Exploring the role of mobile internet in the capability expansion of Nepalese farmers

A research report submitted in partial fulfilment of the requirement for the degree of Master of International Development

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February 2025

Abstract

This research report aims to improve the understanding of the role mobile Internet plays in expanding the capabilities of Nepalese farmers. A notable gap is evident in the existing research literature regarding the value added by mobile Internet in enhancing farming and agricultural productivity in Nepal. Given the widespread adoption of the mobile Internet and its instrumental roles, a comprehensive study is needed to address this gap. This research report makes an initial exploration in that direction. Apart from the immediate impacts of mobile Internet in farming, the results and findings are also analysed using Sen's Capability Approach to understand the role of mobile Internet technology in the capability expansion of the farmers. A sample of five farmers was selected using purposive sampling gain some initial insights. A qualitative data analysis method is used to codify and categorise the accumulated data into separate themes. The results showed a positive relationship between mobile Internet use and farmers' productivity and income. An expansion in their capabilities is also observed due to the benefits received using mobile Internet. However, specific barriers and challenges also remain that prohibit the benefits from being achieved to a greater extent. Suggestions received from farmers during the interview and policy recommendations formulated through the data analysis have been incorporated in the report to extend its potential benefits.

Acknowledgements

I am deeply grateful for the people and institutions who have helped me to put this work together.

My father *Dil Kumar Ban,* who is my greatest source of inspiration for all my endeavours. My partner *Preeti,* who has shouldered other important responsibilities while I dedicated my time to this report. My brother *Sundar,* for making it possible for me to further my academic ambitions and providing the necessary resources.

I am thankful towards *Glenn Banks*, my supervisor, whose guidance and knowledge helped me to get ahead of any gridlocks along the way and providing vital strategies to produce this report. I am also grateful towards my faculties, Regina Scheyvens, Gerard Prinsen, Maria Borovnik and Rochelle Stewart-Withers for enriching my understanding of *Development* and shedding light on the aspects of *Development* that were unexplored before this.

I am also indebted towards the participants of this study who were kind enough to give me their time and insights, without which the report could not have been completed. I hope that this research will help to add something positive towards their agricultural efforts, which is one of the main goals of this study.

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1. Introduction

1.1 Nepal in a quick glance

Nepal is a landlocked country with a population of around 30 million and an area of 147,181 km sq., comprising three main topographic areas: mountains, hills, and flatlands, which extend horizontally in three distinct strips. The northern part of the border is shared with China, while the other three sides are shared with India. Due to being positioned between two significantly larger neighbours on all four sides, it is also nicknamed 'a yam between two boulders'. Although being a landlocked country presents multiple sets of challenges, Nepal has met the prerequisites for graduating from the LDC category and will be transitioning to a developing country by 2026 (*World Bank Open Data*, 2023).

Figure 1: Nepal bordered between India and China

Despite the topographical variance posing a challenge in certain aspects, such as for physical infrastructure, it also presents an opportunity to grow a variety of crops and form varied agro-ecologies (CIAT, 2017; Gyawali & Khanal, 2021). Nepal has traditionally been an agricultural nation, where most of its production is sustenance-based. However, a gradual progression

towards commercial farming can also be observed as a more recent phenomenon (CIAT, 2017).

1.2 Agriculture in Nepal and the prevailing challenges

A sizable workforce in Nepal is employed in the agricultural sector, which constitutes 66% of the total employable population. The common issues for the agricultural sector are land fragmentation, low-yielding farming practices, lack of adequate infrastructure development and insufficient education and training (Mishra, 2023). Consequently, despite a significant population employed in farming, the country's agricultural productivity generated through this engagement remains considerably low, resulting in only about 21.2% of the total GDP for 2023, according to *World Bank Open Data* (2023). With such a high dependency on agriculture, coupled with low income, farmers are one of the most vulnerable groups of individuals in Nepal. Further marginalisation occurs in the sub-groups, such as women, lower castes, and Indigenous peoples, and this offers an important area for exploration, given that they are pushed further from the dominant hierarchy of society. Therefore, agriculture remains a crucial sector for Nepal, involving a significant portion of the population. Efforts towards developing and uplifting this sector can benefit a large portion of the population while significantly contributing to the country's economy.

1.3 Embracing the mobile technology and its impact on agriculture

Nepal has experienced considerable and rapid growth in the telecommunications sector. Between 2021 and 2022, the number of internet users in Nepal increased by 7.7%, pushing the total number of users to 11.51 million (Kemp, 2022, February 15). The number of mobile phone users also increased by 4% over this period, a growth of 1.5 million, bringing the total number of users to 40.58 million.

Globally, the adoption of mobile technology has shown a positive impact on agricultural producers and buyers to a large degree (Emeana et al., 2020; Mittal & Tripathi, 2009; Timsina et al., 2024). Most of the benefits come from the easy and timely access to information. Traditionally, farmers received information from local networks, extension services or other broadcast media such as television and radio (Aker et al., 2016). Improved and quicker access to information has led to increased productivity and more profitable opportunities through changes in the allocation of factors of production and crop patterns (Nakasone et al., 2014).

For example, an extension initiative called KHETI, which is operated by employing young people with technical proficiency as mediators for the farmers in the village and extension services, showed a positive impact on the farmers overall productivity and confidence. Another finding made by this study was that the service was more advantageous for the poorer farmers rather than more prosperous ones (Fu & Akter, 2011).

However, giving access to mobile Internet or technological assets is insufficient to empower the individuals and requires further efforts from other stakeholders (Bailur et al., 2018). Capabilities of individuals can only be strengthened when the policies establish institutional frameworks that support the poor, has a clear understanding of the obstacles and are applied with clear objectives and foresight (Hamel, 2010). Policymakers and the people deployed in this sector need to work towards creating a favourable environment for the farmers to realise the full potential of ICT and its benefits.

1.4 Mobile Internet; a step forward from mobile telephone

The agricultural sector can benefit from ICT in multiple ways, such as research, improved market activities, and exchanging information, among many others, which helps to create economic sustainability (Saidu et al., 2017). However, limited literature can be found focusing on the impact of mobile internet technology on farming community of Nepal and other surrounding regions. A technology adopted at such a broad scale needs to be understood more deeply so the benefits can be leveraged while the potential challenges can be identified and curbed to a feasible degree.

Most studies target the telephonic use of the mobile phone, which was the initial purpose and function of the mobile phones; however, there has been significant development from its initial capacity, and phones have now evolved into smartphones, which perform a range of functions, that were unimaginable a decade ago. One of the significant functions of this development in the ICT sector is mobile Internet, which allows individuals to access virtually unlimited information given that their smartphone is connected to mobile Internet. This development has had a transformational effect on the world and has drastically changed how information was communicated before this. Mass production and adoption of this device has also made it affordable for most individuals, connecting them with this global network of information.

1.5 Aims, objectives and Research Questions

Nepalese farmers are some of the individuals who have been able to leverage mobile internet technology to some extent with its wide-scale adoption. This study aims to explore the impact of this technology on their lives and its potential challenges. Since this research is part of a development studies project, a development framework known as the 'Capability Approach' (Sen, 1999) is applied as the theoretical lens to understand the mobile Internet's contribution to farmers' 'development'. The reason for applying this framework is that it moves beyond the traditional view of measuring progress solely based on economic terms but instead focuses on how development interventions can facilitate individuals in pursuing the life that they value.

This perspective is critical for this study because sometimes asset acquisition is synonymised with the 'development' process, which do not always correlate. Therefore, the adoption of mobile internet technology can sometimes be synonymised with the development of individuals; however, this approach challenges that view and explores whether that commodity has helped the farmers lead a life they value. Is this asset just an additional tool for the farmers without any benefit, or does it contribute towards improving their lives? This report will aim to answer this question. The core concepts of the Capability Approach will be further described in the second chapter and will be applied to the report's result and findings in the final chapter to understand the role of mobile internet in the capability expansion of the participants.

Aim:

To explore the role of mobile Internet for Nepalese Farmers in their agricultural practice and their capability expansion

Objectives:

Objective 1: To contribute to the study of the relationship between mobile Internet and farmers.

Objective 2: To help in the formulation of policies in Nepal to integrate mobile internet technologies with farming practices to aid in farmers' capability expansion

Research Question:

Research Q1. Does mobile internet facilitate Nepalese farmers in improving their farming practices, and if it does, in what ways?

Research Q2. What are the prevalent challenges the farmers face when applying mobile internet technology, and what suggestions do they offer?

Research Q2. Does this technology help in farmers' capability expansion when analysed from the Capability Approach?

Report structure

This research report contains five chapters. The introduction will provide some background information about agriculture and mobile internet technology in Nepal, and it will present the aims and objectives of the study. Subsequently, a literature review chapter will contain a review of the findings and studies carried out in this area, identify a gap in the relevant literature and demand a more comprehensive study on this subject, specifically in the Nepalese context. Some key ideas of the CA will also be discussed which will help us analyse the findings of the study by linking them to these core tenets of the CA. The third chapter will discuss the research design and methodology regarding the data collection and analysis method. The following two subsequent chapters will firstly present the findings and then in chapter 5, the conclusions and policy recommendations will be shared.

