Gender and innovation for climate-smart agriculture

Assessment of gender-responsiveness of RAN's agricultural-focused innovations

Working Paper No. 260

CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)

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RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security
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Correct citation:
Okello D, Mayega W, Muhumuza C, Amuge PO, Karamagi E, Amollo M, Kayiwa R, Bazeyo W. 2018. Gender and innovation for climate-smart agriculture: Assessment of gender-responsiveness of RAN's agricultural-focused innovations. CCAFS Working Paper no. 260. Wageningen, the Netherlands: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Available online at: www.ccafs.cgiar.org

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The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) is a strategic partnership of CGIAR and Future Earth, led by the International Center for Tropical Agriculture (CIAT). The Program is carried out with funding by CGIAR Fund Donors, Australia (ACIAR), Ireland (Irish Aid), Netherlands (Ministry of Foreign Affairs), New Zealand Ministry of Foreign Affairs & Trade; Switzerland (SDC); Thailand; The UK Government (UK Aid); USA (USAID); The European Union (EU); and with technical support from The International Fund for Agricultural Development (IFAD). For more information, please visit https://ccafs.cgiar.org/donors.

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Abstract

Ownership of agricultural production resources has generally been shown by research to be male dominated and to have wide disparities between males and females. The disparities are more pronounced in rural areas where women have less income, smaller pieces of land, and have inadequate market for their produce. In dealing with Climate Smart Agriculture (CSA) adoption and with agricultural technology adoption, there has been increasing recognition of the importance of focusing on the gender-based needs behind the adoption choice itself.

Grounded in the belief that solutions to Africa's resilience challenges lie in understanding what makes communities thrive in adversity, ResilientAfrica Network (RAN) is a multidisciplinary innovation lab that leverages the creativity and talent of youth, students, scholars and communities to develop and scale innovative ideas. Given how dominant agriculture is among RAN's problem sets for strengthening resilience through innovation, RAN sought to understand how supported innovations had contributed to gender-responsive climate smart agriculture solutions. What lessons could be learned from Women of Uganda Network (WOUGNET) in their history of engagement with women farmers to co-create a gender-responsive innovation process to strengthen resilience through the agricultural sector?

With the support of CCAFS, RAN and WOUGNET conducted a gender assessment exercise to evaluate if the current solutions/innovations are gender responsive or not. Three innovations were selected that are primarily focused towards CSA and that had affordability and ease of use as key objectives. The gender assessment embraced a qualitative research approach. This choice was guided by the need to appreciate respondents' understanding and experiences or perceptions of the different innovations that RAN has been nurturing and developing over the years. The respondents were purposively selected based on availability and on being located in any of the four Northern Uganda districts of Apac, Kole, Lira and Oyam where WOUGNET has actively engaged with women farmers.

From the study, it was clear that men and women farmers are willing to embrace new technologies, practices and innovations in their pursuit of enhanced agricultural productivity and new opportunities. That said, a clearly gendered view emerged from the assessment in

that uptake of the innovations was to a large extent driven by socio-cultural norms and expectations related to issues of ownership, work, decision making capacity, and income generation and control. For instance, use of the innovations can reduce time spent on farming activities and can open up time and space to explore new opportunities. However, if gender considerations are not taken into account, such time could be used to negatively impact on the work burden for women farmers as it may be taken that the women are now free to take on new work – even that which would have been previously done by the men in their households.

Keywords

Climate-smart agriculture; Gender; Assessment; Innovation.

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Acknowledgements

This work was implemented as part of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), which is carried out with support from the CGIAR Trust Fund and through bilateral funding agreements. For details please visit https://ccafs.cgiar.org/donors. The views expressed in this document cannot be taken to reflect the official opinions of these organizations.

The research and analysis on which this report is based were provided by ResilientAfrica Network (RAN) and Women of Uganda Network (WOUGNET) teams. We would therefore like to express our appreciation to both teams. Contributions from RAN were provided by Prof William Bazeyo, Deputy Vice Chancellor for Finance and Administration, Makerere University and RAN Chief of Party; Dr. Roy William Mayega, Deputy Chief of Party; Dr. Dorothy Okello, Director of Innovation; Christine Muhumuza, Research Manager; Deborah Naatujuna Nkwanga, Engagement Manager; and Mr. Ronald Kayiwa, Innovations Officer. Contributions from WOUGNET were provided by Ms. Peace Oliver Amuge, Program Head, Information Sharing & Networking; Ms. Goretti Amuriat, Program Head, Gender and ICT Policy Advocacy; Ms. Edna Karamagi, Gender Consultant; Mr. Matthew Amollo, Data Analyst; Mr. Isaac Amuku[2], Program Assistant, Information Sharing & Networking; and Ms. Mercy Lillian Apio, Team Leader, Kubere Information Centre, Apac. We would also like to express our appreciation to the three innovator teams, M-Omulimisa, Mushroom for Mushrooming Livelihoods and Low-Cost Solar Irrigation Pump, for taking time to explain and allow the farmers learn and advise on better ways to improve their innovations. RAN's work on innovations is made possible with support from the American people delivered through the U.S. Agency for International Development (USAID). The content is the responsibility of The ResilientAfrica Network (RAN) and does not necessarily reflect the opinion of USAID or the U.S. Government.

Contents

1. Introduction

In 2015, the United Nations General Assembly adopted a consensus resolution of transforming the world in the agenda 2030 with a key priority which stresses that realizing gender equality and the empowerment of women and girls will make a crucial contribution to human progress. Uganda's Vision 2040 and the second National Development Plan 2016-2020 (NDPII) identify agriculture as a strategic opportunity that requires harnessing of maximum returns to the country's economy.

However, research has shown that generally, ownership of agricultural production resources is male dominated and wide disparities between males and females exist. The disparities are more pronounced in rural areas where women have less income, smaller pieces of land, and have inadequate market for their produce. In dealing with Climate Smart Agriculture (CSA) adoption and with agricultural technology adoption, there has been increasing recognition of the importance of focusing on the gender-heterogeneity behind the adoption choice itself. Interestingly, a clear fact in Uganda indicates a gender gap averaging 20 – 30 percent in favor of male farmers with respect to the value of agricultural yield.

ResilientAfrica Network (RAN) is a multidisciplinary innovation lab that leverages the creativity and talent of youth, students, scholars and communities to develop and scale innovative ideas. Hosted by Makerere University, Kampala, Uganda, RAN is a consortium of 18 African Universities from 13 countries in sub-Saharan Africa that is founded on the premise of bringing together scholars, a diverse array of industry players and entrepreneurs to co-create evidence-based solutions that build the resilience of communities facing recurrent shocks and stresses in Africa. RAN's definition of resilience is the capacity of people and systems to mitigate, adapt to, recover and learn from shocks and stresses in a manner that reduces vulnerability and increases well-being. Grounded in the belief that solutions to Africa's resilience challenges lie in understanding what makes communities thrive in adversity, RAN's approach includes consulting the communities affected by shocks and stresses through resilience studies, development of resilience problem-sets that are the basis for innovators in developing solutions in close consultation with the target communities. Key among resilience intervention pathways are problem sets related to scaling sustainable agriculture and technology for climate risk mitigation

How then has RAN's innovation pipeline process contributed to gender-responsive climate smart agriculture solutions ... given how dominant agriculture is among RAN's problem sets for strengthening resilience through innovation? How should RAN's innovation management be made more gender-responsive in approach? What lessons can be learned from Women of Uganda Network (WOUGNET) in their history of engagement with women farmers to co-create a gender-responsive innovation process to strengthen resilience through the agricultural sector? This necessitated RAN and WOUGNET to conduct a gender assessment exercise to evaluate if the current solutions/innovations are gender responsive or not. Three RAN innovations were purposively selected for use in the gender assessment with a focus on those innovations that had a primary objective of enhancing agricultural productivity and markets through low-cost agricultural innovations.

2. RAN innovations for gender assessment

Three criteria were applied in selecting the RAN innovations for the gender assessment. One, was that the innovation was primarily focused towards addressing climate smart agriculture, and two, the innovation had affordability and ease of use as key objectives. The third criterion was use of the innovation by women farmers. While RAN has a program focus on getting more women involved in resilience innovation, this had not necessarily translated into a significant use by women of the developed innovations.

On the other hand, Women of Uganda Network (WOUGNET) has experience of over 10 years in working with women farmers in Northern Uganda on the use of technology and improved agricultural practices to enhance productivity and access to markets. Of note, was the use of information and communication technologies (ICTs) including the use of mobile phones and community radio. Based on these experiences, the approach undertaken for the assessment builds on the experiences of women farmers in Northern Uganda to assess what innovations would better address their needs from a gender equity perspective. Furthermore, some of the women farmers had indeed used one of the RAN agricultural-focused innovations, M-Omulimsa. In addition to M-Omulimisa, and conscious of demands on time of women farmers, two other innovations were selected for the assessment. These were the low-cost solar irrigation pump given the challenges for women farmers in Northern Uganda of

relying on rain-fed agriculture and the Mushroom project given the need to address improved agricultural practices through the introduction of high-value time-saving agricultural activities for women farmers.

