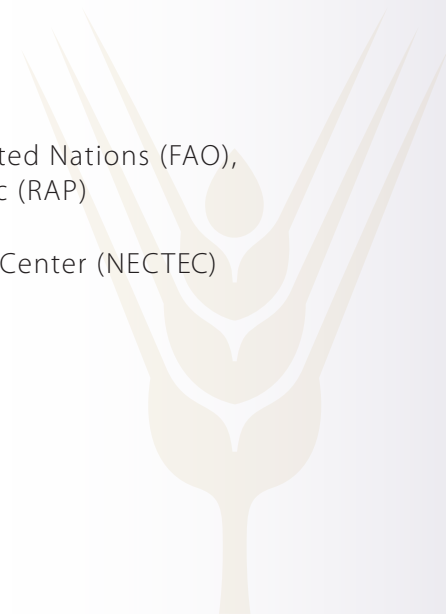
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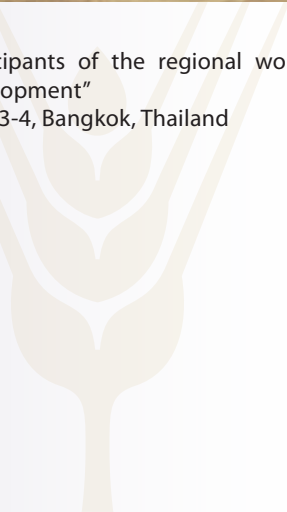Regional Office for Asia and the Pacific (RAP)

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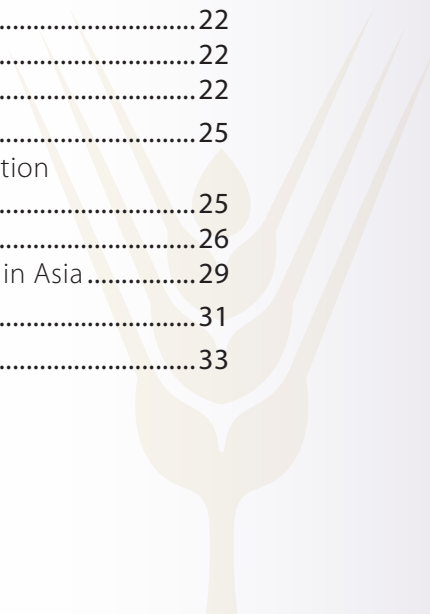
Bangkok, 2012

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Participants of the regional workshop on "Mobile technologies for food security, agriculture and rural development"
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Content

Annex

Boxes

Foreword

Access to the right information at the right time and in the right form helps us make informed decisions on critical issues. This is most important for resource-poor farmers and the poorest of the poor living in rural areas. Access to the right information is no more a luxury – it is a necessity.

Agriculture is increasingly knowledge-intensive. The sector is confronted with challenges posed by climate change, loss of biodiversity, drought, desertification, increase in food prices and inefficient supply chains. Farmers' need for information will only increase as their need to make complex decisions increases, which will impact the livelihoods of families and society.

The world's population is at seven billion and growing. The number of mobile connections is at six billion and counting. Clearly, mobile phone-based information services hold great potential. However, we cannot forget that a great number of people live on less than US$2 per day, and the developing "mobile revolution" must not pass them over and leave them behind.

This is where favourable policies and an enabling environment have to be fostered to facilitate the creation and use of mobile agricultural information systems. There are many examples of mobile-based interventions in agriculture, health, education and rural livelihood projects in Asia. Yet, how many of these have moved from pilot phase to a fully functional sustainable initiative? We know of very, very few.

Mobile technology holds great promise in rural development. We have convened this workshop to share experiences and good practices about the use of mobile phones in agricultural development and poverty reduction in the region. Together, we must extend successful innovations and good practices widely and think of sensible solutions to address the problems of food security and agriculture.

FAO welcomes opportunities to work with governments, institutes of higher learning and public and private sector organizations to identify opportunities to advance the livelihoods of people in agriculture and allied fields.

ICT4D and M4D – it is time to move from being just acronyms to actions… and sustainable ACTIONS!

