



**Analytical Work to Develop a Gender Responsive
Conceptual Framework and Guidelines for the Efficient
Use of ICTs in Scaling-Up Initiative**

Submitted To

**Farm Radio Trust
Lilongwe, MALAWI**

**By
Felix Maulidi, PhD
Sekanawo Kasiya, PhD**

November 2019



Table of Contents

Table of Contents.....	i
List of acronyms.....	iv
EXECUTIVE SUMMARY	v
1.0 Introduction.....	1
1.1 ICT4Scale Research Approach and Gender Integration	2
1.1.1 Literature Review	2
1.1.2 Meta-Research of Existing/Past Scaling-Up Initiatives.....	2
1.1.3 Case Studies	3
1.1.4 Intervention Research.....	3
1.2 Soy Bean Inoculant Intervention.....	4
1.3. Study	4
1.4. Objectives	4
2.0 Methodology	5
2.1 Research design	5
2.2 Data Collection Methods	5
2.2.1 Focus Group Discussions.....	5
2.2.2 Key Informant Interviews.....	5
2.2.3 Sampling	5
2.2.4 Secondary Data Sources	6
2.3 Data analysis	6
3.0 Key Findings.....	7
3.1 Opportunities and Barriers for Different Gender Groups in Using ICTs to Access and Adopt Agriculture Solutions	7
3.2. Opportunities in Using ICTs to Access and Adopt Agriculture Solutions by Different Gender Groups.....	8
3.2.1 Access to ICTs	8

3.2.2	Farmers' willingness to pay for ICTs to access agricultural solutions because of the benefits	9
3.2.3	Gender Awareness	9
2.4	Trust in Messages Accessed Through ICTs	12
3.2.5	Quick Feedback.....	12
3.2.6	Message Sharing Behaviour	12
3.3	Hindrances in Using ICTs to Access and Adopt Agriculture Solutions by Different Gender Groups.....	13
3.3.1	Cost of ICTs.....	13
3.3.2	Lack of knowhow on use of ICTs -accessing cell phone messages, using radio..	13
3.3.3	Cultural Barriers	13
3.3.4	Lack of Interest.....	14
3.3.5	Content: Lack of demonstration and market information	15
3.3.6	High Illiteracy Levels	15
3.3.7	Inadequate ICT Infrastructure	15
	15
3.3.8	Inadequate supply of soybean inoculant due to increased demand.....	15
3.4	Gender Conceptual framework for ICT-for-scale initiatives.....	16
3.5	Gender Analysis of the Type of Technology to be Promoted Using ICT	17
3.5.1	Access and Control of Resources.....	17
3.5.2	Address of the practical and strategic needs of different gender groups	17
3.5.3	Gender division of labour	17
3.5.4	Level of Participation.....	17
3.5.5	Impact of the project on men and women	18
3.6	Gender analysis at institutional, social and political level in the provision of agriculture solutions.....	18
4.0	Conclusion.....	19
5.0	Lessons Learned and Key Takeaways.....	21

References 1

List of Tables

Table 1: Sample of Respondents **Error! Bookmark not defined.**
Table 2: Opportunities and Barriers for Different Gender Groups in Using ICTs to Access and Adopt Agriculture Solutions..... 7
Table 3: Ownership of Phones and Radios among Research Participants..... 11
Table 4: Gender Analysis for FRT..... 18

List of Figures

Figure 1: Gender Equality Continuum (Source: IDRC, 2017) 3
Figure 2: Men and women working together in the field, Mkanda EPA..... 10
Figure 3: Conceptual Framework on Transformative Pathways for adoption of Gender and ICTs for different Gender Groups 16

List of acronyms

FRI	Farm Radio International
FRT	Farm Radio Trust
ICT4Scale	Harnessing ICT to Scale-up Agricultural Solutions
ICTs	Information and Communication Technologies
EAS	Extension advisory services
FGD	Focus Group Discussion
KII	Key Informant Interview
DARS	Department of Agricultural Research Services
DAES	Department of Agricultural Extension Services
ZBS	Zodiac Broadcasting Station
ISL	Input Supply Limited

EXECUTIVE SUMMARY

Farm Radio Trust (FRT)'s aims to promote the dissemination of information for sustainable livelihoods of farmers through innovative agriculture extension and advisory service (EAS) delivery using radio enhanced by Information and Communication Technologies (ICTs).

However, there are challenges in the uptake of innovative ICTs, particularly among rural women. Thus, scaling up ICTs in agriculture can exacerbate existing gender inequalities and poverty.

In collaboration with Farm Radio International (FRI), FRT is implementing a research project "Harnessing ICT to Scale-up Agricultural Solutions" (ICT4Scale) which aims to examine the roles and contributions of ICT in scaling agriculture solutions for food, nutrition and income security, with a focus on sub-Saharan Africa. Mix research methods was used, which include a literature review, a meta-research, an intervention research and case studies. Field trials will test, refine and validate early findings of the meta research, literature review and the case studies for the intervention research. This study aims to develop a gender strategy for the ICT4scale research project. The project mainly focuses on the intervention research component of the project and review of the current ICT platforms used to provide extension service. Findings from the meta-research and case studies were used to inform the literature review. One of the major outcomes of the study is the gender-responsive conceptual framework and guidelines for the efficient use of ICTs in scaling-up initiatives.

The specific objectives of the study are:

- a) To identify barriers and opportunities for different gender groups in using ICTs to access and adopt agriculture solutions.
- b) To develop a gender theoretical framework for ICT-for-scale initiatives.
- c) To conduct an analysis of gender and type of technology to be promoted using ICTs such agronomic practices, access to markets, etc.
- d) To conduct gender analysis at institutional, social and political level in the provision of agriculture solutions.

The study reaffirms that women have less access to ICTs and consequently information for agriculture solutions. While 91% of the male farmers had a mobile phone, only 48% of the female farmers had a mobile phone. There was not much gender difference regarding radio access - 46% of male respondents had access to radio equipment compared to 44% of the female farmers. Furthermore, men and women accessed radio the most for the various reasons: mobile phones were also used for accessing the radio; radio instruments were usually left at home, which allowed women to access it upon returning from the fields; and since both men and women listened to the same agriculture information through the increase chances of adoption. Mobile phones also provided quick feedback through SMS, call centre and direct contact with the extension workers. In order to improve access to ICTs, strategies proposed include provision of loans for purchasing low cost smartphones, subsidising phone prices, and increasing number of FRT radios issued and providing one smartphone to each farmer's radio listening clubs.

The study finds increased gender awareness in the study area. Men and women reported to have been involved in productive and reproductive work. However, women agency was limited as most women could not make decisions on the use of revenue from soybean, which affected their decision to purchase ICTs. Other factors identified that limited women agency included limited mobility, high illiteracy levels and cultural barriers. The study recommends

gender trainings for both men and women, radio and video programmes and addressing the root causes of gender inequality to promote women empowerment.

Other challenges also included lack of expertise in using ICTs, demonstration and marketing content, and illiteracy. The study also recommends training on use of ICTs for agricultural solution by the extension agents and promoting adult literacy education. The study further recommends increased demonstration through video extension and increase in marketing information on the crops promoted.

The opportunities to use ICTs to access and adopt agriculture solutions were farmers' access to ICTs, willingness to pay for the ICTs to access agricultural solutions, quick feedback, gender awareness, trust in agricultural messages accessed through ICTs and the message sharing behaviour among the farmers. The hindrances were cost of ICTs, lack of knowhow on use of ICTs, cultural and gender barriers, illiteracy, ICT infrastructure, inadequate supply of soybean inoculant due to increased demand and lack of interest.

The conceptual framework illustrates the transformative pathways that enable African women, and different gender groups in the rural areas to take advantage of the ICTs for innovative agriculture. Access to these ICTs enhances skills, knowledge and confidence of different gender groups to access to credit, markets and women empowerment, which results in increased income and sustainable livelihoods.

The gender analysis on the Soybean Inoculant campaign found men and women accessed radio most; men listened to the radio using their phones on a regular basis, and radio instruments were usually left at home hence accessible to women who were usually at home after returning from the fields; husbands and wives listened to agriculture information together, which increased chances of adoption. Radio listening clubs allowed men and women to learn together, debate and discuss agriculture solutions.

The study also conducted a gender analysis for FRT. The organisation promoted gender equality through its staff recruitment, training, leadership and management. The implementation of the Soybean Inoculant Campaign also engaged personnel, including interns based on the expertise of the workers. However, gender equality can be further advance through legal frameworks such as Gender Policy and Sexual Harassment Policy to ensure equality and human rights.