2.1. Overview of RAN innovations selected for gender assessment

2.1.1. Low-cost solar irrigation pump

This is a low- cost solar powered irrigation pump that is cast from local scrap materials. Having been tested in several communities in Uganda, this pump has the potential to substantially increase access to low cost solutions for local irrigation and water transfer for other purposes. It can deliver water to a height of 15 meters and horizontal distance of 300 meters. The team is also testing mechanisms for longer distance delivery systems to transmit water over longer distances through serial reservoirs. This technology has the power to transform social attitudes and perceptions about irrigation for increased crop yields in sub-Saharan Africa. Delivery of additional water for irrigation, livestock watering and domestic consumption can not only prolong the productive period but can allow diversification of crop and animal husbandry in these regions. The costs of irrigation pumps currently on the market are prohibitive relative to the average cost of 100 USD for a low-cost solar irrigation pump. The cheapest pumps available from leading pump manufactures cost a minimum of 500 USD, which is inaccessible to many rural communities in Africa.

2.1.2. Mushroom for mushrooming livelihoods

One of the key barriers to mushroom growing in the region is the requirement to use cotton-seed hulls as the medium for germinating and growing the mushroom plant. In addition, the cotton-seed hulls have to be sterilized, which is often done by roasting with firewood. Firewood is increasingly getting scarce and its use negatively affects the environment. The project innovators have developed, tested and piloted a new medium for mushroom growing using crop residues that are locally available in the target communities, instead of cotton seed-hulls. In addition, the innovators are using new methods of sterilizing the crop-residues - instead of relying on firewood. Plenty of these crop-residue materials are available on the farm without significant alternative uses. Secondly, use of soap and water has been employed as an alternative low-cost sterilizing method. Farmers in parts of Central Uganda (Wakiso District) have already adopted this approach enabling them to grow mushrooms regularly

through-out the year unlike in the past when cotton seed-hulls were scarce. Livelihoods have also improved.

Growing of high value crops like mushrooms on smaller holdings provides an important livelihood option for rural farmers. Mushrooms are not widely grown in Eastern Africa yet they are on high demand in hotels, hospitals and homes. Breaking barriers to mushroom growing (especially the growth medium and the sterilization process) will render the growing of this high value crop cheaper for rural subsistence farmers. This platform can also be used to build community agency for improved agriculture and to launch other approaches to modernize agriculture.

2.1.3. M-Omulimisa

M-Omulimisa is a mobile and web-based platform that enables farmers to exchange information with extension officers in their local languages for free. In M-Omulimisa, the M stands for mobile while Omulimisa means extension worker in one of the local languages in Uganda, Luganda. The M-Omulimisa platform integrates human mediation and text messaging to create a mobile and web-based consultation space. Current ratios of 1:5,000 extension officers to farmers leads to poor access to services, low technological adoption, lack of access to quality inputs, lack of access to affordable credit, changing weather patterns and many others. The advent of ICTs, especially mobile technologies, and their rapid diffusion in Uganda if well leveraged, can bring about major quantum leaps in agricultural services.

M-Omulimisa leverages the ubiquitous presence of mobile phones to improve farmers' access to extension services as well as efficiency and effectiveness of the services. Farmers can use their phones to ask questions in languages that they understand, and receive feedback from extension officers via text messages. Some of the key M-Omulimisa partnerships to-date include nongovernmental organizations providing conventional agricultural extension services such as World Vision Uganda, Sasakawa Global 2000 and District Local Governments. They leverage their well-established networks with farmers and extension officers to mobilize and train farmers to use M-Omulimisa.

2.2. Purpose for the gender assessment of RAN innovations

2.2.1. Overview of the literature

The literature on gender and innovation posits that gender is a significant factor that affects innovation performance. Some authors are of the view that being an innovator is not an attribute of women because the image of the innovator is not compatible with the image of being a woman (Nyberg, 2009)[i]. Consequently, men are assumed to be highly innovative while women are not (Blake and Hanson, 2005)[ii].

In dealing with CSA adoption, as well as with agricultural technology adoption, there has been increasing recognition of the importance of focusing on the gender-heterogeneity behind the adoption choice itself. This necessitated RAN and WOUGNET to conduct a participatory assessment of the gender responsiveness of RAN's innovation processes using the CSA plan methodology. In the CSA framework, the interconnections between climate change adaptation, mitigation and food security are so heterogeneous and pervasive that it is challenging to disentangle all the effects that an agricultural practice/policy could have on present and future households' livelihoods (McCarthy, 2011)[iii]. Quisumbing and Pandofelli (2010)[iv] report an example of successful gender-responsive policy adoption in Bangladesh, where social norms do not allow women to mix publicly with men. This implies that any action to be undertaken in the community needs consideration of all dimensions of socio-cultural and environment impact.

The gender gap in agriculture means that women and men farmers have differential access to the resources and services required to prepare for and respond to climate change. In most developing countries, women have less access than men to productive resources, financial capital, and advisory services. Women tend to be excluded from decision making and may not benefit from technologies and practices that could help them adapt to new climatic conditions. When it comes to developing and adopting CSA practices, men and women are not starting at the same point (World Bank 2016)[v]. Along this line, World Bank and FAO recognise that rural men and women have different access to productive resources, services, information, and employment opportunities, which may hinder women's productivity and reduce their contributions to agriculture and broader economic and social development goals.

Generally, climate change poses an increasing risk to the agricultural sector, food security, and nutrition and the most appropriate model to be adopted is the climate smart agriculture

that jointly addresses food security and climate challenges. Integration of gender issues into this model puts more strength and/or flesh in identifying and addressing the different constraints faced by men and women by recognizing their specific capabilities to enable reduce gender inequalities and ensure that men, women, boys, and girls can equally benefit from CSA interventions and practices, thus achieving more sustainable and equitable results.

The major pillars of CSA that women can benefit from according to World Bank and United Nations Food and Agriculture Organisation (FAO) include: sustainable increase in agricultural productivity and incomes, adapting to and building resilience to climate change and reducing and/or removing greenhouse gas emissions where possible which can be integrated into gender issues by considering all the number of gender responsive technologies that are applicable under CSA approach based on needs and interest of both female and male farmers, reduce time and labour and those technologies that are accessible and affordable to both men and women farmers.

2.2.2. Research questions and study objectives

The research questions and study objectives were developed taking into account the literature on gender and climate smart agriculture plus the experiences of RAN and WOUGNET for agricultural-based innovations.

Research questions

1. How do men and women farmers access and use RAN innovations in the community?
2. What is the level of participation in decision making by men and women regarding the use of agricultural innovations?
3. What are the constraints/challenges that women and men face in using RAN agricultural innovations?
4. What are the short term and long-term climate smart agricultural benefits of RAN innovations to the communities in Uganda?

Study objectives

The general objective of the study was to assess the gender responsiveness of RAN Innovations using the Climate Smart Agriculture approach. Specifically, the assessment sought:

1. To evaluate ownership and usage of the RAN innovations among men and women farmers
2. To determine the level of participation of men and women in decision making regarding RAN innovations
3. To assess the challenges that men and women would face in using RAN Agricultural innovations
4. To analyze the SMART agriculture benefits of RAN innovations to the community

3. Study methodology

3.1. Data collection

3.1.1. Data collection methods

There were three data collection methods applied for the study, namely, Focus Group Discussions, In-depth Interviews and Key Informant Interviews. The methods were selected so as to complement each other with respect to information gathered through group discussion and through individual engagement. Audio recorders were used to capture all sessions, and these have been transcribed and translated, where a session was conducted in the local language, Luo. In addition, prior to any data collection exercise, the RAN innovators shared about their respective innovations and made a demonstration of how they work. Respondents were invited to ask questions about as well as to have a feel-and-touch of the innovation.

For the Focus Group Discussions (FGDs), the study had two groups where the farmers were grouped by sex and one mixed group. There was a group of married women, a group of married men, and a mixed group of youth (unmarried men and women). Following engagement with the RAN innovators, the groups were engaged in loosely structured discussions of varying topics of interest. Respondents also used cards, sometimes flip charts on the wall to express their opinions, with the colored markers being used to bring out sex-disaggregated views. On-Spot analysis enabled information on the cards and charts to be used to generate further discussions; and especially with the aid of prompter questions: Why? What? When? Who? Where? To ensure all participants had ample time to discuss the three innovations, the World Café method was applied to allow for rotation of the groups to engage

with the three innovator teams. At the end of the day, all FDG respondents had the opportunity to share their knowledge, views and perceptions at each of the three innovators. Of note, the language used by the groups depended on the preference of the respondents. Some used the local language, Luo, while others used English, and yet others used both Luo and English.

Following the FGDs, respondents were invited to volunteer to participate in In-depth Interviews (IDIs). This approach was followed because during the pre-testing exercise, respondents had expressed reluctance to publicly discuss gender issues. During the IDI, detailed information about the respondents' thoughts and behaviors or wants towards tabled topics were captured with a focus on their own experiences at household level. Prior to the interview, respondents also had the opportunity to further engage with the RAN innovators for questions and/or a feel-and-touch.

