
Access to Mobile Telecommunications and the Internet in Rural Myanmar

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Abstract: A quantitative survey of 411 completed questionnaires was conducted in northern Myanmar to try to ascertain the extent to which the rapid spread of mobile telecommunications in much of the rest of the country is also taking place in rural, northern areas. It was found that although mobile telecommunication penetration had taken place at a high rate, there was a lower level of apparent internet usage as mobile operators have promoted Face book access at a low or zero price as separate from the internet as a whole, for which a premium fee must be paid. Face book has, for many people, *de facto* become the internet. The comparatively low level of Face book pages in Myanmar language and the even fewer numbers in the languages of the many ethnic minority people of the country mean there are both barriers to access to information and a greater likelihood that unchecked information might spread rapidly. It is also found that access to agricultural information through mobile telephones is at a comparatively low level and most people use these devices to keep in contact with friends and family members. There are, therefore, opportunities for improving developmental opportunities for rural farming households by using this technology.

Keywords: agriculture, information, internet, mobile telecommunications, Myanmar

1. Introduction

1.1. Background of the Study

Small scale farmers in developing countries are often characterized by their spatial dispersion and lack of organization into farmers organizations. These factors bring them to a situation in which they do not produce sufficient quantities to meet demands of large buyers, they lack of bargaining power and skills, they lack of information about the true value of their products, and they travel long distances in the uncertainty of finding a market for their production. The uncertainty of income and repeated failures in selling their products at a profit can cause the unavailability of capital to buy farm inputs such as fertilizer, pesticides, and improved technologies leading to a decrease in production and product quality. Small-scale farmer thus enter poverty cycles as a consequence of poor market access.

Recent development in Information and Communication Technology (ICT) have been reduce the asymmetry in information among the market players and to create linkages and networks between the actors in the chain that ultimately benefit small scale farmers. Many of small scales farmers have in common the use mobile phones to make information on prices arrive to the small-scale producers. This is usually done through intermediaries that post the information they receive by text messages (short message services or SMS) on information boards and thus make this information available to farmers. In countries where mobile phones are widely spread and SMS are less costly SMS are directly sent to producers.

Market access is one of the most critical factors influencing the performance of agriculture in developing countries and plays a major role in enhancing and diversifying the livelihoods of poor smallholder farmers (Barrett, 2008). Market access for farmers means the ability to acquire farm inputs and farm services, and the capability to deliver agricultural produce to buyers. Markets provide the opportunity to generate income, contributing to a reduction in poverty and hunger in developing countries. Markets also drive production to meet consumer demand in terms of quantity and quality. Sustainable access to markets is required to guarantee smallholders an increase in income and to lift them out of poverty.

Smallholder farmers form the majority of rural poor in many developing countries, especially in Myanmar most are engaged in subsistence or semi-subsistence agriculture, often characterized by low productivity, low marketable surplus and low investment - a situation described as low equilibrium poverty trap (Barrett, 2008; Barrett and Swallow, 2006). Increasing returns from

agricultural production through improved access to markets can, therefore, be a vital element of poverty alleviation strategy and livelihood improvement of farmers and economic development for the country. Improved market access results in commercialization of agriculture, which can in turn result in increased marketable surplus, increased agricultural income, savings and hence investment in productivity enhancing technologies.

As a result, Information and communication technologies (ICT) have been attributed a key role in both economic growth, market access and poverty reduction of a country. ICTs increase efficiency, provide access to new markets or services, create new opportunities for income generation and give poor people a voice. All around the world, most farmers may depend on extension personnel to get information on agriculture practice. The advent of Information and Communication Technologies (ICTs), and the rapid spread of mobile-based ICT, is transforming agricultural management systems throughout the world. The use of ICT is a critical building block in the upgrading of national extension services.