2. Literature Review

This literature review study will explore the research available which relates to mobile phones and its overall impact in the farming community. It would be necessary to inform beforehand that the primary focus of this chapter will remain on ICT's contribution to agriculture and farming due to limited literature available that specifically correlates mobile Internet and farmers in the Nepalese context. ICT is the broader umbrella term for all communications technology, mobile internet being one of them. Following this, the report will highlight the gaps within this area and explain how this research report could contribute to a greater understanding of this subject and address this gap. Subsequently, a summarised idea of the Capability Approach will be presented, based on Amartya Sen's book, 'Development as Freedom' (1999), along with a discussion of some of its limitations and criticisms.

2.1 Impact of ICT on farmers

There is an extensive availability of literature that connects ICT and its impacts on agricultural practices, and there is a consensus that ICT positively correlates with productivity(Lio & Liu, 2006; Nakasone et al., 2014; Swaminathan & Swaminathan, 2018). When farmers access ICT tools, it can serve as a useful Decision Support tool, reducing the farmer's risk and accessing quality products through market information (Bhusal et al., 2021). In southwestern Uganda, mobile phones are vital in increasing productivity, market access, natural resource management, and farmers' knowledge base (Masuki et al., 2010). The principal use of the phone was to gain information on the market, such as current prices and the availability of seeds and pesticides. Access to information is the central benefit of mobile ownership among farmers (Qiang et al., 2012). Mobile phones can be crucial in balancing the asymmetrical state of access to information among rural and urban areas (Ye & Yang, 2020).

A group of Kenyan farmers saw their income rise by a third by using the app DrumNet, which gave them a better position for price negotiation, contracting and other services related to value chain support (Okello et al., 2013). A similar conclusion was reached (Mittal et al., 2010) in a study conducted among 180 farmers attending an Agricultural Fair in India. Farmers reported being able to communicate while on their farms, increased safety from access to information about weather emergencies, increased profits from real-time access to market prices, and handling plant diseases, among many other benefits. Despite most of the benefits coming from

the telephonic use of mobile rather than using them to access the Internet, it still highlights some significant uses of mobile phones in increasing the yield and profits for the farmers. A more recent study (Khan, Ray, Zhang, et al., 2022) established a positive correlation between mobile phone and internet usage and the impact on the farmers' income. The agricultural profit increased by almost 41%, while there was a 31% surge in non-agricultural profits. It was beneficial for the farmers to find a more profitable sales channel to sell their wheat rather than operating self-selling systems, which gained lower prices and profits and where they often had to rely on the middlemen.

Baumüller (2013) asserts that as mobile phones evolve, they can significantly impact various aspects of farming and its practitioners. As mobile phones support diverse types of media, they can be even more helpful in disseminating information on farming practices through videos, voice recordings, images, and longer texts. Sophisticated interfaces can be a valuable tool to train farmers on topics like production and marketing, which are crucial in bolstering their economic prospects. Furthermore, given the prevalence of illiteracy and limited technology among rural farming populations, the evolution of mobile phones can also benefit them by designing unique interfaces. A network built during these activities can also help farmers develop social connections with individuals with shared interests to build a forum. Women farmers can also hugely benefit from this technology as it can help them because they do not have time to join the training or may be hesitant to join these activities due to cultural sensitivities (Baumüller, 2013).

Many studies conducted concerning the mobile phone and its use in agriculture were also based on mobile phones providing "extension services, " a common term across many studies. Agricultural extension services are defined as "the entire set of organisations that support people engaged in agricultural activities to solve problems and to obtain information, skills, and technologies to improve their livelihoods and well-being" (Davis et al., 2020). An application known as "Smart Krishi", launched in Nepal, is a market leader mobile application providing agriculture-related information whose video contents generate more than 3 million views monthly (Adhikari, 2023). It provides farmers with information on a wide range of subjects, such as types of seeds, improvised seeds, fertilisers, weather forecasts, modern farming processes, and modern technologies for irrigation.

Qiang et al. (2012)concluded that Mobile phone applications can offer innovative, dynamic, and interdisciplinary services. Consequently, they can help the farmers raise their income and create more opportunities for people in underserved communities. Furthermore, “m-ARD apps” (mobile applications for rural and agricultural development) were still in their preliminary phase when this study was carried out, and the real potential would be fully explored in the coming years. As shown by another study (Duncombe, 2016), there is a rapid ongoing expansion in the research carried out to understand the potential and limitations of mobile phones in delivering services in the rural agricultural community; also, many contributions to add to the existing pool of information that is coming from developing countries (Abdulai et al., 2023; Khan et al., 2025; Mittal & Hariharan, 2018; Steinke et al., 2021).

2.2 Mobile internet vs Fixed broadband

Multiple studies have also established the benefits of the mobile internet against the fixed broadband. In a study by (Prieger, 2013), it was found mobile internet was facilitating the gaps for coverage of internet where the broadbands access had been limited. Access to the mobile internet further helped in building the prerequisites for the economic activities, which led to higher demands for mobile telecommunications, creating a virtuous cycle, especially in the low-income countries. In a more recent study in Tanzania (Bahia et al., 2021), mobile internet helped individuals in shifting towards higher paying jobs leaving behind the farm jobs. There was an 8% increase in the labour-force participation once the individuals were exposed to mobile internet for around 3 years, earning a higher income for themselves.

In another study (Thompson Jr & Garbacz, 2011), it was found that mobile internet had significantly more positive impact on the poorer countries compared to the more prosperous nations. Compared to fixed broadband, mobile broadband (internet) played a greater role for the poorer countries because of the pricing reforms and mobile internet technology is performing better compared to the older systems, which are rapidly being obsolete and replaced. The study also suggests that to maximise the benefits, mobile broadband in lower income areas must be emphasised. This can be achieved by price and tax reforms and increased competition among the private investment.

These studies suggest that for a country like Nepal, which is seeing a dramatic shift from rural to urban but is still largely a rural economy, mobile internet technology can play a crucial role in

addressing the digital divide while having a considerable impact on the economy of the rural areas at the same time.

2.3 Challenges with ICT for agriculture

Despite all the advantages of mobile phones, some challenges hinder reaching their full potential. It was found that getting access to ICT services such as mobile devices was affected by various factors (Bhusal et al., 2021).The first factor was the awareness of the technology among the farmers, who were often unaware of such facilities. Secondly, gender caused a disparity when it came to access to technology, where males were 14% higher in terms of accessibility. Similarly, the level of education also affected whether the individual had access to ICT tools, with the secondary and higher secondary educated sector having a much higher access to ICT (54.4% and 42.2%), while below primary levels had much lower (3.3%) access. In addition, there were infrastructure constraints, supply chain inefficiencies, and significant problems in the diffusion and access to information.

In addition to that, other factors such as the age, cost and geographic location and political situation also determined access to ICT for the farmers. 60% of the young population had access to ICT tools while, only 12.8 of the elder population used them for their benefits. At the same time, regular political instability has thwarted the dissemination of the ICT tools due to lack of policy innovation and implementation. Although recent developments and wide scale adoptability has made mobile phones more affordable than they used to be, people living in extreme poverty might still be deterred from using, as it might not fall under their primary needs (Bhusal et al., 2021). In another study (Pun et al., 2022), the prospects of a call centre, established to serve farmers and address their queries was assessed and its performance was reviewed. The study showed that majority of the farming community did not or could not access these services highlighting similar challenges as Bhusal et al. (2021). It suggested that there was a need for an umbrella policy measure, quality control mechanism, adequate budget allocation and nationwide awareness campaigns.

2.4 Identifying the gap

Most of the literature helps us establish that mobile phones have played a vital role in the upliftment of the life standard of the farmer, be it in rural or urban areas. However, a concrete study on the role of mobile Internet was still lacking to some extent. It is a possibility that the

proliferation of mobile Internet in rural areas is a recent phenomenon, and the area is currently under close observation and research. Such literature in the context of farmers practising in rural Nepal is even more scarce. Much of the literature on this subject was found in the African, Indian and other context, but not focused on Nepal (Khan, Ray, Kassem, et al., 2022; Mapiye et al., 2023; Oyelami et al., 2022). Despite India having a shared border with Nepal, they somewhat differ in their agricultural practices.

There is certainly a need for a study that rigorously addresses the role of the mobile internet for the farmers, so that the benefits can be maximised while the pitfalls can be managed. Since the mobile internet technology is proliferating at a rapid pace, suitable policies and support from institutions can help farmers resolve many of their agricultural issues by themselves without being too reliant on the external agencies. This will be put considerable agency in the hands of the farmers, empowering them and improving their agency. This report might certainly help in building some foundation in the Nepalese context, an extensive study will be required in the future to get a deeper understanding.