Hiroyuki Konuma
FAO Assistant Director-General and Regional Representative for Asia and The Pacific
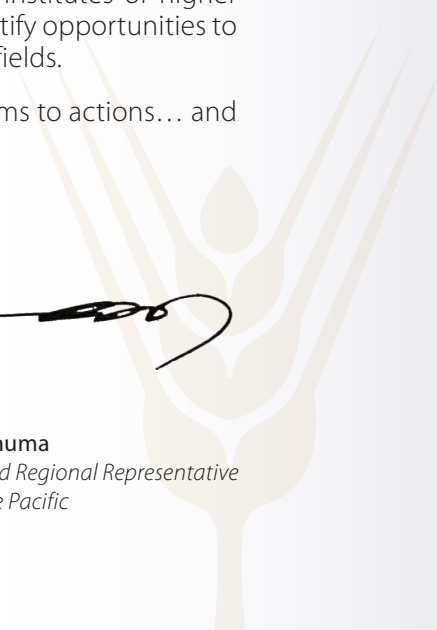
Preface

This regional workshop on "Mobile Technologies for food security, agriculture and rural development" conducted at Bangkok from 3 to 4 April 2012 brought together senior officials from the Ministries of Agriculture and allied ministries to share examples of the use of mobile technologies used in their countries, in both public and private sectors, for agricultural information services.

The examples quoted in this publication provide an indicative list of the types of services available, and are by no means a comprehensive analysis of relevant activities in the countries concerned. The aim was to use some cases mentioned during the workshop to achieve a common understanding of the state of the art in these Asian countries, taking account of the tremendous increase in the adoption of mobile phones for delivering agricultural information services.

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Acknowledgement

Abbreviations and Acronyms

FAO	Food and Agriculture Organization of the United Nations
GSMA	Groupe Speciale Mobile Association
ICAR	Indian Council of Agricultural Research
ICT	information and communication technology
ICT4D	information and communication technology for development
IFFCO	Indian Farmers Fertiliser Cooperative Ltd
IKSL	IFFCO Kisan Sanchar Limited
IVR	interactive voice response system
KMAS	Kisan Mobile Advisory Services
LIRNEasia	Learning Initiatives on Reforms for Network Economies Asia
M4D	mobiles for development
MAIS	mobile agricultural information systems
MNO	mobile network operators
NECTEC	National Electronics and Computer Technology Center
RAP	FAO Regional Office for Asia and the Pacific
PPP	public–private partnerships
RML	Reuters Market Light
ROAP	Regional Office for Asia and the Pacific
SMS	short message service
Teleuse@BOP	ICT used at the bottom of the pyramid
USAID	United States Agency for International Development
USSD	unstructured supplementary service data

Executive Summary

"Mobile technology holds great promise in assisting the livelihoods of the rural poor."

Hiroyuki Konuma, Assistant Director-General
and FAO Regional Representative for Asia and the Pacific

A two-day workshop[1] in Bangkok in April 2012 brought together senior officials from agricultural ministries of 12 countries in the region, representatives of the private sector and experts in mobile agricultural information systems (MAIS) to explore the role of the public sector and how effective partnerships between the public and private sectors can deliver mobile agricultural information services – with examples presented of successful partnerships in the region. Their discussion generated the following insights and recommendations:

• **Mobile-based information delivery** holds great promise and is either being considered or is in use as a major channel for agricultural advisory services.

• **Clear policies** need to be formulated by governments and the public sector that define the principles for their involvement in the development of MAIS, that also take account of national communication policy or information and communications technology (ICT) policy. Of necessity, this will require collaboration between the agricultural and telecommunications sectors of government.

• **Partnership with the private sector** has proven to be an essential mechanism for the public sector to develop MAIS sustainably. The roles and responsibilities for the private and public sectors have to be clearly defined in each particular case, preferably through a formal written agreement; the most frequent split of roles is that the content is provided by one and the delivery mechanism is handled by the other.

• **Trustworthiness and reliability** of the public sector information and advice delivered through MAIS is of paramount importance to the people whose livelihoods depend on actions influenced by what they receive. In this context, clear policy guidelines should be formulated to ensure the validity and accuracy of the technical information and advice provided. Appropriate processes need to be put in place to ensure the reliability of the information and advice provided by the public sector through MAIS, potentially including quality control by government-approved experts.

[1.]   Jointly organized by the Food and Agriculture Organization of the United Nations - Regional Office for Asia and the Pacific and National Electronics and Computer Technology Center; see Annex IV for the list of participants.

- **Accountability** for the quality (correctness and accuracy) of technical information and advice delivered through MAIS should be formally recognized by the respective public and private sector actors involved. This accountability should be defined in any partnership agreement between the actors in MAIS.