2. Literature Review

2.1. The Myanmar Context

In Myanmar, agriculture is the backbone of country's economy, representing 30% of Gross Domestic Product (GDP) (MoALI, 2015) and 25% of export earnings (MoNREC, 2016). With 61% of the people working in agriculture sector (MoALI, 2014 according to MoNREC, 2016) and the majority of the farmers being smallholders, the agricultural sector also plays a key role in the fight against food insecurity and poverty of Myanmar. Regardless of relatively favorable and diverse production circumstances, Myanmar's agricultural sector is significantly underdeveloped compared to other Southeast East Asian countries like Thailand and Vietnam, probably mostly due to the long period of isolation and sanctions under military rule, from which the country has just emerged. Despite the role played by agriculture in development in Myanmar, agricultural production has lagged far behind those in neighboring countries over the past few decades. In accordance with the reasons indicated earlier, this poor sector performance, to a greater extent, has been attributed to the underutilization of improved agricultural technologies, which has remained relatively low in developing countries. (Geodata for Agriculture and Water Official Publication: Quick Scan Myanmar, 2017).

Besides, Directing General of Ministry of Agriculture, Livestock and Irrigation (MoALI) said that "in Myanmar 70 % of the country's population live in the rural areas, depending on farmland and forests as their livelihoods drives agriculture sector an important growth engine of rural development. Growth in agriculture sector is the government's priority for poverty elimination of the country. He mentioned that in 2016, Foreign Direct Investment (FDI) in agriculture sector only accounts for 0.4% of the total FDI with 19 foreign enterprises with the approved value of US\$250 million. Due to climate change and natural disasters, agricultural exports have declined the past few years".

Directing General of MoALI mentioned that Myanmar farmers have been following native production methods and rely upon friends, relatives, fellow farmers and input dealers to get information regarding agriculture. He noted that "the main challenges for the agriculture sector in Myanmar are climate change, access to modernized machinery, access to knowledge such as internet and quality training courses, access to inputs, and the marketing of agricultural products (including livestock products) to the international markets. Among the factors mentioned to limit the contribution of the growth in agricultural sector is poor network of agricultural information services. Few knowledge in the awareness of ICT facilities such as internet and ecommerce and poor country's ICT infrastructure limits to the accessibility and usage of agricultural knowledge and information among farmers.

Although agriculture and natural resources are deemed to continue being the key drivers of Myanmar Economic growth, it is the application of modern technologies that is considered to

have the most significant impact on the growth of routes of Myanmar' economy. Kimenyi and Moyo (2011) stress that technological innovations and the adoption of new technologies provide great opportunities for growth in service sectors such as agriculture, health, education banking and insurance. This being in the case, countries have identified ICTs as an important component in moving the countries' subsistence-based economy to service-sector driven, high value added information and knowledge based economy that can compete effectively on the global market (Ansoms, 2008).

The use of technology and information transfer is the most important factor in agricultural innovation (Aker, 2010). Consequently, various forms of Information Communication Technology (ICT), especially traditional ICTs such as radio, TV, pamphlets, posters and newspapers, have been widely used to disseminate information to farmers in Myanmar. The spread of mobile phones and their potential advantages—low cost, large geographical coverage and ease of use —makes mobile phones a better tool for information dissemination than traditional ICTs such as internet, newspapers and radio.

Among other ICTs, mobile telephony has emerged as the technology of choice of the majority of the urban and even the in the rural areas (Ansari and Pandey, 2013). People in rural masses do now have in great numbers is access to internet through mobile telecommunications. Mobile phone technology permits farmers to exchange knowledge about international market prices and demand, climate change information and also allow accessing to agriculture-related information conditions for various products (Chachar et al., 2014). Though the technology does not permits communications with people speaking a different language nor suggest how to find the new market contacts, especially when they are cross border in nature.

Moreover, telecommunication sector in Myanmar has developed quickly after the entry of two foreign operators, Qatar's Ooredoo and Norway's Telenor recently. Myanmar's mobile market has seen very strong growth from 2013 to 2016. Penetration rose from 7% in 2013 to 85% by 2016 with 46 million subscribers (Harpur, 2016 and Mizzima, 2017). Smartphone adoption was 70% in third quarter of 2016. However, the technology adoption in Myanmar has significantly low in Myanmar that a survey done by Myanmar Post and Telecommunication (MPT) expressed 34% of smartphone users that do not use internet, which points at a lack of awareness or relevant content (Iji, 2016). The low use of appropriate yield-enhancing technologies among farmers has been a major constraint to increased agriculture productivity in Myanmar. Despite the predominant role of agriculture in Myanmar economy and given the great potentials of ICT in improving yields and thus stimulating improved food, security, trade, and income growth, Myanmar farmers are yet to embrace the initiation of Information Technology. Myanmar farmers still depend on the use of traditional method of disseminating and gathering of information and this is unhealthy for improved agricultural marketing.