Nepalese farmers and policymakers can benefit from this study as it helps to provide a better insight into the current state of farmers' digital literacy position, which can be utilised to formulate strategies for improving their knowledge of the technology and its uses. Gaining an insight into this significant aspect of the economy, as earlier researchers have suggested, can be vital for creating achievable goals in terms of what can be done to harness the power of mobile devices that have reached far and wide of Nepal's topographically challenged lands (The Republica 2025). Nepal has been facing some issues due to unsustainable urbanisation, and mass urbanisation places considerable strain on the resources of the cities (Sapkota, 2022). Developing agriculture and imparting knowledge on ICT to rural farmers can help significantly improve their agricultural revenue and alleviate some of the challenges of over-urbanisation.

2.5 Looking towards the future

Further advancement in ICT sector can lead to the implementations of concept like IoT (Internet of Things), an advanced concept that could be highly useful for the agricultural Industry. Gills (2023) described “IoT as a network of interrelated devices that connect and exchange data with other IoT devices and the cloud.” It has grown in use in industries to enhance customer

experience, improve the decision-making process, and increase the value of the business. There has already been widespread contemplation and implementation of this idea in various agricultural scenarios (Alexey Shalimov, 2023). It is believed that IoT can help collect data, lower production risk, cost management and waste reduction, process automation across the production cycle, enhanced product quality and volume and reduced environmental footprint.

Mobile Internet use has proven to boost farmers' productivity and income, contributing significantly to the first Sustainable Development Goal of the United Nations, which is "No Poverty" (United United Nations 2015). Poverty remains a stark issue in Nepal, and as mentioned earlier, most people still rely on farming as their primary source of income. Providing better infrastructure can significantly impact the lives of many of Nepal's population, enhancing their livelihoods and contributing to the fight against poverty.

2.6 Capability Approach: 'Development as Freedom' by Amartya Sen (Sen, 1999)

'Development as Freedom' is a book by Amartya Sen, a Nobel prize winning Economist and philanthropist who defines freedom as the ultimate expression of development, which deviates from the traditional notion of measuring the development of people's quality of life based solely on their income. Sen believes that actual development lies in the ability of the people to live the life they choose or are free to choose. The freedom he denotes is the means and the end to achieve a quality life, since some will lead to further freedoms and reinforce each other. For example, a person with the freedom to study and receive education will enhance their possibilities of gaining further economic freedoms through better employment opportunities.

Sen categorises freedom into two types, which often overlap with each other due to their interconnected and dual nature. He calls them constitutive and instrumental freedoms or 'primary end' and 'principal means' (Sen, 1990, Chap. 2). Sen denotes that the constitutive freedoms are the substantive freedoms that play an important part in enriching human life and adding value to it. Some examples of constitutive freedoms are being able to read and write, being well nourished, enjoying political participation, and having freedom of speech. From a constitutive perspective, Sen believes that the goal of development lies in expanding these freedoms.

Similarly, Sen also provides the idea of instrumental freedoms or principal means, reinforcing freedoms that lead to the expansion of the principal ends or constitutive freedoms. These

freedoms also work in conjunction with each other, or as Sen calls it, 'interconnections' that are produced by the interlinkages of these freedoms.

The kinds of instrumental freedoms that Sen outlines in his book (Sen, 1990, loc.707) are as follows:

i) Political freedom: This denotes the freedom to participate in political processes and have freedom of speech and voting rights, among other political rights. This freedom ensures that the voice of the masses is well represented in the government and maintains accountability.

ii) Economic facilities: Sen is a vocal supporter of the free market and believes one of the key freedoms for individuals is to be able to participate in free market transactions. This constitutes an advantage for employment and credit markets through which people can earn a decent living and invest their savings.

iii) Social opportunities: The social opportunities include access to essential social services such as education, healthcare, and other social facilities. These opportunities help people enhance their capabilities to participate in society meaningfully and improve their quality of life.

iv) Transparency Guarantees: The transparency guarantees is the fundamental presumption of trust that people possess concerning each other in the society. This freedom ensures the absence of corruption and financial irresponsibility, which, when violated, seriously affects the openness of every stakeholder.

v) Protective Security: Protective security is the social safety net for the ones in the fringe of vulnerability despite optimised economic systems. Protective security refers to the arrangements by the institutions to ensure that no portion of the population succumbs to abject poverty or misery.

Sen also mentions some other key terms extending this idea of freedom. *Capabilities* are thus opportunities for people to achieve these freedoms. Sen distinguishes this idea of capabilities from resources, stating that many individuals might have the resources at their disposal but sometimes lack the tools to convert them into freedom. He also defines the idea of *unfreedom*

as the state in which the individual cannot realise their freedom and might feel oppressed (Sen, 1999).

2.7 Criticisms of Sen's Approach

Sen's capability approach is sometimes considered the bible (Desai & Potter, 2013) for the development framework. However, it has also been criticised by some scholars for various reasons. One limitation that Robeyns (2006) highlights in his study is the underspecified nature of Sen's approach. He calls for greater clarity on the focus of the study between the capabilities and functioning, selecting the appropriate capabilities to measure and trade-offs between the capabilities while measuring them. Furthermore, he adds that the capabilities approach is not an all-encompassing theory but a supplement to the existing theories. Considering this suggestion from Robeyns (2006), this study employs the CA (Capability Approach) to understand the role of mobile Internet in the capacity building of the farmers, but at the same time, acknowledges that this study is not exhaustive and will require multiple perspectives in the future to understand this phenomenon in much greater depth.

Another criticism that follows for Sen is the one given by Corbridge (2019). Among other ideological shortcomings in ‘development as freedom’ is the lack of acknowledgement of politics and power relations within this concept. He further demonstrates this by pointing out that Sen fails to insert why some authoritarian governments have performed better in expanding the freedoms of individuals while some democratic governments have failed to achieve this goal. Similarly, also points to the lack of precision in Sen's ideas, explicitly pointing towards a lack of precise policies that Sen wants to adopt for these freedoms to occur. Sen lacks policy prescription to achieve the goals he exemplifies in the cases of China and Kerala (an Indian State), where ills of social justice such as morbidity and illiteracy have been avoided despite their average economic performance. Despite these success stories, Corbridge (2019) highlights the lack of specific policies that Sen wants to apply for these 'freedoms' to be replicated in other areas.

2.8 Conclusion

CA has been applied previously to study the impacts of the ICT in the development sector (Haenssgen & Ariana, 2018; Hatakka et al., 2019), whereas, some studies have done this while keeping a focus on the agricultural sector (Hoque, 2020; Magesa et al., 2020). These studies

broadly capture and explore the advantages and disadvantages of the digital platforms across different geographical regions. However, mobile platform and the internet is a rapidly changing technology, where noble features are being added and brought into light quite frequently. For this reason, and given the absence of a study which integrates the capability approach with the mobile internet technology in the context of Nepal, this research holds relative academic and practical importance.

3. Research Design and Methodology

A qualitative approach is utilised in this report to identify and explore the effects of mobile internet technology on Nepalese farmer's capabilities. A qualitative approach is a research method dependent on qualitative information such as words, images, or other forms of data that cannot be quantified (including observations). It often stems from the concepts related to relativism, subjectivism, and social constructivism (O'Leary, 2021). Unlike the traditional methods of 'top-down' research where the external researcher would produce the knowledge as seen from their perspective, and which would typically exclude the views and ideas from those at the grassroots levels, this research aims to collect and analyse the information of farmers and associates themselves and use it for their benefit and empowerment.

The data set generated for this research project will contain the participants' words and ideas. The goal of the research will be to understand the role mobile Internet plays in the lives of Nepalese farmers. Although the findings might have a broader implication in the global farming community, the data generated will mostly be relevant in the Nepalese context and specific in this geographic region. For this research, five individuals from semi-rural villages in close proximity within Sunsari district in Nepal were chosen. The reason for choosing these villages is because I belong to the same district and my partner travelled there to assist me with the data collection, we could use our network to identity the participants with more convenience, but also representative of the broader farming community. The study can further benefit form incorporating a wider range of demographics from around the country, however, due to limitations in the resources and the scope of this study, the study was not able to achieve this. However, this study aims to create an opening for future studies that is able to overcome these obstacles.

3.1 Power and positionality

The positionality and power of the researcher in the research process play a vital role in social sciences research. Therefore, the researcher must acknowledge the position that they are in to identify the potential biases in the data and the limits of the research. Factors such as the gender, class, race, ethnicity, and life experiences of the researcher might influence the outcome of the research as it is often the case that the researcher has the upper hand and thus exerts more influence over the participants in the research (Scheyvens, 2014). During the

interview process, an example of the influence of my positionality was evident as some of the participants were trying to extrapolate or exaggerate their answers. Since I come from the same region, I could understand this tendency of the participants, which would have been overlooked by anyone outside this region or would not have comprehended the cultural subtext operating in the background during the interview process. I have made my best efforts to extract the facts during such moments by reiterating the requirement for factual answers for the process, which would be helpful in government policy recommendations.