1.0 Introduction

In lower income countries like Malawi, women have limited access to land, productive resources, income from land, education, financial services, information and the ability to share and learn knowledge, despite being producers of most crops. This is likely to empower them to make better choices for themselves and their families. Key drivers of social and economic transformation are access to information and knowledge creation. In agriculture, new information and knowledge fuel innovation and increase productivity and competitiveness.

The ability of farmers to participate in and benefit from growth in the sector is linked to their ability to adopt new practices, solve problems and embed themselves dynamically in agricultural value chains (Okello, 2019). Male and female farmers need to be connected to the communication channels of the appropriate flow of information. Farmers currently access information through a complex web of social networks that include other farmers, family members, extension agents and input supply dealers. However, these networks lack the type of information that can help many farmers move into more productive strategies (Okello, 2019). Closing the gap in women's access to a range of technologies can allow them have more time spent on productive activities thereby improving their agricultural productivity and market returns.

Information Communication Technology (ICT) can help close this gap with the necessary technologies that meet the priority needs of female farmers if women are aware of their usefulness, and have the means to acquire them. The explosion of new ICTs in the agricultural development scene offers an opportunity to extend the reach of current information systems. ICTs can amplify the efforts of Extension Advisory Service (EAS) providers in disseminating information to large, dispersed audiences. ICTs offer the opportunity for rapid and cost-effective dissemination of agricultural information to remote locations and diverse populations. ICTs can deliver near real-time information on weather, market prices, disease and pest outbreaks, and the availability of services, allowing farmers to make informed decisions. Content can be delivered in audio, visual and written formats to reach farmers with varying levels of education and literacy. In addition, ICTs can overcome gender-specific barriers that limit women farmers' access to information, which will improve farming practices and close gender gaps in yields and productivity.

Despite ICTs demonstrating potential to enhance household food and nutrition security and contribute to rural development, there are challenges in uptake especially among rural women. Scaling up ICTs in agriculture can exacerbate existing gender inequalities and poverty. By assessing the differences in how men and women farmers currently access information may provide insight into how ICTs can be used to deliver agricultural messages more efficiently.

The study presents the mirror image of the triple divide: digital divide, rural divide and gender divide. The digital divide refers to the gap between demographics and regions that have, do not have, or have restricted access to modern ICTs. The rural divide refers to the gap between urban and rural areas in accessing ICTs. The gender divide refers to the differences between women and men in accessing ICTs, resulting in rural women being relegated to the most disadvantaged position.

In collaboration with Farm Radio International (FRI), Farm Radio Trust (FRT) is implementing a 3-year International Development Research Centre (IDRC)-funded research project on Harnessing ICTs in Scaling up Agricultural Solutions (ICT4Scale), which aims to examine the roles and contributions of ICTs in scaling agriculture solutions for food, nutrition and income

security, with a focus on sub-Saharan Africa. The research project consists of a literature review, a meta research, case studies and an intervention research respectively.

1.1 ICT4Scale Research Approach and Gender Integration

Across all these project objectives and research activities, gender was integrated in order to contribute to global discussion and interventions on gender, ICTs and scaling up. The project applied mixed research methods and activities concurrently to address the following questions:

- What combinations of ICTs, actors and institutional arrangements are most effective and efficient in scaling agricultural solutions?
- What strategies for the use of ICT are successful in facilitating the scaling of agricultural solutions, e.g. interaction with audiences, type and quality assurance of information and content?
- What are the gender equality considerations of ICT-enabled scaling of agricultural solutions?
- What barriers may limit the reach and/or effectiveness of ICTs in scaling initiatives?

In this report, we aim to answer the following question: “What are the gender equality considerations of ICT-enabled scaling of agricultural solutions?” Findings from the four components of the ICT4Scale project: literature review, a meta research, case studies and intervention research, informed the study.

1.1.1 Literature Review

A review and synthesis of academic and grey literature on scaling concepts, gender dynamics and recent advances on scaling solutions using ICTs was carried out to contribute to the development of a conceptual framework to guide the implementation of research activities. The research analysed gender issues to be considered when using ICTs to scale up agricultural solutions. The research developed a list of good practices and pathways as enablers in using ICTs to scale up agricultural solutions. In addition, indicators that could be used as a criterion for assessing the effectiveness of different combinations of ICTs in scaling up were developed.

1.1.2 Meta-Research of Existing/Past Scaling-Up Initiatives

The meta-research assessed a series of existing ICTs that enhanced scaling-up initiatives implemented worldwide through project document analysis, interviews, and surveys. The project will include environmental sustainability considerations in meta-research. The key research question was “What (ICT-based) scaling up strategies work in ensuring widespread adoption amongst women and men smallholder farmers?”

According to IDRC (2017) the meta-research aims to have a key output of a refined gender-responsive model for scaling up agricultural solutions using ICTs, which include gender sensitive practices and pathways to scale up agricultural solutions. The meta-research was also interested in analysing gender exploitative, accommodative, and transformative pathways that would empower women to take advantage of ‘women-only’ opportunities focused on ICT4Ag project on scaling up. IDRC and FRI developed a checklist to assess the gender sensitivity of the project.

Figure 1 offers insights within the project on the extents to which ICT4Scale projects were gender exploitative, accommodating or transformative.

The Gender Equality Continuum

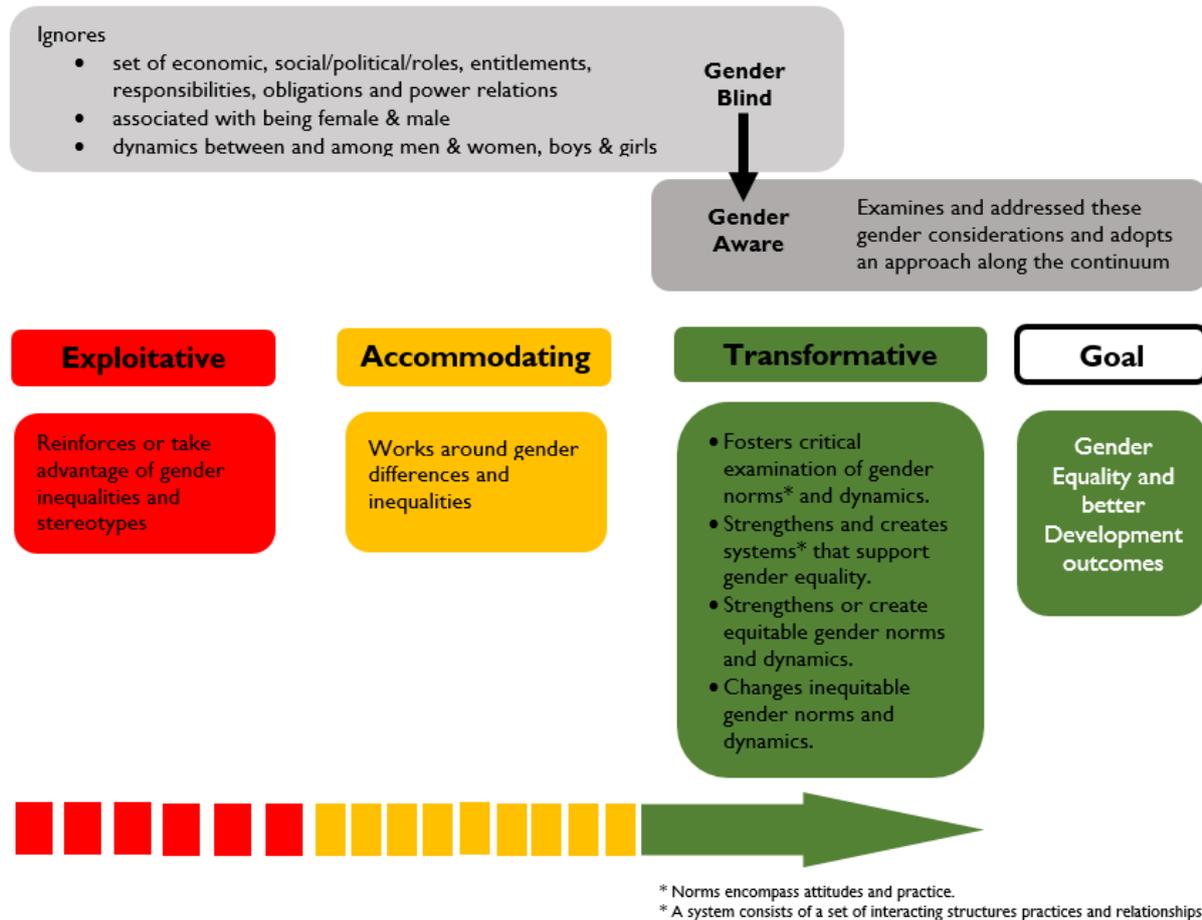


Figure 1: Gender Equality Continuum (Source: IDRC, 2017)

1.1.3 Case Studies

Case studies examined the impact and functioning of a limited number of scaling-up initiatives implemented in sub-Saharan Africa in greater depth, which incorporated a distinct ICT component. The project also considered projects that were scaling up environmentally sustainable solutions. The project used Focus Group Discussions (FGDs), Key Informant Interviews (KIIs), and/or user surveys as well as review of ICT-channelled messages, strategies, and usage to collect data.