2.2. Role of ICTs in Agriculture

Increasing agricultural production is critical in reducing poverty as it can boost farmers' income especially smallholders farmers who have limited resources to leverage in growing and marketing their products. This could be achieved if efficient value chain exists there, which needs engaging many stakeholders ranging from farmers growing the crops and raising cattle, to input suppliers and distributors. However the existence of efficient value chains depends on the effective and systematic flow of relevant information, which in turn depends on the existence of an competent and reliable ICT infrastructure and the associated services to connect to a diverse range of stakeholders along the agricultural value chain (Halewood and Surya, 2012). In this regard, ICTs could provide a unique opportunity to assist agricultural information on markets and market prices, weather, transport and agricultural techniques.

In the context of agriculture, ICTs play also an important role in facilitating agricultural growth because they increase the efficiency of market interaction and provide access to real time information mainly by enhancing farmers' access to markets and their pricing power through

the use of trading platforms over the internet through web/mobile applications (Driouchi, Azelmad & Anders, 2006). They allow people to obtain information immediately on a regular basis as compared to other information channels. It is argued that utilization of ICTs, especially by using mobile technologies greatly reduces search costs, as stipulates by the search theory.

In agriculture, the potential of information communication technologies (ICTs) can be assessed generally under two heads: (a) as a tool for direct contribution to agricultural productivity and (b) as an indirect tool for empowering farmers to take informed and quality decisions which will have positive impact on the way agriculture and allied activities are conducted. Precision farming, popular in developed countries, extensively uses ICTs to make direct contribution to agricultural productivity. The techniques of remote sensing using satellite technologies, geographical information systems, and agronomy and soil sciences are used to increase the agricultural output. This approach is capital intensive and useful where large tracts of land are involved. Consequently it is more suitable for farming taken up on corporate lines.

The indirect benefits of IT in empowering farmer are significant and remain to be exploited. The farmer urgently requires timely and reliable sources of information inputs for taking decisions. At present, the farmer depends on trickling down of decision inputs from conventional sources which are slow and unreliable. The changing environment faced by farmers makes information not merely useful, but necessary to remain competitive.

2.3. Information Needs of Farmers

Several studies have identified the information needs of farmers from which applications of ICTs can be derived (Steinfeld & Wyche, 2013). For instance, a national survey of farmers in India, Mittal, Gandhi, and Tripathi (2010) identified three broad categories of farmers' information needs:

- ✓ Know-how information which helps farmers decide what to plant and varieties to use
- ✓ Market information which includes prices and price indicators
- ✓ Contextual information which includes weather and information on best practices

These types of information are needed at several stages of the agricultural life-cycle which includes crop planning, buying seeds and inputs, planting, growing, harvesting and selling (Mittal et al., 2010). According to their study, the most critical information farmers needed included weather, livestock and disease control, seed information and market prices. In an earlier study, Chapman and Slaymaker (2002), identify two types of information needed by the rural poor to make effective investment decisions as well as fast-track their livelihood activities: Type A information is core information that facilitates long-term capacity building and making of effective livelihood strategies. They suggest that this type of information is usually achieved through training and technical support. They contend that the provision of this of information has long been the focus of extension and health systems. If provided, type A does not only improve understanding of systems and processes, but might also assist the way assets are used as well as effective planning of livelihood strategies. This type of information may include information their rights in relation to public institutions so they can hold them accountable. On the contrary, type B information concerns local contexts and needs and requires regular updating for people to make effective decisions concerning their immediate livelihood activities. It helps the rural poor to maximize the potential of an asset one time, reduce vulnerability to shocks and helps them respond to immediate needs. Such information includes market and income-generating activities which the rural poor typically lack.

In Myanmar, Internet plays a vital role in exchanging information through chat and social media such as Facebook, Viber and Line. Farmers can get the updated information services through creative use of mobile technology. In developed countries, most of the big farmers are using internet to get information, to communicate and for buying inputs or selling outputs. This decade become a revolution in the use of ICT in developing countries. Many people and offices as well as rural farmers own ICT facilities such as personal computers and mobile phones.