- **Lessons learned and good practices** have to be regularly captured and disseminated across Asia through various mediums, such as brochures, television and radio, so that provinces/countries can benefit from the experience of others.

> *Examples of effective partnerships in Asia for the delivery of MAIS*
>
> - IFFCO Kisan Sanchar Limited, which is a mobile telephone information service to empower people in rural India delivered by the Indian Farmers Fertiliser Cooperative Ltd, Bharti Airtel (a mobile network operator) and Star Global Resources Ltd (a non-banking finance company).
>
> - Dialog Tradenet spot price information system delivered to farmers in Sri Lanka by Dialog Axiata PLC, the country's largest mobile network operator, and Govi Gnana Seva (Farmer Knowledge Service) NGO.

- Ideally, agricultural information services should be **platform-independent**, given that technology-specific services impose requirements on potential audiences and can greatly limit accessibility. All newer models of mobile phones support short message, or SMS-based, services in non-Latin character sets, which is very important in countries in Asia.

- Given the region's **low literacy** rate, voice-based advisory services are more widely preferred by smallholders than SMS-based services, even if they are automated. However, some services, such as weather forecasts, can be effective when delivered through SMS.

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1 Introduction

Multiple challenges constantly besiege the agricultural sector in the Asia–Pacific region, where more than 60 percent of the world's population and about 65 percent of the world's poor live. To cope, farmers need useful and reliable information at the right time. Such information assists them in making complex decisions, which then impact the livelihoods of their families and the broader society. Improving farmers' prompt access to that information is paramount to reducing poverty and feeding more people. The tremendous increase in the use of information and communications technology, especially among rural communities, has opened up innovative ways in delivering agricultural advisories and other information services aimed at increasing rural livelihoods.

Mobile-based services in many countries are delivering information services to agrarian communities, and experimentation with this channel is heavily increasing. The massive numbers of people with access to mobile phones, many of them at the bottom of the economic pyramid in developing countries, makes this potentially an extremely effective medium for delivering information services.

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A favourable policy and the right blend of technology and information services have proven to contribute significantly to the income-generating capacities of rural communities, especially for farmers.

Information and communication technology (ICT) is now regarded as a major driver of economic growth. As the United Nations Secretary-General, Ban Ki-moon, remarked, "In today's world, telecommunications are more than just a basic service – they are a means to promote development, improve society and save lives." [2]

[2] United Nations, 17 May 2010, Secretary-General message on World Telecommunication and Information Society Day, New York (available at http://www.un.org/sg/statements/?nid=4544).

Innovations around the information flow from a web site to a mobile phone and vice-versa continuously emerge and inspire. The availability of reliable data on the use of telecommunications in rural areas provides valuable insights into how ICT and mobile phone-based information services can be designed into effective tools for information dissemination to rural communities. The incremental and transformational benefits that mobile phones bring to rural farm families are tremendous.

In April 2012, the Food and Agriculture Organization of the United Nations-Regional Office for Asia and the Pacific (FAO) and Thailand's National Electronics and Computer Technology Center (NECTEC) brought together policy-makers, experts, practitioners and other private sector players who influence and are involved in the use of mobile phones and other ICT as a catalyst for building sustainable livelihoods. The two-day workshop brought together experts from organizations and countries to highlight innovative initiatives in mobile-based information services and ICT for rural development. The workshop also provided opportunity to exchange the latest information on new projects that will bridge the rural digital divide and advance sustainable development of ICT in rural areas and agricultural communities, knowledge sharing and the validation of models for use in agricultural and rural development.

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2 OBJECTIVES OF THE WORKSHOP

The workshop's goal centred on sharing good policies and practices related to the use of ICT, specifically mobile phones, for agricultural development and rural poverty reduction in Asia in the drive to extend the application of successful innovations and good practices more widely. The discussions were to emphasize the role of the public and private sectors and prospects for public–private partnership related to mobile technology. The workshop intent also aimed to:

i)   create a platform for a dialogue among stakeholders, especially officials from agriculture ministries in the region, on the use of mobile technology and ICT;

ii) present and exchange current policies and practices regarding the use of mobile technology for information dissemination;

iii) provide an opportunity for participants to learn from the experiences of other countries on the development of favourable policy environments to facilitate the growth of MAIS;

iv) introduce and demonstrate mobile applications that have been developed and/or deployed in various sectors, such as agriculture, heath, education, finance and business.