To ensure that the research considered the role of women and ICTs in agriculture, gender related questions was included in the research tools administered and at least 50% of the interview participants in the case studies were women (IDRC, 2017). Similar to the meta-research, the extent to which the gender approaches were ‘transformative’ was assessed.

1.1.4 Intervention Research

The intervention research involved implementation and testing of ICT4Scale models within existing initiatives by adding specific, discrete ICT interventions for testing and comparison, and/or other evaluation tools. The project used existing initiatives because the scope and duration of the proposed project did not permit the implementation of ‘stand-alone’ scaling-up initiatives.

The gender integration strategy for the intervention is as follow:

- Conduct a gender analysis before conducting an intervention research

- Integrate gender pathways and good practices into existing ICT project
- Develop criteria for establishing effectiveness of the gender component
- Ensure at least 50% of respondents interviewed are women
- Integrate gender-related questions on ICTs and agricultural solutions in research tools

1.2 Soy Bean Inoculant Intervention

The intervention research was implemented to test, refine and validate early findings, of the meta research, literature review and the case studies to assess ICT strategies that are most effective and efficient in scaling agricultural solutions. Farm Radio Trust Malawi implemented the intervention research where specific and discrete ICT interventions were tested and compared in the promotion of soybean inoculation. The intervention research aimed to determine improvement in the scale up of soybean inoculation; the role of the ICT tools in the scale up; the relative role of the different ICT tools used for supporting the scale up; the role of institutions supporting soybean inoculation in the scale up; and the impact of inoculation on soybean yield.

A Participatory Radio Campaign (PRC) was adopted for the promotion of soybean inoculant. The PRC was enhanced by SMS push and pull platforms and the farmer call centre also known as the Mlimi hotline. Interactions with farmers in the implementation of the intervention research was done in three Extension Planning Areas (EPAs): Kalulu, Mkanda and Chioshya in Mchinji district. The radio programs were aired from 6 November 2018 to 22 June 2019 on ‘Mudzi Wathu’ community radio station in Mchinji.

The campaign aimed to raise awareness of the use of inoculant among legume farmers to improve production. Key campaign messages were on definition and description of inoculant, its benefits, access, availability, utilisation, storage, and farmer experiences of the technology. Different ICTs (radio programs, SMS push messages, call centre, beep calls and ICT hubs) were deployed using the Mudzi Wathu Community Radio campaign.

1.3. Study

This study aims to develop a gender strategy with a focus on the intervention research and a review of current ICT platforms used to provide extension service. The study also aims at establishing transformative pathways (including ICT platforms) that would empower women to use available opportunities, particularly innovative agriculture solutions using lessons learnt from intervention research, meta research, and case studies.

1.4. Objectives

The main objective is to conduct a gender analysis to understand how gender dynamics influence and are influenced by scaling up initiatives and develop a gender responsive conceptual framework and guidelines to efficiently use ICTs in scaling up initiatives. The specific objectives are:

- 1) To identify barriers and opportunities for different gender groups in using ICTs to access and adopt agriculture solutions
- 2) To develop a gender theoretical framework for ICT-for-scale initiatives
- 3) To conduct an analysis of gender and type of technology to be promoted using ICTs
- 4) To conduct gender analysis at institutional, social and political level in the provision of agriculture solutions.

2.0 Methodology

This section highlights how the study was conducted, including research design, sampling technique, data collection, analysis and research ethics.

2.1 Research design

A qualitative approach was used to understand the differences in asset ownership, access and use with regards to ICTs through in-depth interviews and discussions with respondents. According to Maynard & Purvis (1994), when conducting a study with a gender dimension or about women, the study should try to create a mixed gender group. As such, the study included women in female-headed households and male-headed households to ensure an equal balance of both sexes to better understand women's experience in a "male" dominated structure.

Participants that participated in the intervention research of the ICT4Scale in Mchinji district were selected using purposive sampling method. The study also involved other FRT's stakeholders involved in the intervention research.

2.2 Data Collection Methods

Data was collected through FGDs, KII and documents reviews.

2.2.1 Focus Group Discussions

The FGDs involved men and women in Mchinji who participated in the intervention research using various ICTs including radio, SMS, WhatsApp and call centre to access farming information about Soybean Inoculant.

Six FGDs were conducted. Each group had 4-6 participants. There were two groups for women only, two for men only, two for boys only and two for girls only. The FGDs allowed different views, experiences, or perceptions of group members to be expressed, discussed, and understood in a group context. According to Morgan & Kruger (1997), FGDs give rise to a synergy of ideas and generation of theories that may rise from social interactions. Behrman et al. (2014) argues that separating women, men, boys and girls allow the participants to share their thoughts and opinions freely without external pressure, which aligned with the observations during the actual data collection process. The study ensured that male interviewers interviewed male participants and female interviewers engaged with female participants.

2.2.2 Key Informant Interviews

Ten (10) KIIs aimed to gain an in-depth understanding of the gender dynamics in using ICTs for scaling agriculture solutions and gender dynamics at FRT institution were also done.

KII participants included:

- Personnel from Mudzi Wathu Community Radio Station
- Opinion leaders in farmer clubs
- FRT staff who interacted with farmers through the toll free call centre and radio
- FRT staff who worked in the programmes' office
- Current and former FRT staff
- Stakeholders from DARS and Department of Agricultural Extension Services (DAES) in the Ministry of Agriculture

2.2.3 Sampling

Table I: Sample of Respondents

Type of Respondents	Area/Organisation	No	Data Collection Approach
Farmers (men, women and youths)	Mchinji - Kalulu EPA	18	4 FGDs comprising 4-6 respondents
Farmers (men, women and youths)	Mchinji - Chioshya EPA	16	4 FGDs comprising 4-6 respondents
Farmers (men, women and youths)	Mchinji - Mkanda EPA	20	4 FGDs comprising 4-6 respondents
Extension workers	Chioshya, Kalulu, Mkanda	3	KII
Opinion leaders in radio listening clubs	Mudzi Wathu Community Radio Station (Mchinji)	3	KII
FRT personnel	FRT - Lilongwe	4	KII
Total number of respondents		64	

2.2.4 Secondary Data Sources

The study used secondary data sources to strengthen primary data, which included a review of the project documents and radio programme's content. Reports from the meta research and case studies were also reviewed for useful information. A matrix was developed to conduct a SWOT analysis for the project cycle.

2.3 Data analysis

Digital recording devices were used to record the interviews to ensure there will be no misunderstanding. To produce meaningful and useful results, the content was analysed in a clear and systematic way. In this study, a thematic analysis was applied to enable the researchers to make sense of the data in terms of participants' definitions of the situation, and identifying patterns, themes, categories and regularities. The analysis involved reading each interview transcript multiple times and noting interesting and significant issues, similarities and differences, and amplifications and contradictions of participants' accounts to gain a thorough understanding of the participant's accounts. This led to meaningful classification of the data into manageable segments, which was achieved by coding.

The second major step involved examining the coded text segments to further understand the participants' accounts. Comments in form of summaries and interpretations were still being noted at this stage followed by transforming these notes into themes. The themes were refined to avoid any repetitions while remaining broad enough to encompass a set of ideas contained in the subsequent transcripts. In this way, the data was further reduced to produce more manageable set of significant themes summarising the texts. Emerging issues from the study were linked to the objectives of the study.

Figure 2: Mapping Methodology and Report Writing Process



3.0 Key Findings

The findings were based on the major four areas of the study.

3.1 Opportunities and Barriers for Different Gender Groups in Using ICTs to Access and Adopt Agriculture Solutions

The first objective involved identifying opportunities and hindrances for different gender groups in using ICTs to access and adopt agricultural solutions. The analysis was based on the meta-research, case studies and intervention research. The methods were used concurrently (IDRC, 2018), across all research activities, gender was integrated in order to contribute to a global discussion on a gender strategy for ICT4Scale.

Table 2 shows the opportunities and hindrances in using ICTs to access and adopt agricultural solutions among different gender groups. Sections 3.2 and 3.3 discuss this further.