Today there are approximately 6.9 billion SIM connections among a global population of 7 billion people (GSMA, 2014). More than 5 billion of these connections are in the developing world where the main source of income and employment comes from agriculture. This dramatic increase has seen mobile phone technology emerge as the primary means to deliver information and services to the developing world (Steinfeld & Wyche, 2013). Since agriculture plays a critical role in the economies of many developing economies (World Bank, 2012), most information and communication technologies developing projects aim the agriculture sector, especially to smallholder farmers (Steinfeld & Wyche, 2013).

3. Methodology

The study was conducted in Mandalay and Ayeyarwaddy Divisions of Myanmar. The presented study was conducted between June to August 2017. Mandalay is located at the center and an administrative division of Myanmar. Mandalay Region is important in Myanmar's economy, accounting for 15% of the national economy. Next, Ayeyarwaddy is the hub of Myanmar's agriculture and the region is flanked by the Rakhine Yoma range in the west and large areas were cleared for paddy cultivation, leading to its well-known position as the main rice producer in Myanmar. In this study, simple random sampling procedure was used to select the respondents. A total of 411 respondents precisely 203 respondents from Mandalay Division and 208 respondents from Ayeyarwaddy Division participated in the study.

The study employed a multi-staged random sampling in selecting the sample. First, two divisions were randomly selected. Second, six villages from each division were chosen at random. Villages' selection was randomly selected based on the easiness of travel and access, ICT infrastructure including availability of mobile phone networks and coverage of TV and radio waves. Decision on how many people from each village to be included in the sample depended much on the village population size and availability of respondents during interviews. Third households were randomly drawn from the lists provided by the chairman of the village, the sample design required one responded from each household to be interviewed and randomly chosen in the household with more than one eligible member.

Prior to actual data collection, a pilot test was conducted in order to establish whether the questionnaires are capturing the designated objectives or not, by looking if the wording is clear, questions are interpreted in the same way by the respondents, and if there is any research bias and what response is provided. Native language was used in the questionnaire. The questionnaire was developed in English language with frequent confirmation with supervisors. First it was developed in English language and later interpreted into Myanmar with the use of convenient wording which was understood by Myanmar farmers. Researchers also ensured that the language used in the interview was clear to assist respondents in answering questions and instructions given clearly. Thus, a pilot study was conducted to 20 respondents in The Te Village, Mandalay Division. The objective of the pilot study was to pre-test the research questionnaires and helped researchers to refine the items which were not clear to the respondents. During the pilot study, a lot of explanation was made to the respondents since they are not familiar with ICT terms and questions. After the pilot study, the researcher made some changes in questionnaire with the guidance of supervisor in order to understand by illiterate farmers.

In addition, the study used secondary data to collect information about Myanmar Agricultural and livestock management. Secondary data are data that are already collected by others. Since the study attempted to cover Myanmar, secondary data collection methods were seen as appropriate and effective. Secondary data can be obtained from government record, journals, newspapers, textbook and the world-wide-web. The sample size of for farmers was calculated based on Yamane's formula (Yamane, 1967). By using Yamane's formula of sample size with an error 5% and with a confidence coefficient of 95% (Yamane, 1967), the calculation from a population of (previous approximation) came up with 411 farmers from two divisions of Myanmar.

The structured questionnaires were used in the study to collect primary data. Each respondent was interviewed at his/her location in the study area. The questionnaires save time and expense and are used for coverage of a wide population as stated by Orodho, 2010. A pilot test conducted with a small sample selected from one village in Mandalay region, which helped in structuring the interview procedures and modifying the questions.

