

Farming methods and the livelihood outcomes of women in Eastern Uganda

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Farming methods are closely linked to the livelihood outcomes of women. The techniques of farming and the manner in which they are applied affects realization of livelihood outcomes. Even though rural women aim at attaining positive outcomes, their efforts are jeopardized by poor farming practices. This situation is exacerbated by gender disparities in knowledge and skills, inadequate access to productive resources and power relations. The current study aims to understand what kinds of farming methods women use and their contribution to livelihood outcomes. Using qualitative interview and survey as an auxiliary method, it was discovered that women predominantly use traditional farming techniques such as intercropping, crop rotation, cover cropping and integrated animal-crop farming. The major hindrances to the gainful use of these methods are knowledge gaps and resource disparities. Most women still grapple with low incomes, starvation, diet deficiencies, inability to access medical care and clothing. They are also vulnerable to climate shocks and stresses. The study concludes that the farming methods have inadequately enhanced income, food security, wellbeing and resilience to shocks and stresses. It recommends that agricultural extension services such as training programmes should consciously target equipping women with knowledge and skills on how to use the traditional and modern methods of farming and support them to access productive resources.

Key words: Farming methods, livelihood outcomes, women, Eastern Uganda.

Introduction

The application of different methods of farming is fundamental in boosting agricultural outputs and transforming the livelihoods of women. Globally, female farmers form the majority of those employed in the agriculture sector. They comprise approximately 43% of the world's agricultural labour force with these numbers rising to about 70% in some countries (Food and

Agricultural Organization (FAO) 2018; Ugwu, 2019). In Africa, an estimate of 80% of agricultural production comes from smallholder farmers who are mostly women (FAO et al., 2019; FAO et al., 2018). In addition, in Sub-Saharan Africa, women provide about 50% of the agricultural labour (FAO et al., 2018; Ugwu, 2019; World Bank, 2014). Farmers across the world use different

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modern farming methods like irrigation, chemical pesticides, fertilizers and high-yield seeds and, traditional farming methods such as intercropping, organic manure, fallowing, crop-rotation, agroforestry, cover cropping and integrated animal-crop farming (Adetoye et al., 2017; Farid et al., 2015; Mwangi and Kariuki, 2015; Singh and Singh, 2017; Zhang et al., 2018). Despite the availability of modern techniques, women are noted to use traditional methods which are supposedly obsolete (Tang, 2013). Nonetheless, other studies show that these methods contribute sustainably to food production when applied appropriately (Singh and Singh, 2017). Even though women dominate the agricultural sector, limitations to the utilization of modern and traditional farming methods continues to undermine their livelihoods.

The livelihood outcomes discussed in this paper are the aspirations that people seek to fulfill through livelihood strategies (DFID, 2000; Serrat, 2017). In another context, outcomes are described as 'the inverse of poverty' (DFID 2000). These outcomes include food security, income, improved wellbeing and resilience to seasonality. Moreover, it is intimated that livelihood aspirations are nonspecific but, may differ under unique circumstances with respect to place, time, context and the characteristics of individual farmers (DFID, 2000). With regards to women, it is observed that they practice agriculture with the intention to attain food security, fuel, water, clothing, shelter, education and medical care (Carr, 2013; De Haan, 2012; FAO et al., 2019; FAO et al., 2018; Lang and Barling, 2012; Ugwu, 2019). Regrettably, the majority have not achieved these outcomes as their agricultural yields are often low and are not commensurate to the labour invested (Ahammad et al., 2020; Kassie, 2017; Valdivia, 2019). This setback is attributed to the perilous challenge of poor soils, illiteracy, small land size, low incomes, climate change and gender power relations (Baba et al., 2015; FAO et al., 2018; Gebru et al., 2018; Ugwu, 2019). This impedes reasonable investment in agriculture through capital, inputs and labour (Baba et al., 2015; Ugwu, 2019). In spite of institutional interventions that target livelihood transformation, gender gaps in the utilization of traditional and modern methods of farming still persist.

It is uncertain if the traditional farming practices that women use have transformed agriculture into a more productive venture that can ensure food security, increased income, resilience to shocks and improved wellbeing. Besides, it is claimed that women have been trapped in an occupation with minimal returns on investment and with multiple inherent risks (Rao, 2014; Ugwu, 2019). Therefore, men seem to have thought it wise to withdraw their labour from 'unproductive agriculture' and direct it to other income-generating sectors of the economy. This aggravates women's predicament since they are left with very limited or no support from their male counterparts who are arguably direct beneficiaries of their labour. As long as limitations

to women's integrated-use of distinct farming methods exist, livelihoods remain poor (Hautala, 2013; Ugwu, 2019).

In the recent decades, studies have shown increase in food insecurity, illiteracy levels, vulnerability to seasonality and other uncertainties and low income levels among farmers including the women (FAO et al., 2018; Phungpracha et al., 2016; Sanders, 2006). In Eastern Uganda, high poverty levels alongside gender disparities in access to resources and women's heavy burden of providing for their families has exacerbated low income levels, food insecurity, misery and suffering among rural women (Balya, 2008, FAO et al., 2018 and Uganda Poverty Assessment Report, 2016). These challenges affect women's use of indigenous and modern farming methods (Kristjanson et al., 2017). Based on this, more studies should have been keen to interrogate the linkage between farming methods and livelihoods outcomes of women but this has not been the case.