A few participants, when they realised that I was this interviewer from a foreign University in a 'First world country', brought some shift in the power dynamics of the relationship. In the moment of realisation, the dynamics changed from stating the facts to attempting to 'impress the interviewer'. I again reiterated the necessity for providing unaltered facts to the respondents and was largely successful in keeping the answers neutral and unbiased. One participant mistook me for a software developer or an IT professional as my questions were based around that and requested me to create mobile applications to solve their stated problems. Similarly, one participant requested that I bring up these issues with the government and mistook me for a government official. Since I had expected these outcomes to a certain degree, I was able to provide them with correct information regarding the interview and redirected the interview towards getting unbiased answers from them. However, I highlighted the fact that this research report aims to facilitate the policy makers or NGOs in future to deliver interventions that can impact the farming community in a positive manner.

3.2 Sampling

The sampling method for this research is purposeful sampling, which encompasses a broader demography and aims to produce a broadly applicable result. Unlike quantitative research, where the research is given rigour and benefits through random sampling, qualitative research tends to benefit from selective sampling because the answers may be derived from a few but still sit with a broader sector of society (O'Leary, 2021). Following this, a purposeful sampling of five mobile internet-using individuals is carried out in this research, and I believe the results and findings will benefit a broader category of farmers. In purposive sampling, the sample's representativeness will depend on the subjective judgement of the researcher (Scheyvens, 2014). Therefore, to make the research as directed and representative as possible of my target group, I have selected participants who have access to mobile Internet and are at an

intermediate level of user proficiency. Participants were aged between 28 and 35 years and involved in farming and agriculture full-time or part-time. I reached the participants from an associate of my partner's former colleague, who used to be employed in the same NGO as her. After explaining to the associate the goal and design of the research, he helped identify these five individuals who fit the participant profile.

3.3 Data collection

A semi-structured interview is used as the primary method for data collection for this research process. It is one of the most effective methods for data collection in social science-based qualitative research. According to O'Leary (2021), semi-structured interviews can start with defined questions, but once underway, they can follow the natural flow of direction of the conversation. The main advantage of this method is generating unexpected answers that can be critical in understanding the participant's worldview and the results and conclusions. For this research, a questionnaire consisting of ten topic-related questions was prepared, but in between the questions, the participants were also asked to elaborate or provide examples of the event that they mentioned. For example, they would say that mobile Internet was beneficial in providing information on a new type of crop they were unaware of. In this instance, they would be asked to provide more in-depth details about the process they would use to acquire further information, what websites or applications would be helpful, and other related questions that were vital in extracting their attitudes and perceptions towards the technology.

Once the contact details of the participants were received, I added their numbers to my WhatsApp (an instant messaging service) group. Fortunately, mobile Internet was another beneficial factor here; all the participants had a WhatsApp number, making it convenient for me to access them all through the same platform. Once a time for the interview was decided, some of them got on a video call while others remained on voice calls. All the participants were highly cooperative and demonstrated considerable enthusiasm for speaking about the prospects of mobile Internet and its role in their agricultural activities. The interview time remained almost similar, around 20 minutes for all the interviews. A consent form and information sheet were provided to the participants before the commencement of the interview. Once the interview started, I recorded audio with their consent and asked the questions on my laptop. These audio files were later used as the data source and were analysed to reach the analysed and findings.

3.4 Data Analysis

As mentioned earlier, this study's data source are the recordings collected from the interview. The spoken words from the farmer participants were analysed using qualitative techniques. Analysing analysis for this research follows the four-step data analysis stages outlined by Scheyvens (2014). These four stages are: i) Data Collection (covered above), ii) organisation, iii) Data organisation, and iv) Developing theory.

i) Data collection

In the first stage, the data was be collected from the respondents through interviews, as mentioned in the previous paragraph.

ii) Data organisation

This systematic transcript of the collected data and using an indexing system to start categorising the information were used to find overarching patterns and common threads were identified. This step of research comprises comparing the interviews and identifying broad themes and how mobile Internet is helpful to farmers.

iii) Data coding (deconstruction)

Data coding involves applying a conceptual or thematic order to the organised data. Scheyvens (2014) suggests relating the concepts of the theoretical framework with the emerging themes and patterns in the analysis while analysing the data. The analysis lens of the research question is also suggested. O'Leary (2021) suggests being careful with predetermined categories, as it will obscure the researcher's ability to observe the biases in the analysis process. Although this research tended to establish a positive relationship between mobile Internet and the farmers, alternative explanations were also identified at the analysis stage. This stage of the analysis related the themes identified with the Capability Approach, the applied theoretical framework for this study.

iv) Developing theory (reconstruction)

The analysis's final stage required theoretical coding of the assimilated data. The researcher can connect the categories and create an explanatory theory relevant to the literature review and theoretical framework. The codes from the previous stage were compared against each other to synergise the one initially evident in the process. The linkages culminated in the

emergence of an explanation and understanding that addressed the research question and further progressed the research aim.

3.5 Pitfalls of a qualitative data analysis

While there are many advantages attributed to the qualitative data analysis methods, there are also many other pitfalls that may come with choosing this method. One such pitfall may be the generalisation of the results for other populations (Scheyvens, 2014). This research is based on a small town in Nepal, and therefore, the results might apply to the broader context of Nepal more efficiently; however, further application of the findings beyond this geographical region might need localised versions to produce better results.

Other pitfalls resulting from the qualitative methods are equipment failure, environmental hazards and transcription errors (Easton et al., 2000). An audio recording was used to save the interviews of this research on the laptop, which was used for the video calling, whereas to avoid environmental hazards, the respondents were told beforehand to choose quiet surroundings to avoid any distractions or noise. This precaution ensured that the audio recording was clear to understand and did not contain any breakages or noise.

3.6 Ethics

Ethics has an important role to play in the conduction of research for the sake of all stakeholders. It plays out mainly two different aspects: one by the researcher to keep their integrity in pursuing the truth. To do this ethically, the researcher must overcome their own biases despite all the challenges and prejudices one is conditioned with. On the other hand, the well-being and safety of the subjects who will be part of the study are also important. It is important to ensure that their best intentions are always at the forefront while the study is carried out (O'Leary, 2021). This research has taken all steps to ensure that the study will consider the best intentions of all the farmers involved. It is understood that the people in the research from the rural areas of Nepal might not be well educated or sometimes even deprived of the economic prospects that one enjoys in a more privileged position in society. It was the researcher's duty to touch on subjects with precaution and sensitivity.

"The research process must ensure the participants' dignity, privacy and safety and give back to them in some ways" (Scheyvens, 2014, p. 161). Researchers must ensure that we do not violate the participants' privacy, especially when anonymity can be linked to the security of the

participants. Although this study had a low impact on participants' security, anonymity was an option for the participants when they choose to do so. However, none of the participants expressed any interest in remaining anonymous. Rural farmers may experience a sense of vulnerability when inquired about their technology skills and capacity to access knowledge using mobile phones. This research will ensure their anonymity if they choose to do so. Additionally, there is no scope for error in the translation or interpretation of the questions as they can be conducted in the first language of the researcher, Nepali, which will also be the primary language of the participants during the interview process.

This research has the potential to benefit the farmers of Nepal by emphasising the need for the expansion of technology and providing academic support for government agencies that are already striving to create more accessible systems throughout the country. The whole premise of this research is based on the idea that technology can facilitate in the dissemination of information, widening the economic prospects for rural farmers. By supporting this conceptual framework, the researcher attempts to make positive changes in the smallholder farmer community.

There is also the understanding that performing research in one's native homeland does not make them free of prejudices and biases, and it differs from the notion of performing the research away from where the researcher is based (Scheyvens, 2014). Being able to pursue higher education in a foreign university is already a position of privilege and comes with its own biases. However, there will be some advantages due to this fact, too, such as the level of comfort and confidence the participants might feel in providing their response. Furthermore, understanding the shared cultural context and similarities helped in retrieving accurate data for the study.

Massey University's code of ethical conduct for research ensures that the research activities undertaken by the students and staff members follow Section 161 of the Education Act 1989 (Massey University 2017). Some ethical questions encompass the codes of this conduct, which are also considered in designing this research. In the case of autonomy, this research will give full rights to the participant to answer all the questions of their own free will and even give the option to leave the process if they deem it important. As mentioned earlier, the benefit of this study is that it can give insight into the role of technology and its correlation to farmers

gaining advantage in their practice, which ultimately helps widen their economic prospects. There is no known harm that can stem during this study period, which can adversely affect the farmers' profession or their well-being.

In addition to this, an internal in-house ethics approval process as mandated by the Massey University was also completed with Professor Regina Scheyvens and research supervisor Glenn Banks. After this discussion, I received the approval to complete a low-risk form by the Massey University Human Ethics Committee, which was complete online. Once the details of the research and other information like the information sheet and consent form were submitted, the research was also approved by this committee, affirming that the research remained within the ethical guidelines of the University and also safeguarding the well-being of the participants involved.