4. Findings

4.1. Demographic Details

A total of 411 questionnaires were collected, with 203 (49.4%) from Mandalay and 208 (50.6%) from the Ayeyarwaddy Division. The majority of the respondents (79.0%) were male, which reflected the fact that women, particularly poorly-educated women in rural parts of Myanmar, were often unwilling to be interviewed. Both men and women were involved in agriculture. Only 6.1% of the population had obtained tertiary education, 33.3% had completed secondary education, 19.7% had completed primary education and 18.5% had lower levels of education but could read and write. Educational attainment was higher in Mandalay than in Ayeyarwaddy ($p = 0.040^*$) and men generally had better educational levels than women. Discussion with village leaders revealed that farmers were rarely comfortable with innovations in agriculture and did not use them, at least at first. The sample achieved was quite old, with 31.9% in the 51-60 age group and 29.4% in the 41-50 group. In common with many other parts of Myanmar, young people tend to migrate from rural areas in particular to seek better paying jobs than are available on the farm, especially since Myanmar's agricultural sector is characterized by the small land size of its farms. Most households had 4-8 family members (70.6%), with 12.7% having fewer members and 16.8% more.

In Myanmar, land is measured in acres because of the colonial part and one acre is approximately equal to 0.4 hectares. In this sample, 39.2% of farmers used 2-5 acres of land and 32.1% of respondents had 5-10 acres of land. Very few respondents farmed on land that was not their own. The small farm sizes mean that there is little alternative to subsistence agriculture. The principal crop grown is rice, although there is usually time for a second harvest after the monsoon season.

Given their age, it is not surprising that most farmers had considerable experience in agriculture, with 46.5% having 20-40 years and 16.8% more than 40 years. While it might be expected in a more developed country that this level of experience would be positively correlated with higher involvement in market activities (Matungal, Lyne & Ortman, 2001), since Myanmar farmers are isolated by the very poor infrastructure that makes it next to impossible for them actually to be able to transport any goods to market. This lack of mobility is demonstrated by the lower levels of people in Ayeyardwaddy who have extra jobs (12.5%) compared to 26.1% in Mandalay ($p = 0.000^{**}$). Farming income was overwhelmingly in the 100-500,000 kyat per month category (96.6%) (Approximately US \$ 74.6-373.1) Given the definitions of poverty commonly in use and the household sizes involved, it is evident that many households are living below the poverty line.

4.2. Livestock Ownership

One possible determinant of market involvement can be ownership of livestock, since livestock can provide regular consumables (e.g. eggs or milk), terminal consumables (e.g. meat or leather) or may be rented out for ploughing or transportation. It was found that 93.1% of the Mandalay sample owned livestock but only 58.2% of the Ayeyarwaddy sample ($p = 0.000^{**}$).

Table 1: Livestock Ownership; source: Original Research

Type (% saying 'yes')	Mandalay	Ayeyarwaddy	Overall	N	P
Chickens	12.7	8.1	10.9	411	0.198
Ducks	1.6	62.3	25.4	411	0.000**
Buffaloes	2.1	0.8	1.6	411	0.375
Cattle	95.8	68.6	85.2	411	0.000**
Sheep	1.1	0	0.7	411	0.256
Pigs	20.1	11.6	16.8	411	0.050*

No respondents farmed any fish. Different patterns of livestock ownership are very noticeable here, especially in the cases of ducks, cattle and pigs. Duck ownership is common in the Ayeyarwaddy sample but very rare in Mandalay, while Mandalay respondents were much more likely to own cattle and pigs. There can be considerable differences in agricultural practices in Myanmar between areas with quite reasonable levels of proximity, because of the complex geography of the country. Respondents were asked about their sources of information about livestock and, also, about rice agriculture, with the following results:

Table 2: Information Sources on Agricultural Practices; source: Original Research

(%age saying 'yes')	Livestock		Rice Agriculture	
	Mandalay	Ayeyarwaddy	Mandalay	Ayeyarwaddy
Family	54.2	58.2	56.7	100
Friends and neighbours	63.5	55.3	74.9	99.5
Newspapers and magazines	14.8	1.0	30.5	15.4
Television	16.7	0.5	25.6	13.5
Radio	11.3	1.0	27.6	10.6
Government officers	20.7	1.0	49.8	13.0
Cooperatives	4.9	0.5	11.8	2.4
NGO representatives	0.5	1.0	2.0	9.1
Internet	4.4	0	9.4	1.9
Livestock market	6.9	0	-	-
Other	2.0	0	1.0	0

It is evident that Mandalay respondents avail themselves of a wider range of information sources than do their Ayeyarwaddy counterparts. By contrast, the reliance of the Ayeyarwaddy respondents on their family and friends and neighbors is quite large. As will be seen below, despite the widespread availability of internet (or at least Facebook) access, it is not often consulted for information about either livestock or rice farming. In general, as might be expected, information is more commonly sought about rice farming than livestock, since all farmers grow rice but not everyone has livestock. Mandalay offers better access to mass media and government offices than does Ayeyarwaddy and this is evident from these results.