The desired outcomes from the workshop:

i)   a set of recommendations for action on current practices and public policies on the use of ICT and mobile technology, based on the advice of officials in the agriculture ministries;

ii) a range of examples of successful public and private sector MAIS initiatives;

iii) a list of characteristics of successful public–private partnerships in MAIS.

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3 BACKGROUND– THE GLOBAL PERSPECTIVE

FAO presented the findings from an online discussion forum hosted by the e-Agriculture Community,[3] with support from the mFarmer Initiative,[4] to support mobile operators and agricultural partners in launching mobile information services that benefit farmers and are commercially viable.

The forum on "Mobile Information Services: The Benefits of Forming Strong Partnerships to Create Sustainable and Scalable Information Advisory Services" took place in November and December 2011 on www.e-agriculture.org.[5] The forum organizers sought to identify critical issues, challenges and good practices around partnerships that are conducive to creating sustainable and scalable mobile information and advisory services for farmers.

Critical barriers to the sustainability of mobile-based interventions in agriculture and livelihood-related initiatives previously identified in studies encompassed: i) too strong a focus on technology and not on the people who use it; ii) a lack of proper capacity or need assessments for the targeted groups and intended users; iii) content offers that are not relevant enough to support local decision-making; iv) too many small-scale services that cannot be scaled up; and v) private sector approaches that are based on unsound business models.

3.1 Defining partnerships for MAIS

Participants in the forum characterized the value provided to the MAIS by the two main types of partners – mobile network operators (MNO) and agricultural partners. They then discussed how to leverage their different strengths. An agricultural partner is any entity, public or private, involved in mobilizing the information content necessary for MAIS but not responsible for connectivity.

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[3.] The full text of the online discussion is available at http://www.e-agriculture.org/forums/forum-archive/forum-mobile-information-services-november-2011. More information and resources on the subject can be found at http://www.e-agriculture.org/mobile-telephony-rural-areas.
[4.] The mFarmer Initiative was created by the Groupe Speciale Mobile Association (GSMA), the United States Agency for International Development (USAID) and the Bill & Melinda Gates Foundation.
[5.] The discussion was guided by six subject matter experts: Sharbendu Banerjee, Director of Business Development, CABI South Asia-India; Hillary Miller-Wise, Country Director, TechnoServe Tanzania; Collins Nweke, Project Manager, Tigo Tanzania; Judy Payne, ICT Advisor, USAID; Fiona Smith, Director, GSMA mAgri Programme; S. Srinivasan, CEO, IKSL.

Strengths of the MNO partner:

- access to the telecommunications network (including underserved regions/ areas);
- market and communication services that are available to users (all services available through their network);
- opportunity to bundle MAIS with other services, such as "mobile money" (remitting and making payments through a mobile phone service);
- opportunity to generate income with the agricultural partner;
- opportunity for using unstructured supplementary service data (USSD) in addition to the SMS format.

Strengths of the agricultural partner:

- capacity to identify targeted farmers and their real information needs;
- maintains a reputation (or trust) that farmers value that will offset scepticism about the value proposition of MAIS;
- understands the most appropriate format for the collection and delivery of information (by voice/interactive voice response or text);
- ability to collect, analyse, refine and disseminate (or make available) relevant agricultural information to the targeted audience;
- capacity to market an MAIS in the field, including through networks of extension workers (or "community knowledge workers");
- instils confidence in the mid- to long-term viability of the MAIS (even when this is not within a mobile network operator's standard period for returns).

In some cases a third party would be needed to facilitate the transformation and quality assurance of content, or to act as a "content partner" that would create a locally adaptable information resource from the agricultural partner's content as the basis of an information service that could be provided by multiple MNOs.

Reoccurring challenges that have been observed in these partnerships include:

- unbalanced bargaining power or unequal relationship due to the difference in size of the MNO and the agricultural partner (typically the former is much larger);
- unwillingness of some MNOs to deal directly with the agricultural partner;
- MNO's need to obtain economies of scale quickly;
- the agricultural partner's focus on "needs assessment" versus the MNO's focus

on "demand analysis". The former is inclusive while the latter emphasizes the business model more. These different focuses are not necessarily incompatible but will lead the partners in different directions with regards to the community that is being served.