4. Results and findings

The results and findings chapter will discuss the outcome of the data collection and the insights it provided regarding the role of mobile Internet for Nepalese farmers. This chapter is structured into different sections to facilitate a comprehensive understanding based on the categories that emerged in the data analysis stage.

4.1 Participants' profile

Farmers Name	Age (Gender)	Type of farming	Level of engagement	Proficiency	Education
Jay Kumar	40(M)	Multi variety farming; duck, hen and vegetable	Full-time farm owner, recently left a job	upper middle	College level
Punam Chaudhary	28(F)	Some vegetable for self-consumption and cash crops like mustard and paddy	Small scale part time farmers along with being a housewife and a small business owner	middle level	School level
Kabindra Bhandari	40(M)	organic vegetable farming	Full-time	Upper middle	College level
Sanjeev Mandal	34(M)	Different produce in ancestral land	part time farming while working full time in an NGO	Upper middle	University level
Subash Ghimire	28(M)	Medium scale cow farm with around 100 cows and vegetable farm	Full-time	Upper middle (use for social media, entertainment and news)	College level

Figure 2. Participants' general information

Five respondents who were involved in farming as a full-time or part-time profession were interviewed for this research. The farmers were between 28 and 40 years old and were moderate to highly equipped with skills to navigate the Internet on their phones. For most of them, using mobile Internet was a regular part of their everyday lives, and they used it for entertainment and social media to receive news and gather information on agricultural practices. Jay Kumar (40) said, “I have become dependent on the phone. It is like my day cannot move forward without having my phone with me”. Others did not express such strong dependency on the device; however, they acknowledged that their phone was a part of the knowledge gathering in some way. All the respondents stated that they had been using the Internet on mobile phones for more than 5 years at the interview, which gave them relatively sufficient time to become familiar with the technology.

While agriculture was the primary profession for the three respondents, 2 of them were farming part-time. Punam Chaudhary (32) juggled the roles of housewife and small business owner and carried out farming activities apart from these roles. She said she could generate some extra income from this endeavour. A certain level of enthusiasm could be heard and observed when the participants were informed that they were speaking on the ‘mobile internet’ topic. It showed that participants were eager to express their views, and since the commencement of the interview, farmers were eager to share their experiences with this technology. It brings validity to their answers because of their confidence when the subject is brought up.

4.2 Sources of information

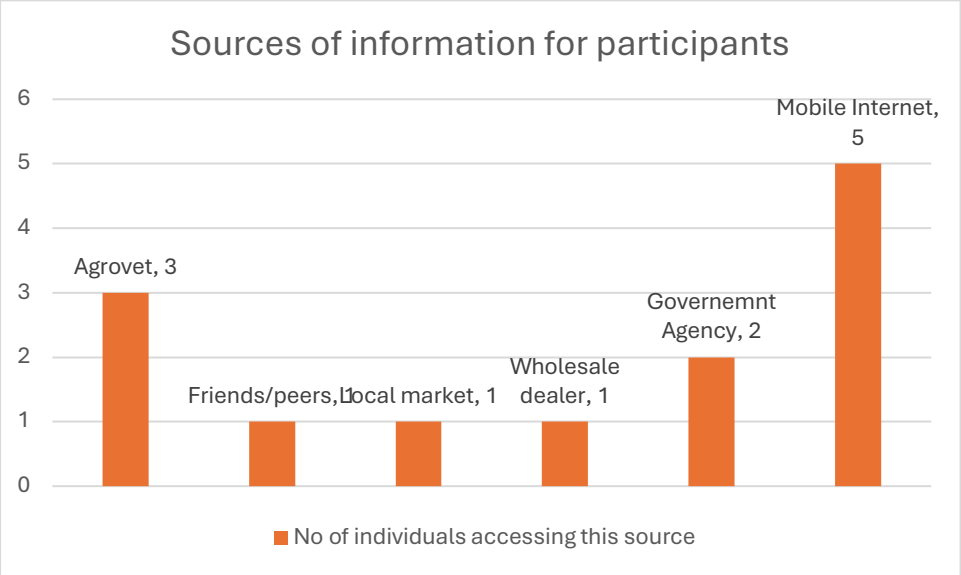

Figure 3. Sources of information utilised

Before the dispersion of mobile Internet, farmers relied heavily on recommendations and suggestions from local agrovets. Agrovets are commercial service providers that usually operate on a small scale and act as the local service providers regarding veterinary and agricultural medicines, tools and consultation. This practice of approaching the agrovets as the first point of contact has carried over, and the agrovet still plays a significant role in disseminating information to farmers. Most of the respondents stated that the agrovet is the preferred resource when they encounter an issue with their crops or cattle. The agrovet often recommends different medicines or sometimes even home remedies that they can use to try to eliminate the issue. Sometimes, the agrovet changes the medicine when the prescribed solution does not provide the desired results. This showed that the farmers entrusted the agrovets with higher regard for the knowledge they bore and had assimilated over the years.

Apart from the agrovets, people also seek information through friends in a similar profession. Asking friends if they know about an issue or just some general information is also a common practice. Kabindra (40) said that he also visits the local markets or calls the wholesale dealer to know about the ongoing rates in the markets for his produce. There are also some agricultural extensions provisioned by the government so that farmers can use them to get knowledge on

various problems, learn about new practices and get recommended to use the right kind of fertilisers and insecticides.

However, since the availability of mobile Internet, there has been an evident disruption in this linear process. Consequently, some farmers prefer to seek the information they need on the Internet or use it to verify the information they receive from their agrovets or friends. Before the Internet, farmers would have to rely solely on the information provided by the agrovets as the final option, whereas now they can come back and double-check the information the agrovets gave to ensure the validity of the consultation. Jay Kumar (40) says that the Internet is the primary source of information as he prefers to learn about new technologies and practices to increase productivity. He gets to watch other people's farms, which are shared on the Internet, and occasionally, he visits his visits peer's farms to discuss their crops and any issues they might be facing.

As figure 2 demonstrates that mobile internet was utilised by all the individuals participating in the study, whereas agrovets remain a popular source of information as well. However, it must also be taken into consideration in what order they occur, since the farmers could be utilising one medium of information to verify the other one or ascertain the information from the first source. Many of the farmers revealed that they would go to the first source and approach the second source to verify the information they got from the first source. For example, when they consulted the agrovet, they would come back and look up the same information on the internet to further confirm that they were given the right solution.

4.3 Uses and applications of mobile Internet

Despite some challenges, the respondents stated that the Internet has positively impacted their farming practices and productivity. The uses of the Internet ranged from solving trivial farming issues to organising online discussions, verifying information from external sources, and enhancing already existing knowledge and practices. However, the respondents who were more educated were better at navigating the online space, where language and other literary factors could act as potential barriers.

Jay Kumar (40) said that he uses the Internet regularly to enhance his farming practices, which would lead to higher productivity. He recalls a moment when there was no available information while trying to start a hatchery. He gathered knowledge from external sources as

much as he could, but these were not accessible every time, and he needed this information on an ongoing basis, or it could significantly impact his production. However, he started again when he had access to this information on his mobile Internet and saw a considerable rise in the number of hatched chickens. Jay Kumar says, “I saw the rate of the hatched eggs go to 70% from 20%, where a rate of more than higher of 50% is considered a success.” Now, he uses the Internet to access information regarding minor treatments for chickens and goats regarding hatching temperature. He was also able to produce animal feeds on his own using information found on the internet and local ingredients rather than buying them, which helped him reduce costs.

Punam Chaudhary (28) said it has increased her income by being able to harvest new varieties of crops while providing organic pesticide-free food for her and her family. She can take these additional crops to the market and sell them, which helps to generate higher disposable income for her besides her other business ventures. She expressed that when she finds out about these crops, she goes to the Internet to research them and learn about harvesting methods, the right season to plant them, the right choice of fertilisers, and soil fertiliser techniques. Kabindra (40) has also been able to prepare his pesticides using techniques he finds on the Internet, which has helped cut down costs and created a social media group where there are like-minded farmers who frequently discuss and showcase their ongoing activities to the group. Kabindra believes that discussing these issues among colleagues has produced positive results in everyone’s yields.

Sanjeev Mandal (34) saw the dragonfruit for the first time in a supermarket. The exorbitant price of the fruit made him curious about it and led him to do some research on the Internet. He discovered that it grew in a similar climate to his own and began researching the potential for harvesting on local farms. He was initially slightly sceptical but thoroughly applied all the information he could find to the best of his capacity. While his father largely supported this novice venture, his neighbours were quite the opposite. They said, “He must have lost his mind planting a foreign fruit that will never bear anything.”

Nevertheless, Sanjeev remained adamant in his fortitude and carried on without paying them too much attention. Finally, when the plant started bearing fruits, his neighbours quickly came and asked for a ‘cutting’ so they could plant it in their own fields, and Sanjeev even started selling them. The neighbours were equally astonished that such an expensive fruit could be

grown in their fields. Apart from this success story, Sanjeev said that he was also able to learn about many other off-season vegetables that could be sold for higher prices in the market. He believes that if more people could find that information on the Internet, they would have been more capable of producing off-season crops, leading to better incomes for the farmers.