During mobilization of the study, it was agreed on the need to conduct Key Informant Interviews (KIIs) with a focus on respondents that were responsible for addressing agriculture and/or gender at district level. Like with the IDIs, the interview began with exposure to the RAN innovations and the opportunity for questions plus a feel-and-touch exercise at will.

3.1.2. The study environment

Given the nature of the study, it was imperative to ensure sex-disaggregated data collection and engagement. Prior set guidelines enabled this. At the registration desk, the sex of the respondent was captured and each respondent was given a special identification (ID) number that also reflected their sex. These ID numbers were indicated on the cards used for responses. Furthermore, during FGD registration, each respondent was given a marker whose colour was based on their sex. This was handy in discussing the gender roles during the sessions.

To facilitate interaction of the respondents with the innovations, the study had supported the innovators responsible for each of the three RAN innovations to travel and personally engage with the study respondents. Group activities were also used to keep the FGD discussions alive and fun.

3.1.3. Training of research assistants and tool pre-test

The study engaged ten Research Assistants. A key element in their mobilization was that they had prior familiarity on gender issues in the community and innovative solutions for rural

development, and that they were knowledgeable in data collection and the use of participatory methods. The Research Assistants had two days of intensive training to ensure accurate data was collected to help inform the process of refining RAN innovations for gender responsiveness. The first day of training was for the Research Assistants to know the Gender Assessment Tools and exercise how they would apply the tools while in the field. The second day of training was conducted following the tool pre-test exercise so as to ensure the research team could ably apply the updated version of the Assessment tools.

Before the field assessment of the gender responsiveness of the RAN innovations, pre-testing was conducted in Mukono district. The aim was to ensure that the data collection tool was aligned to meet the objective of the assessment. Mukono was selected due to close proximity to the RAN office in Kampala and being an area where WOUGNET had long time engagement with women farmers. The pre-testing team included the ten Research Assistants and the three RAN innovation teams, which also provided an opportunity for further training of the Research Assistants.

3.2. Data analysis

All data used in the study was obtained from the responses in the field except for excerpts that will appear as quotes in this report, aside from the literature overview. A data analyst was engaged in addition to ensuring adequate space and time to eliminate technological and sudden loss of data. A Co-Creation Workshop and Dissemination engagements including radio shows and meetings were used to validate the study findings.

3.2.1. Data analysis methods

The assessment of the gender responsiveness of RAN innovation conducted in four districts of Kole, Apac, Lira and Oyam generated, 68 transcripts: 16 Key informant transcripts, 16 IDI Transcripts and 36 FGD transcripts. The analysis of data was conducted at three levels – on-spot analysis conducted by the moderators during the interviews as well as a thematic analysis of the transcripts. All transcripts were given a unique identifier that would ensure that the sources of information were concealed, and any text within the body of the transcripts with identifying information like names was removed before coding and analysis.

The thematic analysis of the data was informed by the study objectives. Furthermore, integrating insights from a variety of sources and interpretations enabled the researchers to

build a deeper picture of the study variables for instance, unearthing the societal perceptions around phone ownership and use and how this is likely to affect use of M-Omulimisa amongst men and women; gender roles and its influence on ownership and access of strategic resources needed to use the RAN innovations; perceived challenges of men and women and possible suggestions on how to implement the innovations in the four districts.

3.2.2. Ethical considerations

The study abided by the principles of Research Ethics and the National Guidelines for Research Involving Humans as Research Participants. Below were the ethical considerations for this study:

Informed Consent: Before any data collection activity commenced, the respondents received Consent forms. The purpose of the study was explained to the respondents, and in the local language, Luo. The respondents asked questions and clarifications, after which, they signed or placed their finger prints on the forms. Respondents retained a copy of their consent form.

Anonymity and Confidentiality: The study team informed the respondents that confidentiality would be maintained of all information collected. This was included in the Field Staff training, inclusion in their contracts, breach of which warranted disciplinary action.

Right to Withdraw: All respondents were informed that they retained the right to withdraw from the study, even after signing the consent form.

3.2.3. Challenges met during the study

The nature of the study was intensive given the short duration of the project. For the FGDs, this meant that respondents needed to be available for the day so as to effectively engage with the three innovations. The use of group activities were key in keeping the mood alive and fun for the respondents and the research team alike. Furthermore, the study was conducted during the hot/dry season in Northern Uganda, and so it was necessary to keep everyone well hydrated and energized for active participation in the discussions.

Given the gender focus of the discussions, some respondents were not comfortable engaging with research members they considered to be young. The average age of respondents was 41. So, while the team had been designed to allow for male interviewers for male respondents and

female interviewers for female respondents, as applicable, the age-related concerns had to be additionally addressed by switching designated interviewers who were deemed "too young" by a respondent.

Some of the FGD engagement with respondents required that views were written down. However, not all respondents could read and write. These were paired with other volunteering respondents who wrote their views. It was time consuming, but worked well at the end of the day. Also, during the Housekeeping sessions, among the rules of the day was that 'writing was not a pre-requisite to participate in the study' and that as needed, respondents would be paired with those that can write more ably because all responses were extremely important. This made them at ease with the exercises but there is also the possibility that it could have led to self-moderating of their views.

For the innovators, access to inputs for their demonstration was not always obvious even while data collection was done in either hotels or community centers. This was due to the largely rural settings in which the engagements were conducted. For example, some locations did not have running water and yet water was needed by the Low-Cost Solar Irrigation Pump and the Mushroom for Mushrooming Livelihoods innovators. The research team solved this by hiring persons to bring water specifically for these two innovations.

All in all, it is important to note that the challenges presented above did not in any way affect the quality and quantity of information collected.

4. Study findings of the gender assessment

The study findings are a reflection of the perceptions and experiences of the respondents. A key variable in the study was to assess the gender responsiveness. As such the findings are presented primarily in relation to "gender".

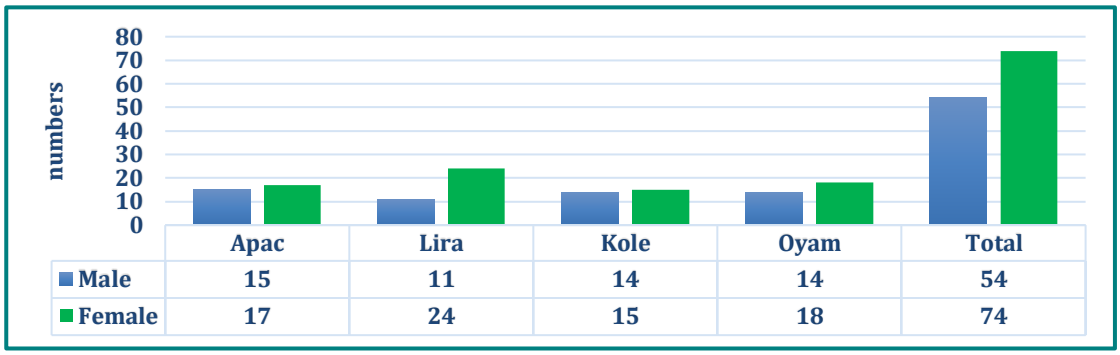
4.1. Demographics of study participants

While the focus of the study was on women farmers and their access to CSA-related innovations, it was important to include both men and women in the assessment. The following sections share the demographic profile of the study participants.

4.1.1. Gender composition of study participants

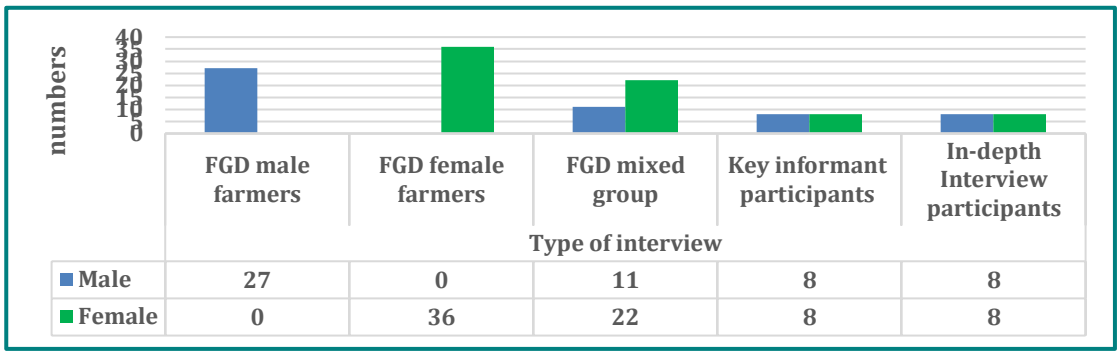
The study had 128 respondents with 74 females and 54 males. The project targeted having more females participate in the study than the men, with a preferred ratio of 60:40. While the same number of respondents was targeted in each of the four districts, varying levels of availability meant that there were different numbers of participants in each district. Nevertheless, in all cases, there were more female than male participants engaged. For the IDIs and KIIs, the gender was balanced.