Based on various experiences, the MNOs consider that agricultural partners can associate with more than one MNO. It will remain, however, difficult to do so until the value of a MAIS is better understood by MNOs. Many forum participants considered this the best possible option for providing value to consumers (farmers). All agreed that having multiple MNO partners would require an agricultural partner to be capable in providing customizable information that supports the MNOs' need for differentiation.

The IFFCO Kisan Sanchar Limited (IKSL) joint venture in India is a successful MAIS partnership, as the mFarmer Initiative has documented in a case study.[6] IKSL is a collaboration between the Indian Farmers Fertiliser Cooperative Ltd (IFFCO), the largest farmers' cooperative in India, Bharti Airtel, the country's largest mobile network operator, and Star Global Resources Ltd, a non-banking finance company. Launched in 2008, IKSL delivers voice-based agricultural information to empower rural farmers. Forum participants pointed out that the success of this particular partnership may be difficult to replicate, given the large size and extensive farm-level reach of IFFCO.

3.2 Challenges

The potential of mobile technology to deliver valuable information to farmers and improve their livelihoods is widely recognized. There is no shortage of pilot and small-scale projects seeking to capitalize on this potential, as evidenced by the many references injected into the online forum discussion. However, there are very few large-scale or profitable (if any) models known to date (for this reason, the Gates Foundation and USAID joined with GSMA to explore this challenge through the mFarmer Initiative.) The forum discussion brought out several critical challenges that need to be addressed.

Many practitioners continue to think that a successful MAIS will need to blend mobile with other communication formats (radio, face-to-face training, etc.) to meet the information needs of rural communities. This prospect greatly complicates the concept of a two- or three-institution partnership and the need to find a reliable business model.

In fact, the concern about the communication medium may be obscuring a more basic challenge – that of making appropriate, actionable content available

6. See the GSMA Web site at http://www.gsma.com/mobilefordevelopment/magri-programme-case-study-iksl-india/

via mobile technology. The inability to reach scale was blamed on the inability of a MAIS to provide high-quality and highly localized (relevant) information to farmers in the face of farmers' cost sensitivity and MNOs' need for volume.

Continued uncertainty or disagreement about the MNO role in an MAIS complicates partnering and the understanding of sustainable business models. Through the online forum discussion it became clear that two models exist for an MAIS, which can be summarized from an MNO's perspective as:

- an MNO integrates an MAIS into its own service portfolio;

- an MNO only provides infrastructure and revenue sharing as a business contract.

Forum participants disagreed over which of these models is the most viable and also whether or not the former model – one in which an MNO integrates an MAIS into its own business is actually appropriate from a development perspective.

In terms of the potential market, the forum participants emphasized that even though there are about six billion phone subscriptions in the world, only a small fraction of them belong to farmers who are both interested in and able to afford an MAIS. Individual prioritizing of expenses does not always rank agriculture (in livelihood terms) as the highest priority for information. There is a great challenge of human behaviour that needs to be better understood.

The participants found general agreement that the ideal MAIS provides a service directly to individual farmers. Within this is the assumption that all farmers have mobile phones and the capacity to act on the information available. Until this is 100 percent true, the case for intermediaries exists, such as the Grameen Foundation's Community Knowledge Workers. But strong disagreement emerged in the forum discussion over whether or not intermediaries can bridge the gap on a large scale. From some perspectives, there is concern that intermediary services will in fact hinder or slow the development of direct services.

Such intermediaries as farmers' cooperatives or subsidies (government support) can also make information services economically available to the poorest in agrarian communities, although probably not on an individual basis. Subsidies are highly opposed by anyone concerned about a sustainable business model; however, some development practitioners think this is the only way the poorest of the poor will ever be served and the only way to prevent the rural digital divide from growing wider.

Interestingly, the challenges caused by literacy and language, while much discussed in the forum, are not as widely agreed upon as might otherwise be

expected. Specific cases in which illiterate populations benefit from SMS-based services directly (learning to understand symbols or codes) or indirectly (with assistance from intermediaries) were cited during the forum.

3.3 Potential solutions and opportunities

Solutions to the challenges described in the previous section must be found. Clarity in terms of the best information producers, owners and distributors, along with their respective roles and relationships, must come about before an MAIS can scale up. The forum participants pointed to the history of MNOs in industrialized countries as providing insight into the "natural" division of MNOs and value-added service.

Great opportunities exist in mobilizing local content that is based on farmers' innovation and knowledge. However, challenges also abound when looking to scalable, sustainable models for this.