4.3. Market Channels

Respondents were asked about their use of different channels when it came to seeking to place their goods in different markets. The results were as follows:

Table 3: Market Access; source: Original Research

(%age saying 'yes')	Mandalay	Ayeyarwaddy	Overall
Neighbours	4.4	1.9	3.2
Village markets	6.9	69.2	38.4
Brokers	67.5	21.2	44.0
Regional markets	62.6	42.8	52.6
International markets	0.5	1.0	0.7
N	203	208	411

It is evident that there are different approaches to market channels based on location from those results. Respondents in Ayeyarwaddy were much more likely to use village markets than those in Mandalay, who in turn were much more likely to use brokers and regional markets. Very few respondents are currently marketing their goods in international markets. In terms of the availability of ICT tools for respondents, it is evident that mobile telephones have become almost ubiquitous throughout the country.

Table 4: ICT Tool Access; source: Original Research

(%age saying 'yes')	Mandalay	Ayeyarwaddy	Overall
Mobile telephones	99.0	100	99.5
Television	99.5	100	99.8
Radio	99.0	99.0	99.0
CDs/DVDs	60.6	92.3	76.6
Computer or laptop	2.0	1.4	1.7
Satellite	0	1.0	0.5

It was only a few years ago that mobile telephone use was at a very low level in Myanmar and much lower than in other, comparable countries. However, since then the government has taken the decision to trust the people to some extent by opening the market to various companies and the high level of competition has driven down prices to the point that just about everyone can afford a telephone – which are mostly low-cost units imported from neighboring China. In many cases, deals are offered to consumers which include free access to Facebook, although other internet applications require a premium fee. For many people, therefore, Facebook is the internet; this is apparently the case both in rural and urban areas, based on these results. There were, it has been reported, some 46 million subscribers in 2016 and this number is rising rapidly (Geodata for Agriculture and Water, 2017). When asked about their preferences for consulting information sources, it was evident that there were various significant differences between the respondents at both sites:

Table 5: Information Source Preferences; source: Original Research

(Mean Score)	Mandalay	Ayeyarwaddy	Overall	P
Mobile telephones	3.33	3.03	3.28	0.000**
Television	3.48	3.23	3.25	0.009**
Radio	2.93	2.90	2.92	0.019*
Internet	2.49	2.19	2.35	0.000**
Social media	2.40	2.31	2.36	0.000**
CD/DVD	2.27	2.40	2.33	0.000**
Computer/laptop	2.00	1.86	2.10	0.000**
Satellite	1.98	1.67	1.82	0.000**

It is evident from these results that the respondents in Mandalay were significantly more willing to use the various information sources than those in Ayeyarwaddy. This might be because there has developed (although at a comparatively early stage) more of a culture of referring to online and offline sources in urban areas which can be discussed with friends and colleagues as a means of truth-checking in a way that is not available in rural areas. It is also possible that people in rural areas have a different experience of everyday interactions with the state than people have in urban areas, where more scrutiny of actions is possible. It is noticeable that the mobile telephone has now become the second most preferred choice of information source and the television follows. It is also noticeable that respondents distinguish between the mobile telephone and the internet and social media, which are less likely to be consulted.