Subash (28) is an educated young male who has used the Internet for personal and professional reasons for the last 5-6 years. He has a medium-scale cow farm with about 70 cows and runs vegetable farming with his brothers. Subhash has frequently used the Internet to improve his farming practices and increase productivity. He utilised the information found online to install milking machines on his cow farm. First, he learned about how they operate and how it can impact the milking process. After learning sufficiently, he looked up vendors that sold the machine, and after finding the one that gave him the best price, he decided to install the machine. Subash says the milking machines have significantly improved productivity while bringing the costs down. He states, "It used to take around seven people to milk all the cows every morning. Now that job gets completed by just two people, there is a significant reduction in labour costs."

4.4 Challenges and barriers

Despite the farmers experiencing multiple benefits from the widespread adoption of the Internet, some challenges and hindrances were stopping the farmers from taking the full benefit of this technology into their hands. From the analysis of the information provided by the farmers, these challenges can be categorised into four themes, which were as follows:

I. <u>Language and literacy barrier</u>

   Only one farmer in the interview pointed out that the language barrier prevented her from fully benefitting from or understanding the information. Punam (28) said," I wanted to look up a disease called 'fauji' on the Internet, which was destroying paddies in our area at that time, but I could not find anything since I do not know the English name for it, and typing in the local name did not bring up the information I wanted". Although it was only Punam who highlighted the issue, due to the limitation and the scope of this study, it can be presumed that language is a potential constraint for many other farmers in Nepal. Since the information on the Internet or even the interface you use to navigate the Internet is predominantly written in English, farmers who do not possess sufficient

literacy skills or have command over the English language usually struggle to find the information they need.

II. Credibility and selection of the source

During the interview, participants also pointed out that verifying the information they find online can be quite challenging. Jay Kumar (40) mentioned that although he finds valuable information in the digital space, he often lacks the resource person to verify that information so that he can deter any losses incurred for potentially hazardous information. Subash (28) was confounded because some of his cows were suffering from udder edema (swelling of a cow's teats) because multiple sources prescribed various solutions; however, he could not select the proper remedy. While having an array of options to choose from is an advantage of the internet, this can also cause confusion, as the lack of resources to verify this information causes the farmer's additional stress. Usually, a flurry of results is produced based on the query of the farmers, however, the internet helps little in determining the most efficient option, which makes them resort to the traditional practice or getting consultation from agrovets.

III. Barriers to implementation

The Internet acted as a viable source of information for the farmers who participated in the interview process; however, despite retrieving this information, they felt there were further obstacles when they wanted to apply these ideas to their farms. Often, it is an issue emerging from the lack of infrastructure, credible information sources, or the inability to find the appropriate measure prescribed online.

Jay Kumar says he had found multiple sources of information regarding what he was looking for. However, when he could filter the needed information and verify it with the right resource person, it was already late as he had to incur some loss during this time. Similarly, Punam said that she had found a solution for a disease affecting her mustard plants. She set out to find the cure in the market in the agrovets that sell this medicine, but the prescribed medicine could not be found anywhere. Despite her best efforts, she

could not save the plants. Incidents like these were prevalent among the farmers as there were not enough resources or infrastructure to implement the information available to them on the Internet. Kabindra expressed similar views regarding this matter. He says, “Although you can find solutions to many issues or diseases on the internet that might be helpful in your particular case, it is difficult to find the exact medicine or tools to apply those solutions.”

IV. Insufficient effort by government agencies

Among most participants, there was an underlying dissatisfaction with the government or local extension agencies, which are looking forward towards a more proactive extension service. Sanjeev said, “I have tried to approach the government extension facilities, hoping they would be able to give us the right information or guide us in the right direction, but I have never received a satisfying response.” He added that there are too many bureaucratic hurdles you would have to overcome for a minor issue, which takes away our valuable time. When the farmers do not receive the appropriate information within the stipulated time, it takes away their capacity to harvest the crops or produce in the right time. This can incur loss on the farmers as delayed information effects the yield and the productive capacity.

These were some of the common issues expressed by the participants during the interview process. Overall, the participants' responses can be aggregated to the idea that, although mobile Internet has acted as a powerful tool, there are times when this tool might not be enough, requiring further assistance to deliver optimum results for the farmers.

4.5 Suggestions

Along with their experience with the usefulness of mobile Internet and its challenges, the participants also expressed their suggestions on how the aspects of mobile Internet or the aspects that work in conjunction with this technology can be improved to further benefit them. Overall, the farmers expressed considerable enthusiasm for mobile internet technology and its usefulness; these suggestions must be further considered if a larger potential is to be realised.

I. <u>Increased awareness through training and orientation programs</u>

The mass-scale adoption of mobile internet technology has opened a plethora of opportunities to access information for farmers; however, Jay Kumar (40) believes that the farmers are not making full use of this technology as many of them only use it for social media and entertainment value without realising that it can significantly help them in their farming practices. He also stated that governments or local agencies must run awareness programs to inform people on how to use this tool in their hands to have a positive impact on their livelihoods.

II. Preference for short video formats

Respondents also expressed that a popular video format called 'shorts' can be more effective than relying on lengthy texts or websites, which can be watched on social media. There has been a growing trend towards these short video formats on social media, which people find engaging and easy to navigate. Since this model of video sharing has been popularised in social media apps, participants believed that informational videos in such formats would be more effective in conveying the message than text-based mediums. Punam, who is an active social media user quoted, "short videos would be a better medium to transfer information on various agriculture-related issues for a person like me, as I sometimes do not understand the texts that I find, especially if they are in English." Jay Kumar shares similar beliefs that video formats would be more efficient at delivering information as most farmers cannot read texts or documents.

III. Formation of effective government agencies

As mentioned previously, during the interview, the participants hinted at a certain degree of discontent with the government agencies' inefficiency. Reducing bureaucratic obstacles was one of the suggestions, while a call for more robust and active government service centres was also advised. Kabindra pointed out that if local government agencies would give us timely and accurate information for our queries, there would certainly be a reduction in the losses that we bear, and it might even help us to shoot up our productivity. He suggested that there should be a counselling centre, the farmers can just walk in and ask questions or call centres that could help the farmers with their questions or issues. Farmers can derive certain information through

the Internet, but before applying it, they seem to want to verify it through a reliable source, where the role of these agencies can play a crucial role.

IV. Localised and targeted internet-based service

Farmers were concerned that much of the relevant information found on the Internet tends to be generalised towards the targeted audience for which it is created and might not always suit someone from a different geographical location. However, crops' productivity varies drastically depending on the location of the plantation and harvest. Therefore, localised information focused on specific farmers from a particular geographic location can help farmers by providing more precise information and increasing productivity. Sanjeev said, "It would be great if there were more mobile applications that could cater to our specific region because the crops, we grow are native crops and require a distinct method to yield maximum productivity." Concerns expressed by the other participants could also be addressed with this solution, such as the language barriers, which could push information in the regional language to provide broader access.

These were some of the solutions proposed by the participants in the research, which ranged from the establishment of local government agencies to localised mobile apps and programs to increase awareness among the farmers. In the next chapter, the results and findings will be analysed in relation to the theoretical framework, and some policy recommendations will be made based on the information generated in this chapter.

4.6 Limitations of this study

While preparing this research report, the words of Robert Chambers deeply resonate with me (Chambers, 2014, Ch.1). What he deemed 'outsiders' is, on some level, applicable to the case I am presenting here. I have had very little or no experience with hands-on agriculture, although my family has a history of agriculture. My degree from a prestigious foreign university, completed from the comfort of sitting in a temperature-regulated room, clearly diverges me from the experiences of a farmer in a rural region of Nepal. My perspectives and experiences

are minimal; therefore, I could not wholly understand the thought process of a farmer dealing with mobile Internet to enhance their farming practices. I also believe there are many other challenges that I am unaware of or issues that these interviews would not accommodate. Therefore, the knowledge generated by this research is limited, and further studies at a much larger scale are required to understand this phenomenon fully. This report aims to be a stepping stone for such studies carried out in the future.

Future studies can also inspect this subject from other lenses such as the Gender, Power relations, digital divide, among other perspectives to gain a deeper understanding. Such perspectives can highlight underlying issues that might be overlooked with a study of this scale. Other questions like, how do the men and women use the technology differently? Do both genders have equal access to the resources to utilise this tool? What is the level of impact that education has on the results for the farmers? Do the marginal community have the same level of access to these technologies? If not, what role can the institutions play in bridging this gap? These and various other questions can be analysed with similar research which can be insightful in adding to the knowledge or producing pragmatic measures to overcome such issues.

5. Discussion and conclusion

The previous chapter has demonstrated the role mobile internet plays in the farmers' lives in Nepal. Various usefulness and parallel challenges were outlined, along with the farmers' suggestions to enhance their lives through this technology. This chapter will discuss the findings in light of the 'Capability Approach', the theoretical framework applied to this study.