Table 2: Opportunities and Barriers for Different Gender Groups in Using ICTs to Access and Adopt Agriculture Solutions

Opportunities	Hindrances
<ul style="list-style-type: none"> • Access to ICTs • Farmers willingness to pay for ICTs to access agricultural solutions because of the benefits • Quick feedback • Language • Trust in messages accessed through ICTs • Message sharing behaviour • Gender awareness 	<ul style="list-style-type: none"> • Cost of using ICTs - phone, radio, credit/airtime and cell phone charging • Higher levels of technological and language illiteracy which limit the effectiveness of certain ICTs • Norms that discourage women and girls from using technology (Cultural and gender barriers) • Lack of control over and ownership of technology • Inadequate supply of soybean inoculant due to increased demand • As assumption of ICTs to be gender neutral, that men and women have the same ability to access, use, and control ICTs • Mere lack of interest in anything technological among women • Timing of farm radio programmes broadcasting • Failure to package the content in a format that meets the different information needs and preferences of different user groups • Treatment of farmers as an undifferentiated group of beneficiaries, with the same needs and the same opportunities • Few extension workers • Access to basic phones which have no internet opportunities

3.2. Opportunities in Using ICTs to Access and Adopt Agriculture Solutions by Different Gender Groups

3.2.1 Access to ICTs

The study found that the most common ICTs used by the research participants in scaling up of soybean inoculant were mobile phones and radio.

Most participants owned mobile phones (67%) than radios (44%) but participants were able to access the radio through their mobile phones, which they listened to every day. This was confirmed by their knowledge of current events at the time of the study. This is consistent with the NSO (2019), which puts national statistics for mobile phone ownership at 51.7% and radio at 33.6%. Although most participants owned phones rather than radio, radio was the most used ICT because it could also be accessed through the mobile phones. Hudson et al. (2017) and Gebru et al. (2018) also reaffirm that radio remains the most widely used and trusted channel of communication among rural populations across sub-Saharan Africa, with an estimate of more than 800 million radio ownership in the region.

Phones were used for calling and SMS messaging, and as a radio. Most participants used the free FRT call centre, which provided instant feedback to the farmers' questions. Farmers could call or send an SMS to the call centre (8111 for Airtel and 711 for TNM). Farmers indicated that feedback was received within a day through SMS. Participants also used phones to call the extension workers to request for information on soybean production and other agricultural related information. In some cases, farmers called or texted extension workers in their area to be reminded of the call center numbers (8111 and 7111) for free advisories. Some of the participants indicated to have received messages on agricultural commodity prices from other organisations.

Apart from Mudzi Wathu radio, which was the station for promoting the intervention research soybean inoculant in Mchinji, participants indicated to have listened to other programs on inoculant from Malawi Broadcasting Cooperation Radio Station One (MBC I) and Zodiac Broadcasting Station (ZBS). Different radio programs on soybean inoculant that farmers accessed on Mudzi Wathu radio, ZBS and MBC included: NASFAM – 'Ulimi ndi Bizinesi'; 'Mchikumbwe', 'Ulimi wa Lero', 'Ulimi Wamakono', 'Tipindule ndi Ulimi wa Mtedza ndi Soya', and 'Tipundile ndi Inoculant' (the intervention research soybean program).

Some farmers could use the beep on the radio or flash on their phones to indicate that they were listening to the participatory radio programs on inoculant. Farmers enjoyed listening to the experiences of other farmers and participate in quizzes where they could win FRT prizes. The repetition of radio programmes on soybean inoculant on these radio stations increased access of information or both men and women on the agricultural solution.

Participants argued that they usually accessed agricultural information through ICTs because extension workers take time to visit them as they are allocated several villages to visit. Additionally, there was no conflict on the soybean advice obtained through ICTs and from extension workers. Farmers were able to achieve higher yields by following modern soybean farming methods through various ICTs.

Opportunity: Access to ICTs

- a) Farmers have access to phones and radios
- b) Use phones to call to the call centre, SMS and to call the extension worker
- c) Call centre and SMS provided quick feedback
- d) Though most participants owned phones than radio, radio was most used

3.2.2 Farmers' willingness to pay for ICTs to access agricultural solutions because of the benefits

Farmers are aware of the benefits of following modern agriculture solutions and they are willing to pay to use ICTs in order to access agricultural information. During the inoculant campaign, SMS and call centre were free, but both men and women farmers also called or sent messages to the extension workers directly. The extension workers from Kalulu and Chioshya EPAs reported that men were calling more than women during the inoculant campaign, but the difference was small. The extension workers for Mkanda reported that there was no significant difference between the men and women who called to inquire about inoculant. This means that both men and women were willing to pay to access agricultural related information.

An extension worker in Kalulu indicated that slightly more men than women farmers were calling him and sending regular messages since the introduction of the soybean inoculant campaign. One female lead farmer from Mkanda explained:

In the past, we used to hear on radio that farmers were making profits in soybeans. We could not understand as we were growing the same soybeans but we were not progressing. But now, through SMS, call centre, and calling the extension worker directly, we have learnt and observed that if you plant soya using inoculant, you get healthy bush very fast, with too many branches and smooth seed that is on demand at the market. In the past, when we were not using inoculant, we used to produce scorched seed that was spotty and very difficult to market. With inoculant you get more than double harvest; imagine this is my second year planting soybeans using inoculant yet my husband and I, together we have been able to build two houses with burnt bricks. Now we look forward to removing that grass thatched roof, replacing it with iron sheets after we sell our soya. Now we save so that we should be able to apply inoculant in all the fields that we plant”
(Female FGD participant, Mkanda).

The extension workers and farmers also reported that during the intervention research activities, farmers would buy airtime and call extension workers directly to ask for information related to inoculant and soybean production. Both men and women farmers called to ask about the following information on soybeans: procedure in using inoculant, planting methods, diseases and pests control, determining maturity, harvesting, storage and marketing. Farmers also used phones get advice on other new farming methods and livestock production.

Furthermore, male participants in Mkanda, Chioshya and Kalulu proposed provision of loans for purchase of mobile phones with internet, so they could access WhatsApp to effectively and efficiently access information on agriculture solutions. While male farmers mentioned smart phones or phones with access to internet, women just mentioned regular phones without any specifications. Nonetheless, this is contrary to the usual culture where rural people in Malawi expect handouts for development related activities.

3.2.3 Gender Awareness

Women and men had clear understanding of gender. A majority of men and women participants indicated that communities were becoming gender sensitive and allowed women to access ICTs and participate in soybean production. There were other cases where change was temporally - after receiving training, some were still gender insensitive.

Gender was understood as “doing things together, both men and women,” “women and men work together without choosing that this job is for a man or for a woman” or “a woman doing man’s job and man doing woman job.” Majority of the participants reported that their families were now more gender sensitive, and women had access to phones and radios. They could send SMS messages to and call the call centre. Women were allowed to participate in development meetings and all stages of soybean production. In the past, women participated more in production while men dominated in marketing. For example, in Mkanda, women and men participated in building shade for soybeans, a role normally deemed for men. Men also participated in activities that were mostly done by women like harvesting, threshing, cleaning homes, cooking, and cutting firewood. Women also participated in marketing. A wife could negotiate the price for soybeans in a market, and inform the husband of the deal without any problems.



Figure 2: Men and women working together in the field, Mkanda EPA

Due to collaboration, the workload was reduced for each person, farming and household work was completed quicker, and there were less quarrels among family members. Farming decisions were discussed unlike before when men were key decision makers. By working together, there was a sense of unity and a learning environment fostered.

Another woman narrated,

In the past, women used to do all household chores - it was like thangata (slavery). We would go to farm and work together, but when coming back, woman would carry firewood on their head, child on the back, carry hoes while man was just walking. When we got home, we would again go to draw water, make fire, prepare water for bath and cook while the man was just sitting on a chair. Life was so heavy on woman and gender has enlightened woman’s life. With gender awareness, husbands treat us as human beings and they now understand that we also get tired (FGD Chioshya).

Gender insensitive practices were more prevalent among families where the husbands drank beer. While men would access phones and radios, the wives could not, to an extent that the husbands moved with the radios. The study also found that 91% of the men had mobile phones while only 48% of the women had mobile phones, which suggests that some extent inequalities

still exist. Findings report that in gender insensitive families, men refused to share the proceeds from the sale of harvested soybeans although the woman took an active role in growing the crop. It was also reported that husband and wife would sit together to decide on how to use the money, but the men would predominantly use the money.