When asked whether they personally owned a mobile telephone (as opposed to having access to one), 95.9% of the sample overall answered that they did. Only 36.7% reported that they had access to the internet through their mobile telephones, while 79.3% reported that they had access to Facebook and only two respondents had access to email. Overall, 50.3% of respondents reported that they accessed information on agriculture on the internet but this rises to 62.3% in Mandalay and down to 37.8% in Ayeyarwaddy ($n = 151$; $p = 0.003^{**}$). Access to information on livestock was only 6.0% overall. The most common type of information sought was weather forecasting (97.3%), followed by general agricultural and livestock news (55.5%) and then market prices (32.9%). Respondents in Mandalay were significantly more likely to search for information such as market prices ($p = 0.000^{**}$), seed varieties ($p = 0.027^{*}$) and post-harvest technology ($p = 0.015^{*}$) than respondents in Ayeyarwaddy ($n = 76$). There is, as mentioned elsewhere, evidence of climate change in Myanmar so it is not surprising that people are interested in the weather, especially as most people can remember the devastation of Cyclone Nargis in 2008 and regular occurrences of flooding since then. Among the small number of respondents who accessed information on livestock ($n = 10$), the most common item was feed and fodder (50.0%).

Overall, only 47.0% of respondents trusted information obtained from the internet, with a slightly lower rate of trust in Ayeyarwaddy. Low levels of trust are not surprising in a society which has been subjected to censorship for so many others. In terms of longevity, only 2.6% of respondents had had internet access for more than three years, with 63.1% having had access for 1-2 years and 34.3% for less than one year ($n = 76$). Most commonly, 40.4% of respondents used the internet on a daily basis and 30.5% once a week ($n = 151$). Although coverage of the

country has taken place, it is not always available, especially in rural areas, which might have affected these results, as too might the fact that most customers have access packages which limit the flow of data.

When asked why they accessed the internet, the most commonly received response (92.1%) was to communicate with friends and family members, followed by the availability of relevant content (47.0%) and ease of access (38.4%) (n = 151). It is possible that, given how new internet access was for so many respondents, their usage patterns will mature with age. It takes a while for people to come to appreciate what is available on the internet and how it can be used. This is particularly true for a country such as Myanmar, which has comparatively few websites written in the national language and even fewer sites written in the languages of its many ethnic minorities. In any case, it is evident that respondents in Mandalay were more divided in their opinions of the benefits of internet access, with most respondents seeing high benefits in different aspects (often significantly so) and, also, those seeing only low benefits.

Table 6: Internet Access Preferences; source: Original Research

(%age saying 'high benefits')	Mandalay	Ayeyarwaddy	Overall	P
Easy access to accurate and timely information	52.6	16.8	34.0	0.000**
Access to regional and international markets and products	1.6	0	0.8	0.002**
Cheaper and faster generation and dissemination of information	1.6	0	0.8	0.002**
Supportive to post-harvest technique	7.3	4.8	6.0	0.408
Better crop management	2.6	0	1.3	0.000**

The statistically significant results here appear to result from the greater proportions of Mandalay respondents considering these issues to be of 'little value,' while most Ayeyarwaddy respondents confined themselves to the 'medium value' category. This is supported by the fact that more Mandalay respondents had actually explored the internet in different ways and, so, would be more able to make a judgment for themselves. It is also notable that 47.9% of all respondents felt that the internet would benefit their agricultural practices, with 66.8% of the Ayeyarwaddy respondents agreeing but only 28.6% of Mandalay respondents (p = 0.000**). It will be interesting to see whether and in what direction these opinions change in the future.

When asked about possible barriers to use of online tools, the following results were obtained:

Table 7: Internet Access Barriers; source: Original Research

(%age saying 'difficulty')	Mandalay	Ayeyarwaddy	Overall	P
High cost of internet access	54.2	43.3	48.7	0.027*
Language barrier	83.7	62.5	73.0	0.000**

Cannot afford ICT tools	71.9	32.2	51.8	0.000**
Lack of basic ICT knowledge	73.4	91.8	82.7	0.000**
No interest in using ICT tools	23.7	43.3	33.6	0.000**
Lack of technical skills	88.2	87.1	92.7	0.000**

It is interesting to note that these results are all statistically significant but not all in the same direction. Mandalay respondents reported significantly more difficulties with respect to the high cost of internet access, language barrier and being unable to afford ICT tools, while reporting significantly fewer difficulties with respect to lack of basic ICT knowledge, no interest in using ICT tools and lack of technical skills. In any case, the principal difficulties are with lack of technical skills (92.7%), lack of basic ICT knowledge (82.7%) and the language barrier (73.0%). It seems likely that the first two of these problems will decrease to some extent as people get to use the tools and become more familiar with them and, hence, able to explain their use to family members and friends. Similarly, Myanmar language content will presumably increase in amount as the number of people able to consumer and create it increases. Myanmar society has had a comparatively recent experience with the online world only and evidence from societies with more extensive experience has always been that the number of people taking up those opportunities. Nevertheless, it is evident that some substantial problems still remain with access. As might be anticipated, most respondents (99.8%) felt that the government had a role in promoting access to the internet. Paradoxically, it is by throwing open the doors to market agencies that the level of penetration that has been achieved has eventuated, when government accesses were insufficient for this need.