Figure 1. Sex of respondents by district



	Apac	Lira	Kole	Oyam	Total
Male	15	11	14	14	54
Female	17	24	15	18	74

Figure 2. Sex of respondent per study method used



	FGD male farmers	FGD female farmers	FGD mixed group	Key informant participants	In-depth Interview participants
	Type of interview				
Male	27	0	11	8	8
Female	0	36	22	8	8

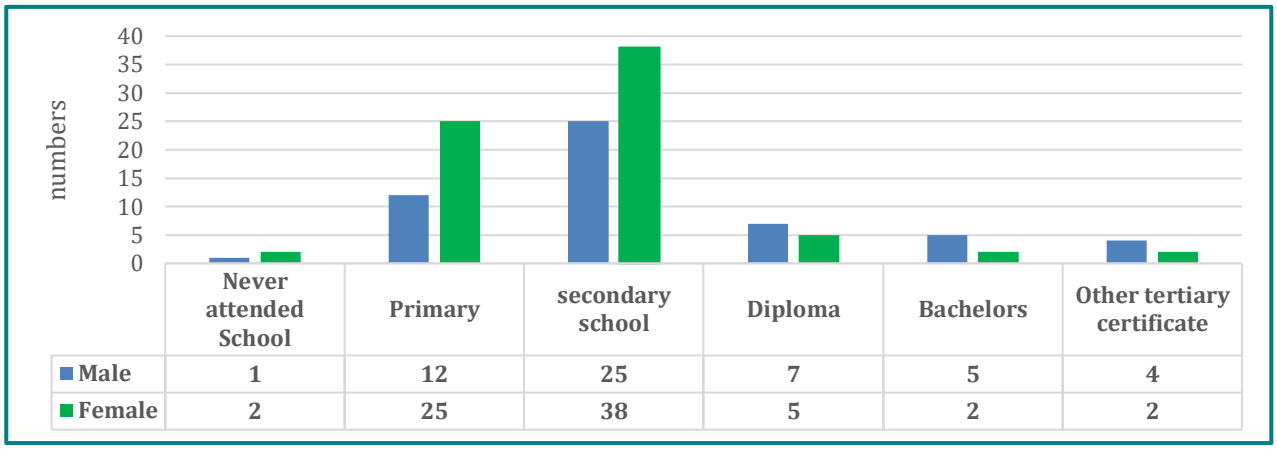
4.1.2. Education level of respondents

Across all the districts, most of the respondents had attained at least “secondary school” for their education. While level of education was not a key determinant in the study, it does help explain why most of the respondents were comfortable with both discussions as well as written responses, as needed.

District	Highest education attained by respondent						Total participants
	Never attended school	Primary	Secondary school	Diploma	Bachelors	Other tertiary certificate	
Apac	2	2	16	4	5	3	32
Lira	1	16	15	2	0	1	35
Kole	0	13	14	2	0	0	29
Ovam	0	6	18	4	2	2	32
Total	**3**	**37**	**63**	**12**	**7**	**6**	**128**

Of the respondents that have ever been to school, 57.6% were female, leaving 42.4% as male. However, it can be observed that more males than females had received education beyond secondary school levels.

Figure 3. Highest education attained by respondent by sex



Source: Primary data

4.1.3. Marital status of the respondents

The study targeted to have at least 75% of the respondents as "ever been married". The definition for "ever been married" encompassed those who were still married as well as those who were separated, widows and widowers. However, it was deemed vital to include persons that also were of the marriage age, but not married. The rationale for "ever been married" was that such respondents would be expected to have more decision-making responsibility by virtue of their age irrespective of sex. It was thus envisaged that these would give an independent view and enable further discussion.

Category of participants	Marital status of respondent				Total participants
	Married	Never Married	Divorced / separated	Widowed	
FGD male farmers	23	4	0	0	27
FGD female farmers	25	8	0	3	36
FGD mixed group	25	5	3	0	33
Key informant	14	2	0	0	16
In-depth Interview	13	2	0	1	16
Total	100	21	3	4	128

4.2. Ownership and usage of RAN innovations amongst women and men farmers

The first study objective was to evaluate ownership and usage of the RAN innovations among women and men farmers. Participants were asked whom among men and women would own and would use the RAN innovations most. Responses revealed that the men would have ownership of solutions perceived as assets, the M-Omulimisa and the Solar Irrigation Pump. In terms of usage, women were expected to use the innovations more except for the mobile phone – a reflection of the perception that men are better suited to asset management.

Culture puts women under the men, this explains why men would own the innovation. In addition, culturally men are the head of the family and they control all family assets... **Apac District_GB_KII_1 Respondent 30**

The Mushroom for Mushrooming Livelihoods would be owned by women because food production activities were deemed the responsibility for women. Furthermore, if a woman had to leave the home, she could easily pack her mushrooms and go with them without affecting family resources.

A woman will own it because mushroom will provide an additional source of food in the family. So, anything to do with food men are less concerned about and they take it as a woman's responsibility to have it... **Apac District_GB_IDI-Code 16**

Men think women are only brought to a given family and a time they are regarded as a man's asset or property and they can be chased away or a man can even decide to marry another one and this explains why most women do not own most family assets. **Apac District_GB_KII_1 Respondent 30**

Figure 4. Ownership of RAN innovations

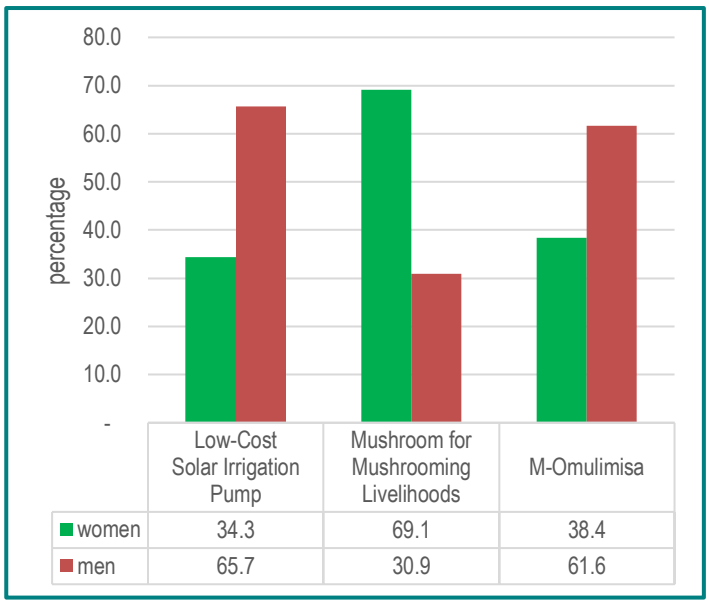
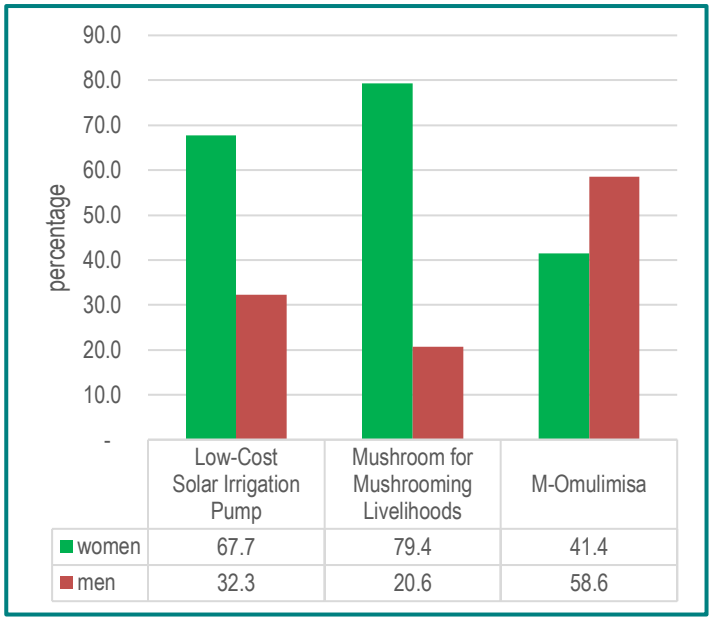


Figure 5. Usage of RAN innovations



The discussion on ownership and usage of the RAN innovations highlights key issues in addressing gender equity in the development and implementation of the innovations:

Access to and control over resources remained steeped in cultural norms in spite of the potential the RAN innovations would have for climate smart agriculture. While there is an anticipated increase in household income, even for the Mushroom project that would be owned and used primarily by women, there is still the expectation that women may not be capable of managing the market.

I think men should own it since it raises money when people come to get it freely, a woman should be in position to tell them I can't give it free unless you ask the owner who is my husband. **Oyam District_FGD Men only Group_Mushroom**

While the innovations were appreciated for their potential benefits, men were deemed to have better exposure and skills to manage new technology and innovations.