Table 3: Ownership of Phones and Radios among Research Participants

T/A	Village	Radio		Phone	
		Men	Women	Men	Women
Chioshya	Kamange	5/5	6/11	3/5	8/11
Mkanda	Masumbu	5/5	2/5	3/5	1/5
	Manthalu	4/4	1/5	0/4	1/5
Kalulu	Kadammanja	3/4	1/4	4/4	1/4
	Chitunda	4/5	4/4	2/5	1/4
Total		21/23 (91%)	14/29 (48%)	11/23 (46%)	12/29 (41%)

The FGDs in all the sections and with the three extension workers found that that the gender trainings had a short-term impact on some farmers. The extension worker from Kalulu and Chioshya observed that farmers in cooperatives and other development related groups were more consistent in their gender equality practices since these participants received constant trainings, critiques from the group and the gains realised in sharing reproductive, productive and community work.

Study participants provided various reasons for the failure to comply with gender practices. Women reported that men sometimes felt disrespected when they learn that their wives told others that their husbands participated in stereotypically female tasks like cooking and bathing their children. As a result, they began to refuse to participate in reproductive work. During the FGDs, the men reported that sometimes women wanted to act as the head of the family in the name of gender, which caused problems.

Gender trainings were being conducted by different organisations including FRT under Feed the Future Agricultural Diversification project. The gender trainings employed gender integration approaches for men and women, which included forming clubs and groups with equal numbers of men and women; encouraging men and women to participation through radio and mobile phone; and involving female lead farmers to teach other farmers on gender and agriculture. If a community did not attend the training, they were still able to listen to radio debates on gender, which helped them learn about different stereotypes and how to participate in different roles. These transformative approaches (see **Figure 1**) adopted for the project helped promote gender equality as the gender integration strategy promoted women participation on radio, and empowered female lead farmers in the villages by engaging them in the Soybean Inoculant Campaign. The gains in the gender training which focussed on Caroline Moser's Triple role gender analysis framework (Moser, 1993) were also conspicuous as women participated in productive roles (e.g. cutting and tying poles and marketing), community roles (i.e. a majority of the female participants were lead farmers or members of development group), and reproductive work. Men participated in productive role like threshing, which was stereotypically for women, and reproductive roles.

2.4 Trust in Messages Accessed Through ICTs

Another potential in harnessing ICTs for agricultural solutions is the farmers' belief and trust of the agricultural and climate related message received through the radio, SMS and the call centre. All EPAs found that none of the messages contradicted with what they received from the extension. All male and female participants agreed that the SMS and radio messages about weather (e.g. rainfall predictions, dry spells, flush floods and strong winds) were usually accurate, which helped promote trust among the information accessed through ICTs.

*We get lots of informative information through the radio. In fact, sometime we do plan guided by the information we get from the radio. For instance, last farming season most of us knew that rainfall would start earlier and would also stop earlier. For that reason, decisions were made as to which crop would do well. We chose soya and indeed we harvested well, **Male Farmer Kalulu EPA.***

However, most farmers still check with extension workers or lead farmers to validate the messages since most participants frequently received text messages claiming they won a prize or needed to collect cash prizes for a competition they never entered. No messages from fraudsters were related to agriculture but farmers still verified their messages to be certain. In some rural parts of East Africa, there is a mistrust in information received through text messages from unknown sources, due to the high volume of spam from fraudsters who send bulk SMSs to promote products or offer lottery wins but swindle money from farmers (Geburu et al., 2018). Mchinji, farmers had no doubts in the authenticity of the agricultural related messages. They further argued that demonstration plots and field days where innovations were modelled helped farmers adopt agricultural innovations. Therefore, extension services are critical for the adoption of using ICTs for agricultural solutions.

3.2.5 Quick Feedback

Participants argued that ICTs provided quick feedback when using call centre and SMS or even calling extension worker directly. Interactive radio programmes where farmers participated by calling on Mudzi Wathu radio FRT radio programmes increased farmer's participation as they obtained feedback quickly by asking questions directly. However, more men called in than women. More women participated when the programme incorporated the voices of women.

Farmers were able to access commodity prices of soybean from different districts through SMS. Both men and women indicated that ICTs were important to them because it took months for extension workers to visit them since they were too few - the current ratio of government extension workers to farmers is 1:3,000 against the recommended ratio of 1:500 (GoM, 2011).

3.2.6 Message Sharing Behaviour

Men and women shared agricultural information obtained through radio or phones (SMS/call) rapidly in Mchinji district, which is important in scaling up the use of ICTs for agriculture innovations. Even those who do not own mobile phones or radios were able to follow agricultural developments by chatting with those with access to ICTs. Apart from interacting with other villagers, participants also reported that ICTs were a source of prestige and hence the reason why messages were shared rapidly.

3.3 Hindrances in Using ICTs to Access and Adopt Agriculture Solutions by Different Gender Groups

3.3.1 Cost of ICTs

Most men, women and youth could not afford the cost of phone, radio, airtime and cell phone charging. None of the farmers that participated in the study had smart phones. However, the extension worker indicated that there was one female and eight male farmers in the Bwalo la Alimi WhatsApp group, and the numbers are increasing. As shown in Table 3, only 48% of women owned mobile phones while 91% of men had mobile phones. There was not much difference on ownership of radios among men (46%) and women (41%) participants. There were fewer radios than phones, which explains fewer radio listening clubs in the EPAs studied. Thus, ICTs were not available or not accessible to the farmers due to cost, which to some extent affected access to information on agricultural solutions.

Scaling up Radio and ICTs in Enhancing Extension Delivery SRIEED, a partnership between FRT, Malawi Ministry of Agriculture and Food Security (DAES, DARS), Lilongwe University of Agriculture and Natural Resources, radio broadcasters, and mobile network operators, piloted provision of smart phones to farmers and this resulted in increased adoption of agricultural practices from 33% to 82% (FRT, FRI, 2019a).

Participants suggested that access to smartphones can increase adoption of modern farming methods because of the picture and video facilities. Farmers proposed strategies to increased access to modern ICTs were to provide farmers with access to loans to purchase phones, subsidise phone prices, issue more FRT radios to and one smartphone to each to the farmer's radio listening clubs.

3.3.2 Lack of knowhow on use of ICTs -accessing cell phone messages, using radio

Some women and men lacked knowledge on use of phones, particularly use of SMS. Most women also argued that they did not know how to tune the radio and relied on men and children to listen to the radio. Extension worker for Kalulu also agreed on the lack of knowhow on use of ICTs among farmers, particularly in accessing agriculture or development related information. He reported that most men and youth used phones to listen to music all day and that the youth also used their phones to listen to and watch music videos, watch movies and pornography. The misuse of ICTs was a major concern in all the study areas. Extension workers and farmers attributed this lack of knowhow and misuse of ICTs to illiteracy; lack interest and confidence, particularly among women, and lack of training. They recommended civic education on how to use the phones for agriculture and development for both men and women.

3.3.3 Cultural Barriers

Despite communities becoming more gender sensitive, there was a low ownership and access to ICTs among women. Women and men reported that men naturally had priority for phone ownership because men moved often to accomplish errands, or communicate with outsiders (e.g. find a market for farm produce). Men in FGDs also added that since they were more mobile than women, they need to communicate their whereabouts. Women added that men were more likely to own phones like they owned everything in the household due to their authority, and men were key decision makers on finances including the purchase of ICTs.

Since men moved with radios, radios were more inaccessible to women. Women argued that gender equality would be successful only if women respected their husbands and marriage values. Therefore, if the man is the head of the household, then priority to phone ownership

should go to him. The study also found that in cases where women had phones, they could not access messages because they had no interest in exploring the phones or they may not be literate. Most women argued that they did not know how to tune the radio and that they were always busy to find time to listen to the radio. Furthermore, during the interviews at Mkanda, it was reported that there were occasional agricultural video shows by different organisation. Women did not attend the video shows due to lack of interest unlike men.

3.3.4 Limited Women empowerment

Failure to make decisions on household revenue generated from soybeans due to lack of empowerment hinders women's access to ICTs. It was reported that women were good at keeping the soybean proceeds for household use, but not at making decisions on how to use the money. It was reported that men dominated the use of the money generated from soy bean farming. During the FGDs at Kalulu, men provided various reasons for women's lack of agency in using financial resources:

Women are not wise in deciding on how to use money, and when they have money, they buy useless things. Instead of buying household necessities, they buy Kwasakwasa or Chitenje (wrappers), shoes, hair chemicals and other items that are not immediate needs, while us men we make sure we focus on the household needs such as paying school fees, uniforms, fertiliser, seed, soap, sugar, Vaseline etc. ...women do not know where to get these items and as they go around they end up buying useless things.