In summary, the influence of demographic characteristics on the access to internet and information on agricultural may be seen in the table below.

Table 8: Influence of Demographic Characteristics on Access to the Internet and Agricultural Information; source: Original Research

Characteristic	Access to the Internet		Access to Agricultural Information	
	P	N	P	N
Gender	0.248	411	0.001**	151
Age	0.000**	411	0.000**	151
Education	0.000**	411	0.015*	151
Farm Size	0.017*	411	0.277	151
Length of Experience	0.000**	411	0.000**	151
Monthly Income	0.006**	411	0.052	151

The influence of demographic characteristics on the access to the internet and to agricultural information is obvious here. All the factors considered have at least one statistically significant distribution and, of course, there is a high level of positive correlation between the different

variables. In general, the level of resources in a household has a positive impact on access to internet and information, while young people are more likely to be early adopters of this technology.

5. Discussion

Market-based activities have enabled penetration of mobile telecommunications and the internet across Myanmar to take place very rapidly and certainly more quickly than could have been managed by public sector resources alone. Whether the sector goes on to witness the hyper-competitiveness and spectacular business failures seen in Cambodia some years ago remains to be seen. The comparatively low level of entrants into the market so far suggests that this will not be the case.

However, although these tools have spread rapidly, it is only in the form of a hybrid version of the internet in that Facebook is provided at low or apparently zero cost while other applications are not included in the base package. For many people, therefore, Facebook has become the internet, even though they are not aware of this because Facebook is positioned as an alternative to the internet. As has become well-established, this channel has been used to shape popular opinions in the country in a negative way and to permit information to spread more quickly than it would otherwise have done. There is something of a natural bias against alternative viewpoints based on the different languages that ethnic minority people might prefer to use and, also, because of the very poor infrastructure available in many of the places where conflict is taking place. It used to be argued by proponents of open access that 'information wants to be free,' while in Myanmar it might be argued that 'prejudice wants to be free.' This is a new area of operation from which unfortunate people can be excluded or from which, as Sassen (2017) has it, they may be expelled. Even though the level of discourse that is taking place in Myanmar is currently quite limited, it is still an evolving sphere in which all people should have access in terms of natural justice.

There are certainly opportunities for more to be done to promote useful agricultural information on the internet and to widen access to it, in a variety of languages and this is an area where the public and civil sectors might appropriately be more active. This should include some consideration of how Myanmar's farmers might be able to obtain access to remote markets, which is an issue that currently prevents subsistence farmers being able to secure better income generating opportunities for themselves.

6. Conclusion

This paper has described the results of a quantitative survey conducted in northern Myanmar among rural farming households aiming to determine their level of access to mobile telecommunications and the internet, as well as their access of information about agricultural conditions in their vicinity. A total of 411 completed questionnaires was obtained, which is a number sufficient to satisfy the requirements of the Yamane equation. However, the research is nevertheless limited by the usual constraints of time and space and by language limitations within the research team. These limitations represent some issues in the quest for generalization across the whole of the country. Steps have been taken to try to cater for these limitations.

In the future, more research is required to determine how quickly the rate of change is developing, if at all, as well as attempting to cover a more representative sample of the overall population of the country. More measurements of the type of discourse taking place in the region would also be welcome.

The government has permitted a much greater degree of competition in this country than has been permitted before and has been rewarded with a substantial level of penetration of both urban and rural sectors. There is considerable scope for the public sector to focus on more income development and nation-building related activities by using these media in the future. It is possible that its resources are better used in this way rather than in trying to compete with or

replace market-based activities. If that is the case, then a valuable lesson may have been learned about the preferable means of directing government activities.

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