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There was a general feeling in the forum discussion that data costs will fall, allowing voice and rich data services to expand, and leaving SMS much less important in an MAIS. This direction would address current challenges around information complexity, literacy and language.

On the hardware side, there is a need for more research into low-cost and low-energy solutions for both handsets and networks.

And finally, awareness and capacity development among the intended beneficiaries and the market are critical to market success.

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4 BACKGROUND – THE ASIAN PERSPECTIVE

A representative from the Learning Initiatives on Reforms for Network Economies Asia (LIRNEasia) studies presented the latest survey findings on the use of ICT at the "bottom of the pyramid".

4.1 Teleuse@BOP studies

LIRNEasia, a regional ICT policy and regulation think tank, conducted a series of studies on the use of ICT by people at the bottom of the economic pyramid in emerging Asian economies; the studies are referred to as Teleuse@BOP. Using a market research categorization, LIRNEasia defines people at the bottom of the pyramid (the BOP) as those belonging to the socio-economic classification D and E[7] in urban and rural areas (or R3 and R4[8] in rural India and Pakistan). The studies are limited to teleusers, who are defined as those who used a telephone (fixed-line or mobile) to make a call in the three months prior to a survey. Four Teleuse@BOP studies have been conducted since 2005, using quantitative and qualitative (beginning in 2008) research methods to investigate different focus areas in seven countries.

The 2011 study, Teleuse@BOP4, targeted **Bangladesh, India, Pakistan, Sri Lanka, Thailand and Java (Indonesia)** and reached 10,147 BOP teleusers between the ages of 15 and 60 with its survey. That fourth study investigated the livelihood-related uses of mobile phones, probing for the contribution of mobile phone use to the productivity and income of the respondents, with a particular focus on those employed in the agricultural sector. The study included an examination of the uptake of more-than-voice[9] (MTV) services, some of which attempt to enhance the productivity and livelihoods of users.

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[7]. http://en.wikipedia.org/wiki/NRS_social_grade
[8]. http://en.wikipedia.org/wiki/SEC_Classification_(India)
[9]. More-than-voice (MTV) services are broadly defined as applications and services that are available either directly on mobile phones or through mobile phones, which go beyond just the use of mobiles for voice calls. The ability of phones to send/process/receive voice, text, images and video are utilized for a variety of services including payments, information access and retrieval, etc. All these aspects come under this broad definition of the term.

Main findings from the Teleuse@BOP4

The following is a summary of the main findings from the 2011 Teleuse@BOP4 survey.[10]

- **Computer use:** In general, computer use among the BOP teleusers was very low, but even more so in Bangladesh, India and Pakistan. Similarly, Internet use was extremely low, with usage slightly higher among Sri Lankan and Thai respondents than in the other four countries. There was a significant lack of awareness of what the Internet could provide among the Bangladeshi and Indian respondents.

- **Access to a telephone:** In terms of household access to communication channels, telephones had overtaken radio among the respondents. Looking across all four Teleuse@BOP surveys, phone access was still lower than television access, but the difference had declined quickly. More than 75 percent of the respondents in the fourth study had access to a telephone of some type within the household. In 2008 in the Bangladesh and India surveys, a public access telephone was the most frequently used telephone reported (by more than a third of the BOP respondents); in the 2011 findings, it had reduced to 6 percent and 8 percent, respectively.

- **Mobile ownership:** More than 50 percent of the BOP mobile phone owners in each country survey reported owning a new phone, with the Thai respondents spending the most on their handsets. Second-hand ownership was highest in Pakistan. Although the gender difference in phone ownership had narrowed over the years, it remained significant in Bangladesh, India and Pakistan. In those countries, phone ownership among BOP women was at least 30 percent lower than men. Thailand was the only country in which more BOP women respondents owned a phone than men. Collectively though, BOP women depend more on a household phone and household members' phones than men in all countries except Thailand.

- **Use of telephone:** The study found that 89–99 percent of the respondents had used a phone in the previous three months (thus was a teleuser). More than 50 percent of them had used a phone on the day or day preceding the survey; more than 70 percent had made a call in the week preceding the survey.

- **Use of mobile:** The mobile phone owner respondents reported using their phone mainly for making (at least 96 percent) and receiving calls (at least 94 percent). Use of the missed call function was high everywhere except in Thailand. SMS use was highest in Java (Indonesia)[11] and quite low in Bangladesh, India, Pakistan and Thailand. The non-users pointed out that the barriers exist in the technical or cognitive usability rather than the structural problems, such as affordability or literacy. The survey found no significant gender difference in the use of SMS.