This finding suggests that women are able to access information, participate in the production and marketing of soybean, but empowerment was not effected as there was a lack of women agency on the use of the financial resources generated. According to Grown et al. (2005:33-34), "empowerment implies that women must not only have equal capabilities and equal access to resources and opportunities (access to ICTs, agricultural solutions), but also the agency to use these rights, capabilities, resources and opportunities for strategic choices and decisions (choice to purchase ICTs from soybean revenue)." The lack of agency here can be attributed to factors such as access to ICTs, mobility, illiteracy and cultural barriers. FAO (2018) also suggests other agency determining factors such as access to land, education and access to financial services and information. These are also some of the root causes to women's subordinate status, and Fonjong (2001) argues that more measures are needed to tackle the root causes of gender inequalities and remove barriers hampering women's empowerment.

3.3.4 Lack of Interest

There was a lack of interest by different gender groups in learning how to use ICTs, listening to agriculture radio programmes and learning more about agriculture itself. Both men and women FGDs reported that women lacked interest in operating ICTs (e.g. radio and phones) as they only used the phone for calling.

Men were more interested in listening to football match, music, and news than agricultural radio programmes as they argued that the programmes lacked seriousness and were meant for women. Men also argued that the timing for the agriculture radio programmes did not work out because most men did not stay at home in the afternoon. The youth in all the EPAs studied lacked interest in agriculture and hence did not listen to agriculture programmes. The programmes were usually aired while they were at school and in some cases, youth did not own or have access to ICTs. Few participants from Kalulu and Mkanda indicated that they actively engaged their children in agricultural activities. Thus, training in use of ICTs for women, improvement on phone type accessed (internet), access to timely information and

encouraging the youth to engage in agriculture were suggestion on cultivating interest among the different gender groups.

3.3.5 Content: Lack of demonstration and market information

Content from radio programmes did not focus on practical demonstration and marketing. Participants argued that information on inoculant was difficult to follow on the radio (e.g. how the hoe mixing was done and how to cover the materials in plastic bag). Farmers argued that demonstrations by the extension worker, exchange visits or videos on the same would help. In addition, all participants indicated that there were many organisations that were focusing on soybean production, but none on marketing. Strategies proposed include practical sessions on inoculant through extension worker or video extension, adding radio programmes on soybean marketing on Mudzi Wathu Community radio and through increased access to internet.

3.3.6 High Illiteracy Levels

Illiteracy levels is still high as a good number of research participants, both men and women could neither write nor read, and this has an effect in scaling up the use of ICTs in agriculture solutions. In this study more women were illiterate than men. Mchinji district has literacy rate of 66% and that literacy level for the district was lower for the women (NSO, 2019).

NSO considered a person literate if he or she was reported to be able to read and write a simple sentence in any language. Gebru et al. (2018) also observed that low literacy levels remain a challenge in some rural contexts and limit the utility and impact of mobile-based agricultural information and services for some segments of the population, particularly female household heads. Adult literacy education is therefore critical in the promotion of increased ICT use.

3.3.7 Inadequate ICT Infrastructure

Despite that the areas had access to mobile phone networks and Mudzi Wathu radio, challenges of poor network resulting in failure to access mobile phone network and Mudzi Wathu radio signal were very common. Participants indicated that most of the times the radio reception is poor. Researchers also noted that it was difficult to access TNM network in Mkanda and Chioshya, which were further from Mchinji district headquarters.

*Several people have radios but then the radio reception is at times very poor. There was a time we could not access the radio and it was a critical time when the soybean bean inoculant programmes were being aired, **Male farmer Mkanda.***

*As you might have noted this s a remote area, sometimes we struggle to get mobile service network. When such is the case, we get delayed messages which in some cases required us to act faster. This has been one of our biggest problems, **Male farmer Chioshya.***

3.3.8 Inadequate supply of soybean inoculant due to increased demand

Participants also indicated that it was not easy to access soybean inoculant on time and was not available in their EPAs. They argued that scaling up the use of ICTs in soybean inoculant campaign increased demand of inoculant, but the challenge was that the soybean could not be found. Most farmers reported that they managed to access inoculant while plants had progressed. Other vendors took advantage of the scarcity by selling expired inoculant. However, most participants indicated that Agriculture Input Supply Limited (ISL) provided a solution through calling or SMS. The case study preliminary report (FRT, FRI, 2019a) also

highlights similar poor supply chain for agricultural inputs in Ethiopia where the promotion of agricultural solutions by the project accelerated the demand for the inputs needed to implement the solutions, which resulted in the shortage of supply and these demotivated farmers who wanted to adopt the improved agricultural solutions.

Therefore, scaling up of ICTs in agriculture solutions should be supported with availability of the product promoted.

3.4 Gender Conceptual framework for ICT-for-scale initiatives

The second objective involved development of the conceptual framework for ICT for scale initiatives.

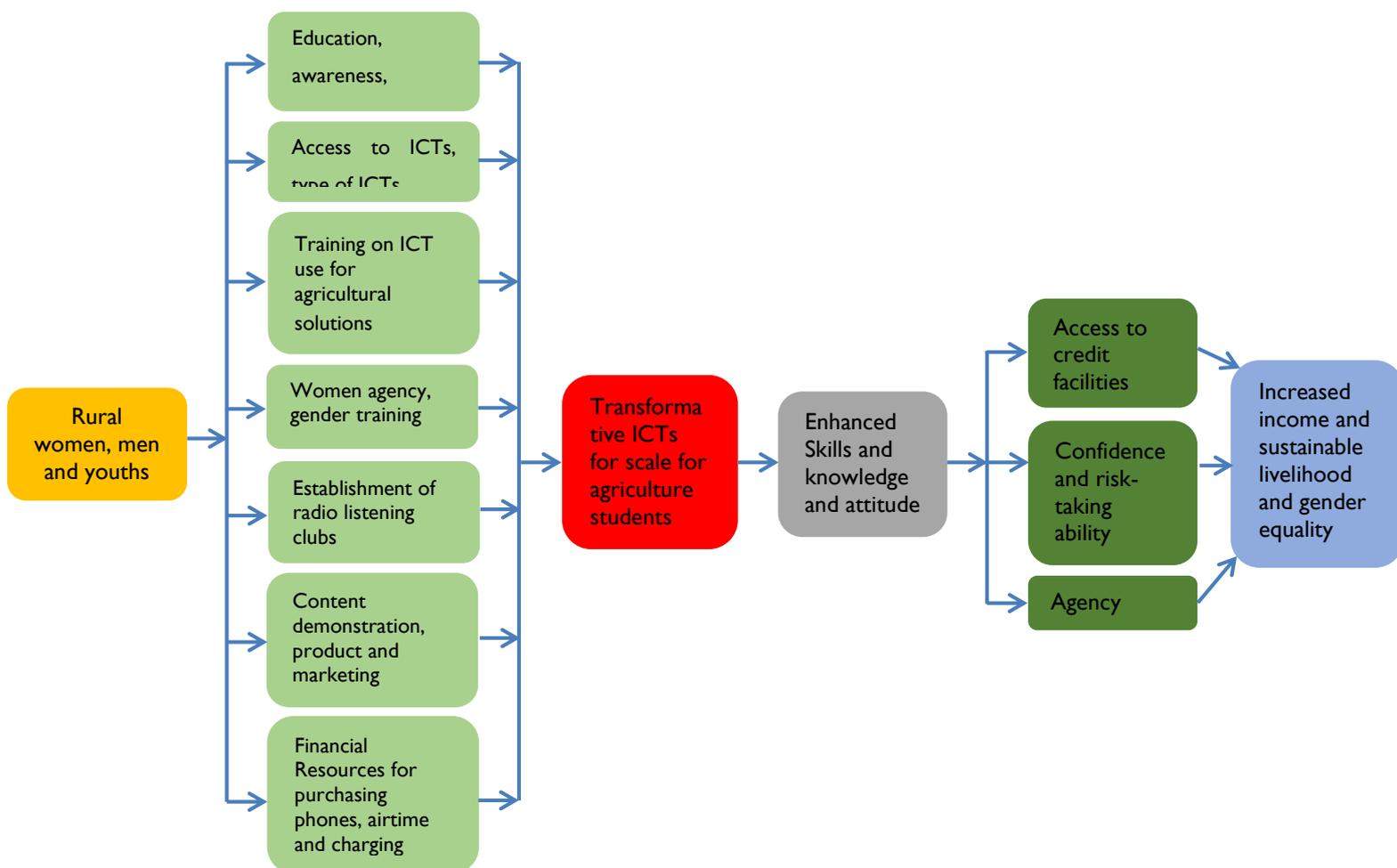


Figure 3: Conceptual Framework on Transformative Pathways for adoption of Gender and ICTs for different Gender Groups

The conceptual framework illustrates the transformative pathways that enable different gender groups in the rural areas to take advantage of the ICTs for innovative agriculture, and these include:

- Incorporating education
- Improving access to ICTs with internet through provision of loans;
- Provision of training on the use of ICTs for agriculture development
- Critical examination of gender norms and conduct gender training to improve women access to ICTs and resources and empowerment indecision making
- Development of radio listening clubs to promote debate and discussions on agriculture solutions

- Use of agricultural extension workers and demonstration plots and promote using ICTs to link farmers to markets.