Most of the time it is easy for the men to manage especially when a project is still new which sometimes the women may not understand it, for you to make a woman understand, it needs a

man who is the head of the family to have time to make her understand. **Lira District_FGD Men Only_M-Omulimisa**

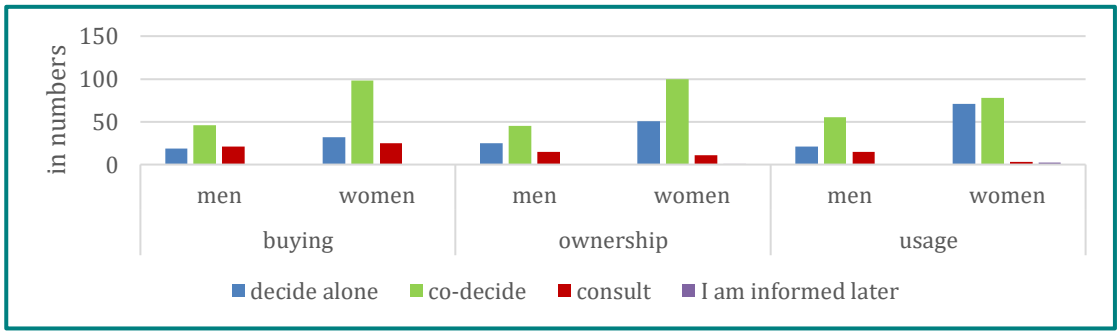
The level of illiteracy in most rural setting give men more opportunity to own the phone compared to the women. For instance, for one to access or use this innovation there steps you have to follow that is SMS application which most women do not know how to use. **Apac District_GB_KII_1 Respondent 30**

Men quickly learn and when it needs maintenance men are better placed. **Kole District _SP_KII Code 1**

4.3. Level of participation of men and women in decision-making for RAN innovations

The second study objective was to determine the level of participation of men and of women with respect to ownership and usage of the RAN innovations. Decision making in a home is crucial and especially when deciding which gender buys, owns and uses the innovations adopted in a home. While the farmers indicated that decisions were largely decided upon jointly but under the leadership and guidance of men. In all cases, whether buying, ownership or usage, women's views on decisions having been reached at jointly was not matched by a similar view from the men.

Figure 6. Participation in decision-making regarding RAN innovations



Once again, the cultural context of the innovation's application took precedence over the potential CSA benefits that could be realized.

In the Lango tradition women are not supposed own property though there has been advocacy done on this but still culture remains of great value here, so men are the owners of resources here and in terms of decision-making men will always have a higher level. **Apac - SP_KII 2Respondent No 19**

We need to be submissive to the authority of the head of the family who is the man. **Kole District _SP_IDI female code 02**

The discussion on decision making about the RAN innovations highlights key issues in addressing gender equity:

Development and implementation of the innovations needs to address agency and opportunity from the initial stages. Otherwise, without inclusion of their perspectives, women who do remain the majority in agricultural production will remain constrained!

In my community women don't have voices when it comes to decision making and in case you feel you should also give your views we are always shut up by the men. In fact, I don't know whether it's a punishment to women by God to put women under the men thus rendering women powerless in most communities. So, when it comes to buying the solar pump men would decide alone. **Apac District_GB_KII_male Code 30**

I decide on my own because since I am the owner of the house, the chief, so I would tell my wife after. **Lira District_Mixed Group 1_M-Omulimisa**

Limited access and control by women to benefits and proceeds from enhanced agricultural production could affect the motivation and willingness of women farmers to invest the time and resources necessary for successful uptake of new technologies, practices or innovations. Men are primarily responsible for decision making over the proceeds from agricultural production. This power is exercised during the harvesting, sale and allocation on how the finances from sale of agricultural production are used at household level. However, there are

also cases reported by women where the men have abused this power by spending all the money from sale of agricultural produce on drinking alcohol or even end up chasing the woman after the crop harvest.

The man has the authority because he can decide to go and sell in the market without asking the wife. **Lira District- FGD Mixed Group_Mushroom**

The men will benefit more from the solar because the ownership belongs to them and since they have strength they will handle the use in the farm. They will also benefit from the results and proceeds from the garden. **Kole District _SP_KII Code** 1

Both men and women will be responsible for the mushroom innovation though women will take an upper lead in the management and greater role during mushroom farming since they are the lead income earners in the family. When it is management of the proceeds from the farming then men will take an upper role. **Apac - SP_KII 2Respondent No 19**

The men use money for school fees, soap, and sugar and also the money for clearing the garden and that's why they think money should be with them. **Kole District-FGD Women only-Mushroom**

I will need financial help from my husband especially in buying other necessary items need in the business. **Kole District _SP_IDI Code 02**

There was also a perspective raised on the need for co-decision making as a means of avoiding gender-based violence. A connection between decision making and gender-based violence was made by both male and female respondents.

We do co-decide with our wives in order to avoid domestic violence. **Oyam District_FGD Men only Group_Mushroom**

If you don't consult a man before buying the phone, it brings fights in the home. And even the money am going to use for buying that phone, I will ask my husband. **Lira District_Mixed Group 1_M-Omulimisa**

If you leave your wife out, she will not accept to support the programme because she will claim she is not aware of it and she may stop children from helping in the activity. **Lira District-FGD Men Only_Mushroom**

The only security a man has with his wife and family is co-deciding, once they mess it up the whole family is gone. **Oyam District_FGD Men only Group_Mushroom**

Never mess your family by taking decisions on your own all the times otherwise your wife will bring confusion by telling children not to work. **Oyam District_FGD Men only Group_Mushroom**

We are farmers that is why we will not be having fights over what we farmed because men take it for sale after harvest and does not disclose the amount they got to you. **Lira District_FGD Women Only_Omulimisa**

Men have violated women's rights and even though a woman may have the money, mostly if you got it together, he can chase you away. They say women do not have rights and it is them who are the heads of the family. **Lira District_Mixed Group 1_M-Omulimisa**

Men are jealous with their women when it comes to phone use with the view that if they allow their women or wife to use phone all the time she would use the phone to communicate to the lover. **Apac District_GB_KII_1 Respondent 30**

Consultation remained key for decision making even in women-headed households. In such cases, women consulted with their children or other family members.

My children are educated. Also it is important that in terms of information and knowledge, we should sit with our children down and that is why I co decide with my children. **Lira District_FGD Women Only_Omulimisa**

At my home, I am alone because my husband died. So in decision making of buying, it is me who decides because I am the head of the family. Therefore, we sit down and tell my family what we are supposed to do. **Lira District_FGD Women Only_Omulimisa**

I wrote 'family members' because my children goes to school but when they come back home and I want to buy the phone, I should first sit with them down and we buy because the money that I would use to buy the phone, it is even them who helped me to get it. Widowed female, **Lira District_Mixed Group 1_M-Omulimisa**

If I want to do something since I stay at home with children, I should first tell them that I want this and then we sit with them down on a family meeting then we discuss and if they allow me to do it then I would do it because their father isn't available. **LIRA DISTRICT_MIXED GROUP 1_M-OMULIMISA**

4.4. Key success factors for adoption of RAN innovations by women and men farmers

The third objective was to assess the challenges men and women would face in using the RAN agricultural innovations so as to identify key success factors for their adoption. Respondents identified potential challenges and/or barriers for adoption as well as possible solutions to enhance uptake of the three innovations showcased for the study.

Across the three innovations, four key challenges were identified. These were cost, skill, cultural norms and expectations, and technical requirements for utilization of the innovations.

Most of the money I get is spent on school fees and beside some innovation, for instance, solar pump the price is high compared to what I earn from farming. Thus to buy then I have to save money for 2 or 3 years. **Apac District_GB_KII_1 Respondent 30**

If seen by fellow men gathering rubbish for use in mushroom production, they might think that I am a mad man. **Oyam District_FGD with men only_Mushroom**

Most of our women in the village are not educated whereby while doing the connection, they may be shocked with electricity, so it needs a man to connect and work with it. **Apac District-FGD Men only_Solar pump Innovation**

The perspectives above are consistent with the literature that identifies gender as a significant factor that affects innovation performance. If men are assumed to be more innovative and trainable than women, women farmers may be disadvantaged if no deliberate interventions are made to engage them in innovation uptake. The following tables present proposed solutions identified by respondents in support of increased uptake of the innovations by both men and women farmers. Key success factors emerging from the proposed solutions include:

Institutional structures to promote access to finance and markets. As a starting point, grants or subsidies could be made available to women farmers directly or through village saving groups could ease access to finances.

The need for new technologies, approaches or innovations to pitch themselves to include both direct benefits for enhanced agricultural productivity e.g. yield increase as well as gendered benefits such as new opportunities, skills development and diversification, addressing the time burden particularly for women farmers, and strengthening resilience at community level.

There is need to engage men and women to transform their attitudes to see the different roles across the agriculture value chain from production to marketing as equally good for men and women. Sensitization of the community and women would provide a supportive environment for men to take part in all activities across the value chain. This would include identifying men who can be showcased as role models to other men.