[10] More in-depth findings and analysis of the Teleuse@BOP4 survey (as well as previous iterations) are available online at: http://lirneasia.net/projects/icts-the-bottom-of-the-pyramid/.

[11] The high SMS use is partly explained by the fact that the Indonesian language is written in Latin script.

SMS use, as well as the use of mobile phones for entertainment (playing games, listening to the radio and songs, taking photos or videos) was more popular among the mobile phone owners younger than 35 years.

Use of mobiles for financial, business or work-related communication was low everywhere except in Java (Indonesia). Business people and petty traders used ICT (computers, mobile phones, the Internet, etc.) the most for livelihood-related purposes. Use by agricultural sector workers was not that much far behind.

- **Benefits of the mobile service:** The main perceived economic benefit of mobile phones among the respondents was reducing travel. Overall, the respondents who owned a mobile phone perceived the mobile phone as mainly benefiting personal life.

4.2 Smallholder and agricultural microenterprise surveys

LIRNEasia conducted piloted non-representative surveys of smallholders and agricultural microenterprise actors as an exploratory module prior to the 2011 Teleuse@BOP4 survey. The exploratory survey was conducted only in **Bangladesh, India, Sri Lanka and Thailand**. The socio-economic classification was expanded to include C, D and E.[7] With this, LIRNEasia wanted to articulate the information and knowledge needs as well as the ICT use among smallholder farmers and agricultural microenterprises. The researchers defined a smallholder as a non-subsistence farmer who cultivated land of less than or equal to 5 acres. An agricultural microenterprise had to have between one and nine employees and only collectors, traders, commission agents or retailers of food crops were considered. A total of 505 smallholders and 447 agricultural microenterprise actors were interviewed. The sample was selected opportunistically, based on Teleuse@BOP4 respondents who met the requisite criteria.

Main findings from the smallholder and agricultural microenterprise owner surveys

The following summarizes the main findings of the LIRNEasia's smallholder and microenterprise surveys.[12]

- **Information needs:** Smallholders reported information needs over an entire crop cycle on fertilizers (84.6 percent), market prices (78.6 percent) and pesticides/herbicides (77.3 percent). However, informational priorities

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[12.] A complete report of the findings from the non-representative smallholder and agricultural microenterprise surveys is available at: http://lirneasia.net/wp-content/uploads/2012/04/ME-Report-final.pdf.

varied depending on the stage of crop cycle and, to a lesser extent, across countries. The overall informational priorities differed for agricultural microenterprise actors, with the main information needs reported as market prices (91 percent), sources and costs of inputs (73 percent) and information on transport (71 percent). This prioritization was reflected even in the cross-country breakdown, except in Bangladesh where information on electricity timings surfaced in the top-three needs instead of sources and costs of inputs.

- **Information sources:** In a majority of the cases (by crop stage or by country), for both the smallholder and microenterprise samples, the most important sources of information and knowledge ranked as self, family and friends, and peers (other farmers in the case of smallholders and traders/collectors/buyers in the case of the microenterprises actors). This appeared true even among the Sri Lankan and Thai samples, in which smallholders were most likely to make farming-related decisions by themselves. The respondents gave a low ranking to agricultural extension and input suppliers, even with regards to information related to the better-known functions of these sources, such as information related to best practices, inputs, etc.

- **Communication channels:** Face-to-face communication trumped all other modes of communication among the smallholders as well as the microenterprise sample. Calling people by phone, however, scored as the second most used communication mode as an information source. The microenterprise sample reported consistently greater mobile phone use than the smallholder sample. The use of SMS, the Internet or computers appeared virtually non-existent. Mobile phone ownership emerged high among both the smallholder and microenterprise samples, with the latter sample showing consistently higher ownership levels in all four countries.

- **Mobile functionalities:** When it came to the use of different phone functionalities, both the smallholder and microenterprise samples reported using the phone for only three principal functions: i) making phone calls, ii) receiving phone calls and iii) sending/receiving missed calls. SMS use was very low.

- **Benefits of the mobile service:** Finally, the perceptions among the smallholders and the microenterprise actors regarding the benefits of phone access, they were mostly similar, with the main benefits being the ability to contact others in an emergency, maintaining relationships and reduction in travel costs.