Access to these ICTs enhances skills, knowledge and confidence of different gender groups to access to credit, markets and women empowerment, which results in increased income and sustainable livelihoods.

3.5 Gender Analysis of the Type of Technology to be Promoted Using ICT

Gender analysis is the process of assessing the differential impact of proposed and existing ICTs among men and women. Gender analysis is a basis for mainstreaming while making sure that scaling up of ICTs does not exacerbate existing gender inequalities. This is based on the background that uptake on use of ICTs for agricultural solutions as in the case of soybean inoculant campaign was minimal on the part of women. The analysis is based on the Harvard Analytical Framework, which focuses on the following aspects: access and control of resources, gender division of labour, level of participation, how the project addressed the practical and strategic needs of men and women and the impact of the project on men and women.

3.5.1 Access and Control of Resources

- a) 91% of the men had phones while 48% of the women had phones.
- b) 46% of the men had access to radio while 41% of the women had access to the radio.
- c) Men had more access to ICTs those women. Men accessed radio through the radio equipment and the mobile phone. Women were limited in use of phones as some partners were jealous. Women had the most challenge in operating ICTs; tuning radios, accessing SMS, which affected their access to information on agricultural solutions. Women listened and participated more in radio programmes because they were in most cases left at home.
- d) Men were key decision makers in the households and made decisions such as purchase of inoculant, marketing of soybeans.
- e) Upon selling of soybeans men controlled the resources because they were the ones buying the household needs, women were said to be not good at budgeting for the household needs and ended up buying clothes and wrappers.

3.5.2 Address of the practical and strategic needs of different gender groups

- a) Timing for the radio programmes suited women most as they were back from the fields and relaxing, but was not convenient for the men and youth
- b) Literacy levels were much lower among women than men.
- c) Information on markets

3.5.3 Gender division of labour

- a) While both men and women worked in the soybean fields, most women did not participate in marketing of the soybeans because they argued that men were the ones who knew how to interact with buyers.
- b) Women participated in building shade for soybeans by cutting trees, tying poles. Men also participated in harvesting, threshing, and cleaning homes, cooking, cutting firewood.
- c) Mobility

3.5.4 Level of Participation

- a) Both men and women attended the gender training together
- b) The radio, call centre provided equal opportunities for men and women in terms of participation and leadership. Female lead farmers were also promoted to encourage

women participation. Gender training emphasised the need for families to work together.

- c) Availability of women in clubs

3.5.5 Impact of the project on men and women

- a) Change of mind set on gender issues on both men and women
- b) Women and men participation in farming activities that were stereotyped for the opposite gender; some women also participated in soybean marketing. Men participated in threshing of soybeans.
- c) Increased production in soybeans and improved income and investments for the households.

3.6 Gender analysis at institutional, social and political level in the provision of agriculture solutions

The final objective involved gender analysis at institutional, social and political level in the provision of agriculture solutions. The analysis is based on the Harvard Analytical Framework, which focuses on the following aspects: access and control of resources, gender division of labour, level of participation, how the project addressed the practical and strategic needs of men and women and the impact of the project on men and women at FRT. In addition, the analysis also focused on the Department of Agriculture Extension Services (DAES), which remains the main provider of advisory services for farmers in Malawi.

The analysis focused on the numbers of male and female employees at FRT, their roles and responsibilities or division of labour and benefits. The evaluation found that FRT was gender balanced as it had 13 males and 13 females. FRT does not have a Gender Policy in place but its practices in terms of recruitment were found not to be discriminatory by gender.

Gender equality is not just the numbers, but also the roles, responsibilities and benefits. The analysis found that managerial positions were equitably distributed, and these include: CEO, Administrative Manager and Focal Persons as illustrated in **Table 4**. It was reported that FRT provided equal chance to everyone of participating in management to provide room for growth. For the organisation, this helps in cutting costs and building staff capacity. Furthermore, training opportunity was also dependent on the project and activities – and perceived contributions one would make to the project.

Table 4: Gender Analysis for FRT

Position	Male	Female
Chief Executive Officer	1	-
Administrative Manager	-	1
Focal person	1	2
Production	5	3
Call centre	1	6
Administrative staff	4	
IT interns	1	1
Total	13	13

Participation in the Soybean Inoculant Campaign depended on one's expertise. The project was implemented with other partners such as FRI, DAES and the Chitedze Research Station. The project benefited employees of different gender groups through remunerations, trainings, leadership and management opportunities, experience and knowledge.

Therefore, FRT promoted gender equality through its recruitment, equal opportunities for training, leadership and management. The implementation of the Soybean Inoculant Campaign also engaged personnel using expertise of the workers and interns. However, it is important that gender equality be advanced through legal frameworks such as Gender Policy and Sexual Harassment Policy to ensure equality and human rights.

DAES, the major provider for EAS is has not been very gender sensitive particularly in its recruitment and deployment of the extension workers. As of 2017, there were over 80% more male extension workers than women in Malawi (DLEC, 2017). This may not be necessarily DEAS approach to recruitment, rather it might be that there are also not many female extension workers being trained or taking up a career in this field.

During the study, the three extension workers for Nkanda, Chioshya and Kalulu were all men. Women who participated in this study indicated that they were more comfortable when interacting with female extension workers. Qusimbing & Pandofelli (2010) also argues that limited presence of female extension workers makes it harder to reach women farmers since women extension workers have been shown to be better than men at reaching women. Studies have also shown that female extension workers face the challenge of mobility in the rural area, as the work requires cycling across long distances, which is difficult for most women extension workers (Jafry et al., 2014). This indicates the need for mechanisms to recruit and retain female extension workers in the country. The recruitment of female extension agents is also a requirement as per Constitution of the Republic of Malawi (1994) which enshrines an equality clause, as well as special rights of women and the Gender Equality Act (2013). The country is a signatory to major international commitments to achieving gender equality, including the Convention on the Elimination of Discrimination against Women (CEDAW), the Beijing Declaration and Platform for Action, and the SADC Protocol on Gender and Development.

4.0 Conclusion

The study confirms what is widely acknowledged that women farmers have less access to information and productive resources than men and lack the authority to adopt new practices that could increase productivity and profitability of their farms. The study further confirms that women in low and middle-income countries are less likely to own a mobile phone than men. Men's sources of information were found to be broader, reflecting men's greater mobility and interaction with a wider range of agricultural actors.

Despite this, the study has demonstrated that ICTs can close gender gaps in agriculture and lead to more equitable opportunities for farmers particularly from the least developed countries like Malawi where access to the ITC enabled gadget in rural areas is a challenge. Despite the perceived trustworthiness of information from the phones or the radio, both men and women farmers explained that they seek advice from other sources, such as extension officers or field day demonstrations, to validate what they hear.

While there are so many services that can be accessed using the phones, majority of rural farmers have not viewed them as a source of information but instead as a vehicle for connecting farmers with trusted individuals for information. Such is the case because most of them cannot access phones that have other applications like WhatsApp or the internet in general. This is also exacerbated with the illiteracy levels especially on the part of women.

Women farmers explained that they listened to the radio because it was in the house; many of the men farmers said that the radio was the best means of getting information because it was portable and accessible through the mobile phone. The advantage of having a radio

enabled mobile phone is that it allows for the actual radio to be left in the house, where women can listen, instead of it being taken to the field or elsewhere.

Interviews with extension workers revealed that they lack knowledge about ICT initiatives that could complement and enhance their efforts beyond just the radio and the phone for calling and push messages. Given their role as trusted information intermediaries, building their knowledge of various ICT enabled services can enhance both their role and their knowledge, as well as promote the use of ICTs by farmers.

The opportunities in using ICTs to access and adopt agriculture solutions were farmers' access to ICTs, willingness to pay for the ICTs to access agricultural solutions, quick feedback, gender awareness, trust in agricultural messages accessed through ICTs and the message sharing behaviour among the farmers. The hindrances were the cost of ICTs, lack of know-how on use of ICTs, cultural and gender barriers, illiteracy, ICT infrastructure, and inadequate supply of soybean inoculant due to increased demand and lack of interest. The transformative pathways that enable African women, and different gender groups in the rural areas to take advantage of the ICTs for innovative agriculture were access to ICTs, enhances skills, knowledge and confidence of different gender groups to access to credit, markets and women empowerment, which results in an increased income and sustainable livelihoods.