There is need for awareness creation targeting men and boys to highlight the positive values of ICTs as tools for communication and connectedness in their communities. This would be so as to address their concerns about women misusing ICTs.

Table 1. Proposed solutions to increase the uptake of the low-cost irrigation pump innovation

Issue	Submissions by men	Submissions by women	Solutions proposed by respondents
Cost	Buying costs for the technology was deemed expensive for them to afford.	Most women have limited access to finances and so might not be able to buy and maintain the pump.	Farmers to work with other agricultural institutions to identify opportunities of accessing the solar pump with lower interest loans.
			There is still need for affirmative action to improve access to credit facilities and technology among women farmers.
			Work with locally available structures like the sub-counties to ensure spares are locally available to the farmers
	There are a few water sources available at community level. The distance between the water sources and the farms may increase the price	There are a few water sources available at community level. The distance between the water sources and the farms may increase the price	Farmers to pro-actively establish more water sources at household level or work within their groups to establish water sources to support irrigation farming
Skill	Need for training to obtain skill to maintain the equipment.	Lack of skills in operating and maintaining the solar pump	Support training of men and women, boys and girls in operating and maintenance of the solar pump.
			Training on use and maintenance of irrigation equipment should focus on empowering households to support in operating and maintenance of the equipment.
Culture	Fear of equipment for instance the wires might be seen as risky for women. In fact, some of the participants indicated that its men who are supposed to be close to wires.	Culture restricts women to access and own strategic assets and resources	Programs need to address negative aspects of attitudes and behaviors, roles and responsibilities in farm work.
			Deliberately provide incentives to enable more women access and own the solar pump
			Women and men to negotiate household roles and support each other
Behavioral aspects	None	High workload on women at household level might affect effective use of the solar pump. The men still have a poor attitude towards work, preferring alcohol, playing games like *mweso* and spending less time in the garden.	Innovators to develop components that are lighter for the women if they are to be able to fully harness the benefits from this innovation.

Others	None	The components of the solar irrigation pump are heavy to carry for the women. for instance, the battery and the solar panel are seen as heavy to carry by women.	The innovation be redone using materials that do not make it heavy.

Table 2. Proposed solutions to increase the uptake of the Mushroom for Mushrooming Livelihoods innovation

Issue	Submissions by men	Submissions by women	Solutions proposed by respondents
Cost	No submission	Limited access to finances to start up the project. The women observed that they are still constrained economically and might need support to mobilize start up resources for mushroom growing.	Agricultural institutions and development partners should link women farmers to financial institutions that can provide finances to women given their limited ownership of assets
Skill	No submission	The innovation is labour intensive for instance, collecting locally available materials to be used as substrates might be tedious and time consuming given the fact that women have other competing household activities.	Women farmers should involve other members of the family to help you in collecting the materials and management of the mushroom project, this should be able to release some time for them to handle other household activities.
Culture	Communities perceived wood gathering, selling of food items like mushrooms as activities for women. These definitions of roles are deep rooted to the extent that a man might be perceived as a mad man in case he is seen carrying mushrooms to the market for sell.	No submission	Respondents noted that men can intentionally involve the household members in the management of the mushroom since they are usually not available to monitor the project. A

Behavioral aspects	The men are never at home, this makes it hard for them to start planting mushroom, and also collecting the items required might be difficult for them. The men also don't have the time to monitor the project because they are never home	No submission	Men to work with family members to identify what roles they can engage in when it comes to supporting in preparation, harvest, processing and marketing of mushrooms.
Inputs	No submission	Access to farm input like the mushroom seeds locally will be hard since there are no community retailers or agents where the farmers can procure from.	The innovators should work with agro-based retail outlets available locally where farmers can access the seeds within the district.

Table 3. Proposed solutions to increase the uptake of the M-Omulimisa innovation

Issue	Submissions by men	Submissions by women	Solutions proposed by respondents
Cost	Maintenance of the mobile phones has cost implications	No submission	Loans obtained to buy the equipment
Skill	They have limited knowledge on how to fully utilize the platform	Limited involvement of women in community activities like community meetings and trainings. This has limited their access to information, knowledge and skills.	Training given to the farmers that buy the equipment
Other	No submission	The groups observed that men are likely to resist the innovation because it equips the woman with a powerful communication tool which can be misused for other non-farm purposes including promiscuity and gossiping.	No solution given

4.5. Short-term and long-term climate-smart agricultural benefits of RAN innovations

The fourth study objective sought to apply the climate smart agriculture framework to respondents' perspectives and discussions. Five dimensions were considered, namely, (1) affordability, which was further split in 'ability to buy the innovation' and 'ability to maintain the innovation'; (2) ease of use; (3) environmental sustainability; (4) result oriented to the farmer; and (5) addresses resilience.

4.5.1. Affordability

While only the Mushroom and M-Omulimisa innovations were considered affordable to buy, all three innovations were deemed affordable to maintain by both male and female respondents.

It can be affordable because (a) we have been suffering from the sunshine yearly and there was little we were getting from agriculture; (b) men are always the heads of the household therefore have access to all household resources. **Female respondent**

The men have the money and can easily afford to start the mushroom innovation, the seeds are also not expensive to buy. **Oyam District_FGD Men only_Mushroom**

Figure 7. Affordability to buy the RAN innovations

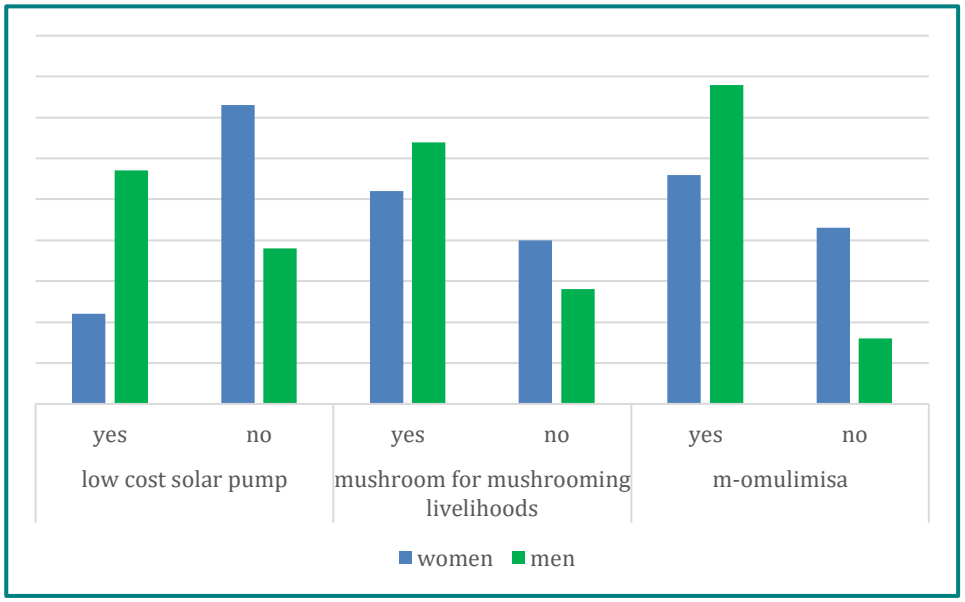
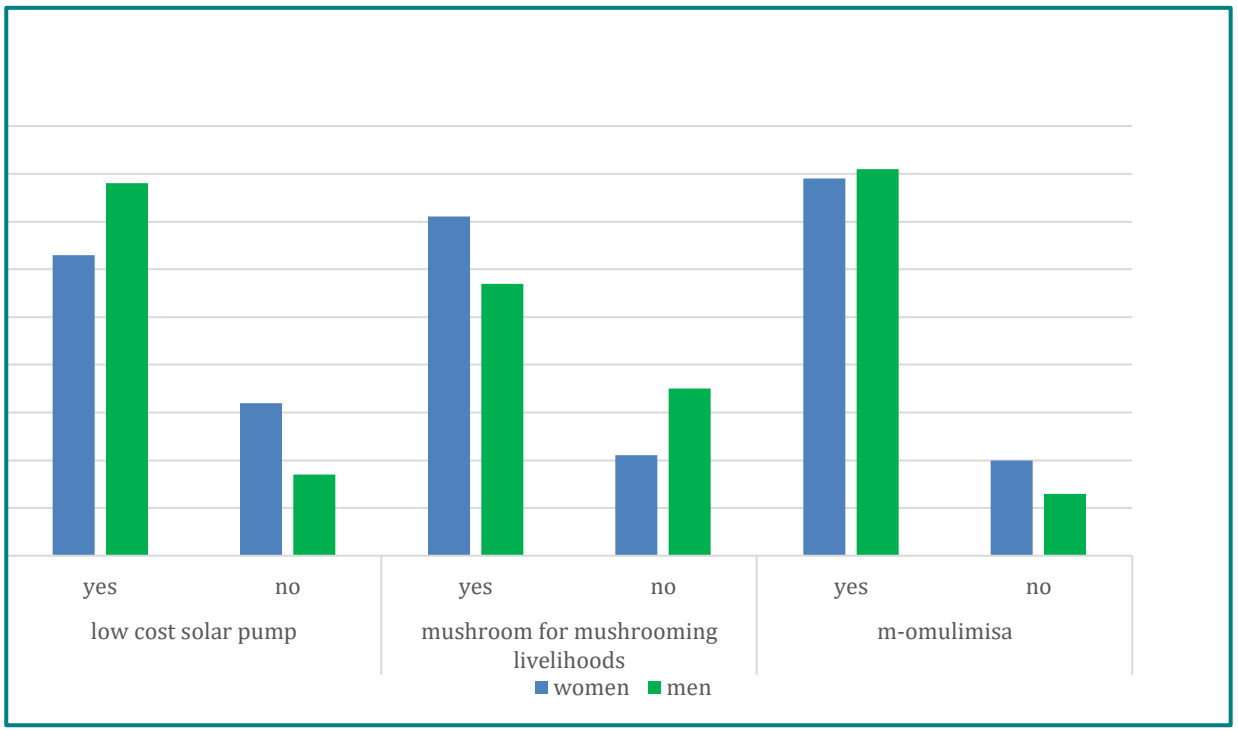