5.1 State of unfreedom or capability deprivation as' information deprivation.'

"Informational limitation restricts or distorts consequential judgments" (Sen, 1997, p. 302). Mobile Internet played a crucial role in reducing the state of ‘unfreedom’ for the farmers by giving them access to valuable information and other consequential benefits that resulted from it. Not getting the necessary information required to increase agricultural or farming productivity and enhance economic prospects is a limiting factor for farmers in terms of livelihoods and ‘freedom’ (Qiang et al., 2012). The farmers actively sought information about agriculture on the Internet, noting that they wanted to escape that state of being 'uninformed' and have the knowledge by which they could expand their choices. Farmers are also aware that access to information paves the way for subsequent advantages, curbed or limited in the absence of adequate information that can be supplied with the help of mobile Internet. So, information and choices it provides is a capability, and a lack thereof is a deprivation. Therefore, we can say that mobile Internet plays a crucial role in removing 'information deprivation'.

Once the farmers reach the functioning state of removal of 'information deprivation', it leads to other benefits of having better economic prospects, social cohesion, or other functions that are sought as being a state of freedom. Removal of information deprivation significantly increases the choices for the farmers, increasing their capabilities. However, access to information does not guarantee that it leads to functioning if the farmers lack the agency to achieve them. In this case, although farmers could realise many of the opportunities available, they could not always act on them due to certain constraints posed by lacking the tools required or credible information verification sources. These constraints would create further ‘unfreedoms’ for the farmers. They would require further agency and capability to eliminate these freedoms.

5.2 Mobile Internet as a capability expansion tool

Sen sees the role of various tools and resources as a medium to expand capabilities rather than just as factors that lead to increased economic growth (Sen, 1999, p. 24). These tools provide 'agency' to individuals to lead to desired 'functioning'. Mobile Internet, in this case, plays such a role for farmers by diversifying their options and strengthening their decision-making and 'agency' to lead to the most advantageous functioning from which the farmers can choose. Mobile Internet provided access to information to farmers, which in its absence would be difficult to reach for the Nepalese farmers or may not be the most beneficial for them. Once they had access to this great wealth of knowledge regarding farming practices, which enhanced their productivity, farmers could further benefit from multiple other advantages such as increased income by selling surplus crops and cost reduction in many instances by practising less resource-intensive practices. As shown by the findings, one farmer, Subash, learned about the milking technology using the machines, which helped him significantly reduce costs. Similarly, mobile Internet also played a significant role in introducing the farming techniques of 'dragon fruit' for Sanjeev, who successfully harvested them on his farm and sold them on the market for much better profit margins than other traditional crops.

Apart from information access, which is the primary function of mobile phones for Nepalese farmers, when developed further, mobile Internet can aid the farmers in multiple other avenues. One such area could be disaster management by providing weather forecasts and insights founded on advanced forecasting systems. This could be tremendously helpful in deterring losses incurred by natural disasters and improving the state of preparedness. Another key tenet for developing the capabilities of farmers through mobile Internet could be financial inclusion, which is supported through digital financing schemes, where financial facilities are absent due to geographical or scale constraints. Similarly, women's positions can be targeted to improve through digital literacy programs primarily focused on women farmers' empowerment (Kenkarasseril Joseph, 2013).

Mobile Internet also increased farmers' agency by multiplying their choices when applying solutions to the issues they would face. A key theme frequently emerged among most interviewed participants regarding the 'Agrovet' and their recommendations. Agrovet, it seemed, was the primary source of information for most farmers regarding the issues relating to the crops or the animals. Whenever farmers realised that they were faced with any kind of

disease or health issues with the cattle and the plants, they would often reach out to the local agrovet, who is presumed to be equipped with the solution, either by medicine or services rendered by them. The participants often expressed concern with these recommendations as they believed, during some instances, the agrovet was not working in the best interest of the farmers but seeking to maximise their financial gains. This assumption cannot be denied entirely, as we have already noted about the local regulatory bodies' inefficiency in monitoring the activities taking place within the agricultural system.

However, since the arrival of mobile internet, farmers were now offered more choices as they did not have to rely solely on the knowledge of the local agrovet but could access the digital space to research the issues they were facing. Even when they were prescribed a medicinal remedy for the issue, they would often double-check it on the Internet to verify that they had been prescribed the correct medicine. This will considerably increase the leverage for the farmers, who are often deemed the less knowledgeable demographic in society, especially in the villages, to have more agency in the practices and methods they follow to resolve any farming issues.

5.3 Mobile Internet technology as 'Principal Means' (instrumental freedom)

Mobile Internet is a widely available and adopted technology currently in the context of Nepal, and at the same time, possessing this powerful tool can facilitate achieving multiple ‘functionings’ for many individuals. A growing number of individuals opt to utilise this technology as it provides access to a vast wealth of knowledge through which people can improve their standard of living, releasing them from certain unfreedoms or undesired states. Since there are no well-specified metrics for measurements of development in the CA by Sen (Robeyns, 2006), the contribution of tools like mobile Internet must be analysed within the contextual framework of this theory. Although there are no specific metrics for measurement of functioning because they can be largely contextual, we can analyse them in terms of the four instrumental freedoms outlined in the CA. Mobile Internet can be considered supplementary in achieving the following instrumental freedoms:

i) Economic facilities

Sen has highlighted the importance of Economic facilities in his book and believes it is one of the key tenets for an individual to lead a meaningful life (Sen, 1999, ch. 5). The idea of a free

market and voluntary exchange for mutual benefits is of fundamental importance for individual freedom. The findings of this study have shown that the economic benefits directly obtained through the application of mobile Internet are one of the main benefits farmers enjoy. While Punam, Sanjeev and Jay enjoyed a higher income through increased productivity, Subash and Kabindra could reduce their cost by implementing farming methods they had learned by seeking information online. This ability provides a significant advantage for the farmers. Being aware of contemporary farming practices, increased productivity through better methods, learning about the most recent market trends, and generating higher disposable income are all the economic benefits supplemented with using mobile internet technology.

Although broader implications on policy levels were not a part of this study, an overarching notion of a lack in terms of government policy could be understood from the answers given by the respondents. For example, the unavailability of a system to notify farmers of the market prices in real-time and the scarcity of retailers and fertilisers are some examples where state or local intervention can play a vital role in further expanding the benefits of the mobile Internet.

ii) Political freedom

Although direct benefits in terms of political freedoms were not discussed as part of the interview, farmers were prompted to ask their local bodies or governments regarding the facilities they received when they observed more advanced and well-managed in other places. Farmers were already united in their efforts to enhance their productivity, especially using social media platforms where they could discuss and share their ideas and issues with other similar members. This kind of collective action can potentially lead to reaching out to local authorities in a group, which is more impactful than taking the initiative alone. Almost all farmers expressed a similar sentiment when discussing support from government extensions, highlighting their dissatisfaction regarding the help they were getting from the local body or the state agencies. To initiate collective action from the unsatisfied farmers to demand more services from the extension services, social media and mobile Internet can provide a common and more impactful platform for the farmers.

iii) Social opportunities:

Mobile devices have been helpful elsewhere as digital platforms to access educational materials for all demographics (Ally et al., 2007; Eshnazarova & Katayeva, 2021; Tang et al., 2013). In Nepal, many farmers frequently use phones to access information and improve agricultural productivity. However, this arrangement was not a collective social decision to aid farmers. Further efforts were required from the local government agencies or NGOs to use the mobile internet platform as a medium to transfer information or other social amenities to supplement farmers' benefits. This can be done by developing applications that cater to the farming demographic and would specialise in providing materials that are comprehensible for all levels of farmers despite their literacy skills. Besides being a social platform for learning, a smartphone can also act as a tool facilitating financial activities and transactions, especially for microfinance and cooperatives where smallholder farmers are most likely to carry out these activities. These social facilities using mobile internet platforms can be supplemental in the capability enhancement of the farmers while contributing to their substantive freedoms and complementing other instrumental freedoms.

iv) Transparency Guarantees

Transparency guarantees are when there is a flow of information in society and a level of trust exists among the people. Mobile Internet is primarily a communication tool that effectively facilitates in the transfer of information for all individuals at different levels. As observed previously, there were instances of farmers like Kabindra and Sanjeev coming together to share and receive information from other farmers, where mobile Internet plays a crucial role in delivering the information. Furthermore, social media and similar platforms have also become a medium for homogeneous groups to create forums or groups where relevant information is shared transparently and securely.

Built on the foundation of the Internet, social media is also a reliable medium for underserved citizens to raise their voices against the incompetency of the local state or political bodies(Cammaerts, 2015; Murthy, 2018; Yılmaz, 2017). It can act as a great tool in the hands of farmers, and it shares information regarding some of the grievances expressed by the farmers during the interview process. Most of the farmers expressed dissatisfaction with the way in which the government extension played a minimal role in supporting farming practices.