5.0 Lessons Learned and Key Takeaways

The study shows that ICTs can be used to close gender gaps in agriculture which can lead to more equitable opportunities for farmers. Organisations willing to reach out to all farmers regardless of gender the following issues will have to be considered:

Need to conduct a gender analysis to identify opportunities on how ICTs can enhance current practices	The analysis should describe where and how men and women participate in the specific value chain or agricultural activity. It should capture what information and services men and women farmers need and how they are currently meeting those needs.
Need to develop appropriate content to meet the needs of women and men farmers	Women farmers' needs and activities are often overlooked in the design of extension service and delivery. Their on-farm activities can differ from men by crop and livestock. Women and men take part in different production, processing, and marketing activities even when they are working in the same value chain. As a result, women and men farmers do not always share the same information needs.
Need to consider using a range of ICTs	While the inclination may be to find ways of integrating the most cutting-edge. Programs need to identify what ICTs are most appropriate for overcoming specific constraints and must avoid the temptation to design programs around ICTs. Using the radio arguably remains one of the most effective means of reaching farmers in the field because the infrastructure already exists. Reports indicate that combined ICT programming-using radio and mobile phone, might provide new opportunities for women. Each of the ICTs discussed with farmers had drawbacks for them. Though the radio is popular, farmers cannot see what is being discussed. Farmers still do not consider the Internet a potential source of information. Mobile phones are being used mostly for connecting with individuals in immediate circles, and farmers are not taking advantage of the full range of SMS and other mobile technology-enabled services.
Need to consider use of ICTs to complement existing information channels	Men and women farmers are already exchanging information. Often through word-of-mouth, farmers share farming practices, experiences with different inputs, preparation of different crops for consumption, and so on. Women especially rely on these channels because their time and mobility constraints often limit their exposure to new information providers. ICTs can support and enhance these information channels by providing access to expertise and more up-to-date information.
Need to develop direct relationships with men and women farmers	The most recent ICT innovations will fail to bring women into agricultural programs if leaders and practitioners are not intentional about engaging women directly. Buyers, extension agents, input suppliers, and other service providers must reward the appropriate individuals for their participation in the value chain. Because ICTs reduce overall transaction cost for firms, this can allow firms to

	invest more in developing relationships directly with their suppliers.
Need to equip extension workers officers with ICT tools and the knowledge	The extension workers have to understand that ICTs can be used to help them reach out to many farmers who need their services. to use them will contribute to enhancing trust in and use of mobile technologies.
Need to implement a gendered ICT based extension project	Any organisation willing to use ICT-based extension should a) conduct an assessment of the needs of the target community. b) To adapt, monitor and evaluate ICT enabled services it is important to conduct benchmark surveys before introduction. Benchmark surveys also help to get a good overview of the actual situation. c) Based on the needs assessment and benchmark surveys, localised and customised content needs to be developed. d) ICT tools need to be selected and developed, in such a way that they correspond to the desires and needs of the target group. e) The target audience should be sensitised on the presence of the services and how to access them. f) The newly developed ICT-based services can then be introduced and used in extension. g) To ensure sustainability of the services, it is recommended to search for partnerships with stakeholders present in the target area or seek for integration of the services in the public agricultural extension system. h) Monitoring and adaptation is important, especially in the beginning of the project. Modifications should be made when the project does not correspond to the needs of the audience. i) Finally, an impact assessment should be realised to determine the degree of success of the project. (<i>Saravanan et al., 2015</i>)
Need to promote and support the development of local content in local languages	Local language content will improve the accessibility and inclusiveness of ICT applications. It can also serve as an opportunity to capture and record local practices and knowledge.
Need to promote gender training for both men and women	Sometimes husbands are stubborn and are not keen to listen to their wives, so even if they explain the husband never listen-but if they get trained together the husbands would be keen to practice. Women too would in the past refuse to build shade, but by learning together women have learnt that they can also do any job. Trainings would also help to educate men that still leave a lot of work for their wives to change.
Need for the introduction of farmer's radio listening clubs.	The clubs will enhance access to agricultural information to farmers and more especially among women as it has been noted they (women) patronise farmer's clubs more. Farmers would listen to the radio programme which would be followed by a discussion to ensure that all of them got the information correctly.
Need for proper design and implementation	Based on a bottom-up and participatory approach, which involves communities themselves, can reduce the potential

	for information inequity that can be created when introducing new ICTs into a community.
Need for gender, youth and diversity to be systematically addressed in the planning phase of project design and during the whole project cycle	Women's and youth's access to technology and equipment, as well as potential consequences for social dynamics within communities, should be assessed prior to project deployment in order to address ICT gaps, and ensure sustainable adoption of solutions within communities.
Need for useful information to be repackaged and mobilized in formats that meet the different information needs and preferences	Need for useful information to be repackaged and mobilized in formats that meet the different information needs and preferences. To ensure that the needs of women are taken on board, there is need to involve them (women) at every stage of the project cycle.

References

- Behrman, J., A., Meinzen-Dick, R., Quisumbing, A., R. (2014). *Understanding Gender and Culture in Agriculture: The Role of Qualitative and Quantitative Approaches*. In *Gender in Agriculture. Closing the Knowledge Gap*. The Food and Agriculture Organization of the United Nations (FAO) & Springer Science + Business Media B.V., Dordrecht. 31-55. (Behrman, 2014).
- Bryman, A. (2008). *Social research methods*. 3rd Edition, Oxford University Press., New York
- Chapman, R., Slaymaker, T. (2002). *ICTs and Rural Development: Review of the Literature, Current Interventions and Opportunities for Action*. Overseas Development Institute. London, UK. Working Paper 192. [electronic] accessed at: <https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/2670.pdf> (Accessed on 10 July 2019)
- Creswell, J., W. (2009). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE Publications, Inc. London. 3rd ed. Kvale & Brinkmann (2011),
- DLEC (2017). *Malawi: Desk Study of Extension and Advisory Services*. Developing Local Extension Capacity (DLEC). Feed the Future Developing
- Farm Radio International (FRI) (2018). *3rd interim report (18 months): Harnessing ICTs to Scale-Up Agricultural Innovations*
- Farm Radio Trust (FRT) and Farm Radio International (FRI) (2019a). *ICT4Scale Case Study Preliminary Report*.
- Farm Radio Trust (FRT) and Farm Radio International (FRI) (2019b). *Scaling up Agricultural Innovations using ICTs in Smallholder Agriculture Systems? ICT4Scale Meta Review Preliminary Report*.
- Gebru, B., Mworozi, E., Kibaya, P. and Kaddu, J. (2018). "Climate Change Adaptation and ICT Enhancing Resilience to Water-related Impacts of Climate Change in Uganda's Cattle Corridor (CHAI II)." Final Technical Report. IDRC Grant Number: 107953-001
- Government of Malawi (GoM) (2011). *Ministry of Agriculture and Food Security Annual Report 2010/2011*. Department of Agricultural Extension Services, Government of Malawi
- Government of Malawi (2010). *Constitution of the Republic of Malawi*.
- Grown, C.; Rao Gupta, G.; and Kes, A. 2005. *Taking action: achieving gender equality and empowering women. Task force on Education and Gender Equality*. <http://www.unmillenniumproject.org/documents/Gender-complete.pdf> (accessed 20th August 2019)
- Hudson, H. E., Leclair, M., Pelletier, B., and Sullivan, B. (2017). "Using radio and interactive ICTs to improve food security among smallholder farmers in Sub-Saharan Africa". *Telecommunications Policy*. doi:10.1016/j.telpol.2017.05.010
- IDRC (2018) *Harnessing ICT to scale up agricultural solutions: Proposed Gender Strategy*
- IDRC (2017) *Second Interim Report 12 months*

Jafry, T., Moyo, B. and Mandoloma, L. (2014) *Assessment of Extension and Advisory Methods and Approaches to Reach Rural Women; Examples from Malawi*. MEAS Evaluation Series.

Morgan, D., L., Krueger, R., A. (1997). *Fokus Group Kit*. Portland State University. SAGE Publications, Inc. Volumes. 1-6.

Moser, Caroline. 1993. *Gender Planning and Development: Theory, Practice and Training*. New York and London: Routledge.

National Statistical Office (NSO) (2019). *2018 Malawi Population and Housing Census Main Report*.

Qusimbing, A. and L. Pandofelli. 2010. Promising Approaches to Address the Needs of Poor Female Farmers: Resources, Constraints, and Interventions. *World Development* 38 (4): 581–592.