Figure 1: Affordability to maintain the RAN Innovations



Since ‘access to money to buy the necessary equipment or materials’ was a strong pre-requisite, the farmers were further probed to share the varying ways they can access money to finance activities. Key sources of funding identified were: ‘sale from the farm’, ‘loans’, ‘salaries, pensions and wages’ and ‘non-farm activities’ such as shops and market stalls. The majority identified the source of loans as Village Saving Loan Associations (VSLAs), Bank

Loans and/or Savings and Credit Cooperative Organizations (SACCOs) – with VSLAs being most preferred. For both men and women farmers, the top three finance sources mentioned were sale from the farm, non-farm activities and loans – though women would largely need consent from their husbands in order to access any funding sources.

4.5.2. Ease of use

The issue of ease of use was considered from two dimensions, namely, application and management of the innovation. All three innovations were deemed easy to use but training ranging from 3 – 5 days would be required to ensure proper utilization. The ease of use was also expected to make farming more appealing too which could lead to more male and youth engagement in what is traditionally considered a women's domain of food production. Furthermore, the type of crops that are cultivated by farmers is likely to change with more farmers likely to grow more crops especially vegetables during the dry season. This in turn would result in increased incomes for the family.

When we get this pump and we have maybe planted vegetables which need water, instead of you going to fetch water then pour in the watering can, you just put on the switch and it sprays everywhere. **Apac District-FGD Men only_Solar pump Innovation**

However, concern was also raised that ease of use could increase the work burden for women since men would believe them to be capable of handling all the farm activities on their own. For example, where men were responsible for water for irrigation, this role could revert to women. Also, during the initial stages of growing the mushrooms, men are likely leave it to be managed by the women, however, the men are likely to get more involved when the money starts to be realized by the women.

The solar pump will make farming look very interesting. The children, women and entire family will find farming interesting. The women will like to do the practice, spray water in the garden, look after the crops and it will ease their work because they will know that in the shortest period if I plant my vegetables they will grow. Whereas in the past, if I plant vegetables and the weather is not good, they wither and die... **Apac District-FGD Men only_Solar pump Innovation**

For the case of the mushroom innovation, the innovation is more of women activities since it involves food production and in most cases men may decide to leave it for women with a notion that it is a women related activity. **Apac District_GB_KII_1 Respondent 30**

Respondents were also asked about ease of management for the innovations, and whether they would be better suited for management at the community or at the household level. Given the ease of use, in general, there was a preference for management at the household level.

It can be well managed at family level because they can agree on the tasks and manage the business. Mushrooms still remains a household business for the women and to some extent the community may manage well if it's a very big initiative... **Kole District _SP_KII Code 1**

Now the community, when it comes to things of spares and repairs, they will start thinking of the government. Because it will be seen as a public good like boreholes and if it gets spoilt, they wait for the government to go fix it... **Lira District-FGD Men Only_Mushroom**

It should be at house level and households will be accountable and maintenance can be easy. Many hands can destroy assets and conflicts are bound to arise and fights on who should use and how it's used can arise; this will make the enterprise to fail easily... **Kole District _SP_KII Code 1**

I am with my wife, I can share it with my wife and with my children because if I take it out people will just spoil it. **Kole District_Men Only_Solar Pump Innovation**

There were some perspectives in favour of community management, and these cited reasons such as information sharing and networking, collective bargaining power, and the opportunity to collectively mobilize farming inputs.

At the household level for instance we have been called for the training only a few of us and some will not be willing to share information but if an office is established in the community, everyone can use and access it... **Apac District-Men Only-M-Omulimisa**

Group members can also contribute money for buying seeds at the start and managing hard work since many people are involved... **Oyam District_FGD Womens Group _Mushroom**

Of note is that the case for collective management of the innovations was favoured due to an anticipated increase in agricultural productivity. However, issues of maintenance and equitable access would need to be addressed to ensure that any switch in gender roles that may arise does not lead to increases in the work burden for women or men farmers.

4.5.3. Environmental sustainability

There was a general perception that all three innovations were environmentally friendly. However, there was also concern raised that by facilitating diversification into different crops the innovations could lead to endangerment of indigenous crops. Farmers are likely to abandon traditional crops for the mushroom and other crops that are likely to take a shorter time to mature and realize money. There could also be degradation of the environment as farmers seek access to water for the solar irrigation pump.

It is also easy to cultivate so other farmers might choose to leave crops they think it takes a long time…. **Oyam District_FGD Men only Group_Mushroom**

"The Mushrooming Livelihoods activity requires chaff, and where there is lack of farm chaff, the farmers will be tempted to encroach on trees and other crops. This could happen during the growing of their crops when they have no farm chaff."

"Low-Cost Solar Irrigation Pump requires digging deep in the ground to access water, thereby bringing to the surface the infertile soil and mixing it with the more fertile soils "

4.5.4. Results oriented to the farmer

Key results of the agricultural innovations were in enhanced agricultural production as well as perceived opportunities for new ventures due to a reduction of time spent on farm activities. Both men and women farmers were confident of these results. The men even continued to indicate that the time saved as a result of use of RAN innovations would be used to increase crop acreage, plant other crops, engage in community activities and start up non-farm business.

It would give me time to plan for other things..... for instance if I maybe have farm there maize, it would give me time to plant some other thing like greengram and then also plan to rear my animals… **Lira District_Mixed Group 1_M-Omulimisa**

I will use that time to do other business ventures like selling in my shop, helping my family at home attending to community programs, and involving in church activities. **Kole District _SP_KII Code 1**

It could be that your garden may be affected by some pests or diseases where even me I can't identify that it is this or that that is disturbing my garden, so with that now, you will keep wasting time but according to this program, when you see what is happening to your garden, you just now text and within the shortest period of time you will get the feedback or the answer or the solution, so I believe that it is going to reduce on the time spent while investigating on what is disturbing us. **Lira District_FGD Men Only_M-Omulimisa**

Women farmers too indicated both farm and non-farm activities that they would be able to engage in. Their 'extra time' would be used for engaging in women group activities, growing a non-farm business, diversifying farm-based enterprises and teaching children how to manage RAN innovations.

I can start a business; inject the time in doing more farm activities in order to get more harvest. I would use the added time to meet the fellow women and we discuss issues that affect women and our community... **Apac District_GB_IDI-Code 16**

The other time can be used do other business like taking care of cattle, involve in doing small scale business. The added time can be used to rear chicken, and other income generating activities. Sensitized the women in our community... **Kole District _SP_IDI Code 02**

The innovations were also anticipated to expand their networks and engagement with a variety of actors including government, civil society and private sector. Such exposure would result in enhanced agricultural productivity, skills development and access to markets for both male and female farmers. Respondents cited that most training and sensitization of farmers in their communities as well as most community development initiatives are conducted by non-governmental organizations. In addition, the innovations and in particular M-Omulimisa was expected to expose farmers to private organizations through establishing networks for sale of their produce and through providing information on market prices for their produce.

It will expose us to civil society because of the existing projects in the community here are done by the civil society and they are still existing and benefiting the community … civil society are always concerned and seriously ensure that their projects can be sustained by the community and they benefit from it... **Lira District-FGD Men Only_Mushroom**

When you look at the community, you will find that, those who brought unity within homes are civil society, even when you go in the villages, you will find disabled persons having a wheel chair because of civil society... **Lira District_FGD Men Only_M-Omulimisa**

Because the way to connect is good and we can get fertilizers and farm inputs from M-Omulimisa fast so it can reduce on the time. **Male participant**, **Lira District_Mixed Group 1_M-Omulimisa**

Most of the knowledge [about innovations] is being got from here, and then when we go back, the subcounty [local government] will be aware that I now have a project and they inform

people to go and see how his project has succeeded. **Lira District_FGD Men Only_M-Omulimisa**

4.5.5. Resilience of farmers

Climate smart agriculture seeks to strengthen the resilience of farmers. Indeed, respondents acknowledged the role of the three innovations in addressing their key challenges of prolonged dry spells as well as pests and diseases. The solar irrigation pump was seen to enable farmers continue production especially of vegetables during the dry periods, the mushroom innovation would be a source of food and income throughout the year, and the M-Omulimisa would improve their access to extension services like access to quality seeds, pesticides, and competitive markets.