Collective action can be taken by the farmers mobilising the social media to highlight these issues to prompt affirmative actions from the government institutions.

Interconnection of freedoms

As Amartya Sen has mentioned, these instrumental freedoms are reinforcing in nature and complement each other in expanding individual freedom (Sen, 1999, p. 4). Similarly, the freedoms achieved using mobile technology and enable other freedoms to be achieved simultaneously or because of this benefit. The different instrumental freedoms the farmers achieve are also similar, dynamic and reinforcing. For example, the economic facilities enabled by mobile internet technology expand their capabilities to better utilise resources made available by additional income. For example, farmers can use the surplus income to enrol their children in better schools, providing them with better education. Therefore, the consequential benefits will go even further as better education can increase the chance of a higher income in the future, which is a reinforcing cycle. Beyond that, quality education can also facilitate political freedom as it increases an individual's likelihood of identifying and exercising their rights.

Similarly, social opportunities such as common learning platforms can also facilitate increased economic growth while also affecting the transparency guarantees as common shared resources can strengthen the trust among the members of the society. The knowledge shared among the individuals improves and promotes better farming practices among their peers, increasing their productivity and leading to better economic prospects. Concurrently, sharing knowledge on agricultural practices in a digital platform can also foster trustworthiness and cooperation between the farmers. This can add to the transparency and guarantees elements of instrumental freedoms, characterised by the trust and beliefs among the members of the society. These are some examples of how instrumental freedoms can reinforce each other or sometimes even create a virtuous cycle to expand the capabilities of the individuals.

5.4 Policy recommendations

When we look at this study's outcome, a few policy recommendations can be proposed to supplement the enhancement already achieved by the mobile Internet despite the small sample size. An effective intervention can significantly impact the overall benefits achieved by the farmers so far, contributing to higher productivity on the field and expanding the choices and

strengthening the farmers' agency. Following are the few recommendations derived from this study:

I) A large-scale study to the confirm the findings

This study was mostly able to identify some positive correlation of the mobile internet and the farmers' capability, however a large-scale study to consolidate these findings, along with influence of multiple factors that might affect the results, must be undertaken. The purpose of this study is to only provide the preliminary information in the subject and act as a stepping stone for further research in the future. Large-scale research with a wider demographic, which was not possible with the scope of this study, can produce much more rigorous and robust findings, can then provide results that can be applied into the policy framework with higher possibilities of success. The demographics chosen for this study were limited to a small area of the country, who cannot be taken as being fully representative of a much wider population with varied needs. Therefore, using the preliminary findings of this study, it is highly suggested to explore this area, as it has shown considerable potential in facilitating farmers improving their capabilities.

II) Reassessment of current extension services

Government in Nepal need to revitalise the available extension services already present within the system. A systematic and thorough assessment of the existing services is required to ensure their effectiveness and efficiency, as multiple farmers vividly expressed their concern regarding this agency. An extension service plays a crucial role in aligning the agricultural goals of the state with those of the farmers, which is vital for an agricultural economy like Nepal. Lagging in these services will not only impact the farmers' productivity but also the national economy and its goals. For example, when farmers would find information relevant to them on the Internet, they would often try to find a reliable source for its verification; however, farmers were discouraged by the lack of interest from the extension services or sometimes the red tape within these organisations. The mobile internet has proven to be a powerful tool for providing the necessary information regarding existing issues or introducing new ideas; however, to fully realise these solution and ideas,

farmers need a robust extension service that can supplement this information. Without proper support by the extension services, these concepts are unlikely to be implemented and may remain theoretical rather than being translated into practice.

III) Orientation and training programs

The study indicates that there is still a gap between the resources available on the Internet and the farmers' capacity to utilise them. Jay Kumar stated that many farmers do not realise mobile internet is an excellent tool for information access as its use is limited mainly to social media. Although the Internet has a vast amount of information, sometimes this can be a disadvantage for people discouraged by the convolution of choice and may deter them. Therefore, training programs that orient people on internet navigation techniques that can filter out the most valuable sources, find new techniques, and resolve farming problems, can be of considerable benefit for farmers. The subject matter and the complexity level can be customised depending on the farmers' level of education. As shown in this report, there are some discrepancies in the level of knowledge that farmers possess, which can impact the efficiency of these programs.

IV) Development of localised or place-based applications

Another form of effective intervention using mobile internet technology can be creating mobile applications targeted towards specific regions, as the types of crops and their nourishment can vary based on geographic regions. Given the wide adoption of mobile applications in many aspects today, it was unusual that very few farmers answered that they utilise mobile applications for farming practices. Apart from imparting knowledge on farming practices, mobile applications can also be developed as a platform for farmers to communicate with extension agents and a forum to share and discuss their issues. Despite the availability of a few mobile applications on agriculture and farming available in the mobile platform, the study reveals that none of the participating farmers utilised them to increase their production. This gap can be bridged by the training and orientation programs mentioned above. Jay Kumar, who seems to have a higher proficiency than the

average participant in this study, believed that mobile applications that are localised will be easily adopted and trusted by an ordinary farmer rather than generic information that is targeted for the masses. Similarly, Kabindra said, "I only believe foreign apps because they provide accurate and honest information", displaying slight distrust for the existing applications in the Nepalese market. More input is needed to deliver credible apps serving a specific farming community segment. Some applications have a noticeable presence in the digital space (Smart Krishi, Krishi Guru), despite none of the respondents answering that they were using such mobile applications to enhance their ongoing farming practices.

V) Improved regulation of the Agrovet businesses

Agrovets were crucial in delivering vital information to farmers who relied on them for all issues and suggestions. These local shops, which act as an unofficial source of extension for farmers, can align with agricultural goals set by the local or national state bodies if they are integrated with such goals and cooperation is initiated with them. However, during the interview, some farmers expressed that their level of trust of these agrovets is relatively low due to their excessive commercial nature. Kabindra said, "Some of the agrovets will intentionally prescribe you the wrong solution for the first couple of times so that you are compelled to do multiple transactions with them, increasing their profits". Although the validity of this statement will require a separate investigation, other participants also showed a slight level of distrust. Since the agrovets were an integral part of the farmers' lives, the regulatory bodies from Ministry of Agriculture and Livestock Development (MOALD) must assess their operation and credibility to ensure their practices remain within ethical boundaries.

VI) Appropriate formats for effective communication

Punam struggles with finding the right source when looking on the Internet to help her with her farming. Most of this is caused by the way the information is presented because of the language barrier. She says she struggles with understanding English, and even with Nepali, she struggles with reading long documents. Jay Kumar also said that a more convenient method is required for farmers to fully engage with the

content they find online regarding their farming. They both suggested creating highly interactive and engaging video formats that would increase the possibility of the message getting communicated to the farmers.

A sensible approach would be to outsource this to third parties who are well-versed in this type of content creation to effectively convey the message to the farmers. The NGOs that can create these helpful videos can also undertake this task. Although many such videos can be found online on video-sharing platforms like YouTube, Kabindra says that the information in these videos is highly exaggerated and sometimes even misleading because they aim to increase viewer engagement rather than inform. Therefore, videos from credible sources can be highly productive and informational for the farmers.

5.5 Concluding Remarks

To sum up, this research report has found that mobile Internet is playing a vital role in expanding the capabilities of farmers in Nepal. Being a first study that applies the CA to study the impact of mobile internet on the Nepalese farmers, there were certainly many limitations that this study had to endure. However, in saying that, it is also one of the goals of this study to provide a foundation for further studies that can extend on the outcome and results of this study. It is facilitating the farmers in generating additional income, farming problem resolution, increasing their bargaining power with the local agrovets, introducing farmers to new and profitable crops and better connecting farmers to take collective action. There are undoubtedly multiple constraints that exist that undermine the full potential of this technology. Despite those constraints and limitations, farmers are utilising it to their best capacity to gain various benefits. If the state or NGOs address these obstacles, they can be mitigated or overcome to a certain degree. However, these bodies must provide more effort to cooperate with the farmers and apply the policy recommendations proposed in this research report. This research report can provide a preliminary insight for future research and actions as few studies have been identified that links the role mobile internet with capacity expansion of the Nepalese farmers.

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Annex 1: Questionnaire

1. Do you use internet on your mobile phone?
2. How long has it been since you started using it?
3. How easy do you find it to navigate through the internet on your phone?
4. What do you use it mostly for?
5. How and where do you get the information regarding farming whenever you need it?
6. Do you use internet on your phone to access information regarding farming?
7. If yes, can you please elaborate on the process, for example what websites do you use or what's the medium of information like, videos or texts?
8. How effective has that information been to you? Have you had any success with it, or did it fail to produce the desired results?
9. Do you find that the information you receive from the internet is credible?
10. What kind of challenges have you faced when trying to receive information on the internet regarding agriculture?
11. What changes would you suggest to better access information on the internet?
12. What was your method of choice before there was internet available for information access?
13. How do you think internet can be made more beneficial for the farmers?