[the low-cost solar irrigation pump] can increase the yield because this type of farming even if there is no rain you can still do your farming and get the yield. For example, where I come from people like growing tomatoes so if you are using irrigation can help a lot and the good part is you do not do it in a large space. **Lira District_GB_IDI- Code 25**

When there is calamity like drought and you have this one [solar pump], you will still be harvesting and you will even be selling to the community since they do not have. Like vegetables. You can even sympathize as a Christian and give them for free. **Apac District-FGD Men only_Solar pump Innovation**

In case calamities like drought or hailstone destroy my crops, the community will stand with me and also they will give loans in terms of seeds. When I get such loans, I can become rich faster compared to someone who got a loan from the bank. For instance, if I plant mushroom, after 2 months, there will be food and I will become rich. **Apac District_Mixed Group 2_Omulimisa**

When there is an outbreak of pests and diseases, then you can text [M-Omulimisa] and find appropriate measures for handling pest and seasons. During time of calamity like famine, you

can use the [fast-growing] mushroom for feeding your family. These innovations can help keep people going when problems strike, they are solutions that are not complex [to implement]. **Apac - SP_KII 2Respondent No 19**

In case of too much drought and now if maybe we have registered on insurance [via M-Omulimisa], it would help us by paying us back on our lost things. **Lira District_ Mixed Group 1_M-Omulimisa**

In addition, there was the view that resilience would not be only in agricultural production but in behavioural change. Of note, was an expectation for the reduction in gender-based violence.

It is going to generate money in the hands of women that will help them solve their social problems and it will also help to solve violence in the home because when poverty is in the home there is quarrel because the needs of women are not fulfilled. Through this innovation [m-Omulimisa], women will learn how to manage farms and hence have high yields. **Apac District-FGD Men Only-M-Omulimisa**

4.6. Validation of study findings

The study findings were validated by way of a Co-Creation Workshop that was held in Apac District followed by community dissemination meetings held in Kole, Lira and Oyam districts. The aim of these workshops was to inform stakeholders of the findings from the study and to conduct in-depth discussions with the participants on practical recommendations that would improve each innovation to a level that the farmer would adopt and use productively. The workshops were attended by respondents (including farmer representatives, community and district leaders) selected from each of the four districts of the study. Also present were persons from the District Agricultural Offices and commercial farmers.

Picture 1. Co-creation workshop participants validate the study findings

Source: WOUGNET

Participants at the workshops affirmed the following key areas to be addressed in order that agricultural innovations can promote uptake and contribute towards equitable access and control of agricultural resources and benefits: affordability, education to reduce gender gaps in literacy, training on use and management of the innovations – including the option of establishing a demo site, multi-stakeholder engagement to address access to water, and sensitization campaigns to address socio-cultural barriers for women farmers in particular.

5. Conclusion

Three RAN innovations were exposed to farmers, majorly women, from four districts of Northern Uganda – Apac, Lira, Oyam and Kole – with the aim of realizing their gender responsiveness in relation to usage, ownership, participation in decision making, and benefits of Climate Smart Agriculture. The Low-Cost Irrigation Solar Pump was embraced by farmers as a practical solution to address their adverse and unpredictable climate. However, it comes with cost implications that the farmers cannot afford on their own. The Mushroom for Mushrooming Livelihoods innovation presented farmers with an income generating activity that seemed lucrative because farmers can produce the mushrooms all year round. However, it had a cultural tag of being considered an activity for women only even while it also was made

clear that men control the farm sales and determine the apportioning of the money earned. M-Omulimisa was considered a much-needed source of information; and with timely information, farmers can address a seeming challenge before it goes out of hand. They can even learn higher value farming methods. However, a gender-biased tag crawls in when men declare that a woman is not supposed to carry a mobile phone. Though this is changing, those that own it are closely monitored. The farming communities still perceive technology ownership as solely for the men.

The general objective of the study was to assess the gender responsiveness of RAN Innovations using the Climate Smart Agriculture approach. Families are evolving towards development and are willing to embrace new technologies, practices and innovations in their pursuit of enhanced agricultural productivity and new opportunities. While the majority of the respondents had not used the innovations prior to the assessment, the use of a demo technique meant the participants had a chance to see the innovations at work and engage with the respective innovators ahead of the assessment. The following table summarizes the results with respect to the key study objectives in terms of in usage, ownership, decision making and benefits for the innovations.

	Men	Women	Comment
Ownership	Men would have ownership of solutions perceived as assets, the M-Omulimisa and the Solar Irrigation Pump	The Mushroom for Mushrooming Livelihoods would be owned by women because food production activities were deemed the responsibility for women	Access to and control over resources remained steeped in cultural norms in spite of the potential the RAN innovations would have for climate smart agriculture.
Usage	Men would use the M-Omulimisa more since is it was mobile phone based	Women were expected to use the Solar Irrigation Pump and the Mushroom Project more	Men had a concern that women would misuse the mobile phone for social purposes instead of the intended CSA benefits
Decision making	Men led decision making and some would involve the family	Women indicated that decisions were largely decided upon jointly but under the leadership and guidance of men	In all cases, whether buying, ownership or usage, women's views on decisions having been reached at jointly was not matched by a similar view from the men. While a number of women reported decisions had been taken jointly, many of the men reported that they either took independent decisions or they led the discussions
Benefits	Men's work load would ease up since the innovations made farming activities such as collecting water easy enough to be undertaken by women Men would have more time to increase crop acreage, plant other crops, engage in community activities and start up non-farm business Men would realize increased family income from higher yields and productivity e.g. fast easy to grow mushrooms Reduced poverty in the home would help to solve violence in the home arising from conflicts due to men not being able to meet the needs of their wives and families	The innovations were considered labour saving and time saving Women would have more time available to engage in women group activities, to grow a non-farm business, to diversify farm-based enterprises and to teach children how to manage the innovations	Limited access and control by women to benefits and proceeds from enhanced agricultural production could affect the motivation and willingness of women farmers to invest the time and resources necessary for successful uptake of new technologies, practices or innovations. This is because the cultural context of the innovation's application took precedence over the potential CSA benefits. For instance, men would still take decisions over the benefit of increased income and may not necessarily put it towards improving the household's status. Instead they may put the funds towards e.g. drinking alcohol.

A clearly gendered view emerges from the assessment – to a large extent driven by socio-cultural norms and expectations related to issues of ownership, work, decision making capacity, and income generation and control. For instance, use of the innovations can reduce time spent on farming activities and can open up space to explore new opportunities. However, if gender considerations are not taken into account, such time could be used to negatively impact on the work burden for women farmers as it may be taken that the women are now free to take on new work – even that which would have been previously done by the men in their households. The assessment thus provides a good input for invention strategies to be developed mindful of the gendered effect of CSA innovations. Such strategies should necessarily involve both women and men farmers' perspectives in development and deployment of the innovations.

Key recommendations from the gender assessment study:

1. Include gender sensitization in the project design to challenge gender stereotypes that limit men from taking up innovations such as mushroom growing [as an example of what was considered an innovation related to "women's work"] as well as challenge norms that limit women's ownership and control of mobile technology and the solar pump [as examples of innovations that are technology oriented and hence deemed as only suitable for men].
2. Explore group and household ownership and maintenance of innovations encouraging choice amongst farmers depending on what promotes their empowerment while taking into account gender relations.
3. Development partners including government and the private sector should initially provide grants to especially women farmers who cannot afford the innovations and phase it out to ensure sustainability.
4. Community demonstration sites should be established to ease introduction of the innovations as well as to provide opportunity for communities to co-create application of the innovations based on their needs. The sites should be established with support from development partners and contributions from the community.
5. Encourage formation and utilization of Village Saving Loan Associations (VSLAs) by women and men to enable them afford to purchase the innovations. Link mature VSLA groups to formal banking institutions to access financial assistance to scale up operations.
6. Identify male and female champions and role models that support a gender balanced ownership and usage of CSA innovations.

References

[i] Nyberg AC. 2009. Making Ideas Matter. Gender, Technology and Women's Invention, Lulea University, Lulea

[ii] Blake M, Hanson S. 2005. Rethinking innovation: Context and gender. Environment and Planning A. 37. 681-701. 10.1068/a3710

[iii] McCarthy et al. 2012. Developing a Climate-Smart Agriculture Strategy at the country level: lessons from recent experience: Hanoi, Vietnam.

[iv] Amber P, Julia B, Quisumbing A. 2010. A review of empirical evidence on gender differences in nonland agricultural inputs, technology, and services in developing countries. International Food Policy Research Institute (IFPRI).

[v] The World Bank 2016. Agriculture Global Practice: Climate-Smart Agriculture Indicators.