Studies focus more on the general contributions of farming to the livelihoods of women (Farid et al., 2015; Gebru et al., 2018; Adetoye et al., 2017; Mwangi and Kariuki, 2015; Nkala et al., 2011; ChuanChuan et al., 2012; Serrat, 2017; Tal, 2018; Willer and Lernoud, 2017). There is little attention on how farming methods enhance or impede livelihood outcomes despite it presenting critical implications in development planning. If rural women appropriately employ the modern and traditional farming practices, it is expected that agricultural outputs would increase food security and agricultural surplus for income thus resulting to improved wellbeing. This paper asserts that if farming is the main livelihood strategy of rural women, it should be a means for gaining more income, food security, increased well-being and resilience to uncertainties. This explains why the study seeks to understand what farming methods women use and how these methods contribute to the attainment of livelihood outcomes in Eastern Uganda. The study objectives are to establish the methods of farming that women use in Eastern Uganda; identify the challenges that women face in using modern and traditional farming methods in Eastern Uganda; assess the contribution of farming methods to the livelihood outcomes of women in Eastern Uganda.

RESEARCH METHODS

The study used empirical data to understand how the farming methods that rural women apply enhance or impede the attainment of livelihood outcomes. Discussions that comprise the paper are guided by scholarly underpinnings on the nexus between farming methods and livelihood aspirations. These debates resonate around farming practices with regards to their contribution to income, food security, wellbeing and resilience to stresses and shocks. Limitations and hindrances to gainful use of farming technologies form part of our deliberations.

Other social, economic and political aspects of the research that contribute to the debate on farming practices and livelihood

outcomes are also incorporated in the paper.

Study area

The current study was conducted in Eastern Uganda and in two districts of Budaka and Kapchorwa. Four Sub-counties- Munarya, Chema, Tademeri and Kachomo- and a total of 8 villages- Irabi A, Nalugondo, Buberu, Bugade, Kapkosojon, Chekwi, Kabore and Chengwet- were selected for the study. This region, districts, sub-counties and villages are suitable because women farmers practice dryland, wetland and riverbank farming. In addition, the terrain and weather of these districts differ. Kapchorwa is mountainous with relatively low temperatures while Budaka is flat and has comparatively high temperatures. Moreover, they also cultivate different cash crops which often 'flare-up' gender contentions and contribute differently to household outcomes. Rice and coffee are grown in Budaka and Kapchorwa respectively. These contrasts permit the study to better comprehend how differently women practice agriculture as well as how the methods utilized distinctively contribute to livelihood outcomes. In this way, the nature of limitations and hindrances that women face in making use of the modern and traditional farming methods are further recognized. Also, Eastern Uganda is predominantly known for high levels of rural poverty and gender disparities despite interventions by different development actors to improve agricultural production through extension services (Balya, 2008; Uganda Poverty Assessment Report, 2016). Therefore, this region is fit for this study.

Data collection methods

We used mixed method – simple (Saunders et al., 2019). In this design, the qualitative interview method was more dominant whereas the quantitative method – survey was auxiliary. Qualitative interview method was applied to investigate farming methods and their contribution to the livelihood aspirations of women. This method permits us to conceptualize gender-related limitations, hindrances and opportunities for making use of the various farming methods. And, it also enhances understanding how different households have attained livelihood outcomes. Its major strength is in teasing-out the experiences of women in applying modern and traditional methods of farming and how this affects livelihood outcomes. Also, this is critical in interrogating what farming methods women farmers use and in establishing whether or not they contribute positively to livelihood outcomes.

A survey was used to substantiate qualitative results on the contributions of farming methods to the incomes of female farmers. This survey was research administered taking the format of a structured interview. It was useful because the majority of women farmers do not know how to read and write. In this way, we generated quantitative data on the relationship between farming methods and women's annual income. Female farmers were asked; 'what methods of farming do you use?' and 'how much do you earn from farming annually?'

Diverse participants from Budaka and Kapchorwa were involved so as to gain wide perceptions of what farming methods women use and their effects on livelihood outcomes. Heterogeneous sampling was used to recruit members relevant to the research question across a wide continuum (Etikan et al., 2015). While selecting respondents, we dedicatedly ensured that participants recruited engage in different farming systems (practice dryland, wetland and riverbank farming) and are of a mixed socio-economic class. In addition, diversity was considered with regards to gender, age, major production activities, farm size, topographic and climatic heterogeneities of location and administrative position in

government. For the survey, all women who participated in the FGDs and interviews took part.

Previous studies participants were directly or indirectly accessed. Direct access means that the researchers identify suitable participants contributing to the heterogeneous sample through online, personal or professional links. Indirect access denote that potential participants are suggested by a 'gatekeeper' like extension experts, Local Council I chairpersons or interviewed respondents who provide new contacts. However, in the case of this study participants were mostly recruited indirectly through extension officers who provided contacts of Local Council I chairpersons who then gave us the contacts of farmers. The study targeted people who practice farming, work directly with farmers and implement extension programmes. So, women and men farmers, agricultural officers and community development officers were interviewed.

A total of 119 respondents participated in this study. They were selected purposively. We had 20 face-to-face interviews with 20 women farmers and 4 interviews with key informants – agricultural officers and community development officers. We also conducted 4 focus group discussions (FGDs) with both male and female farmers and 68 research administered survey with female farmers who participated in the interviews and FGDs. The reason for combining genders was to elicit cross-cutting issues and general thoughts on how farming methods affect livelihood outcomes as well as verify and authenticate data collected from women. One focus group discussion at each of districts was held with a Local Government official so as to stimulate and check responses. The age range of all informants for this study was 17 – 70 years.

The involvement of all respondents in the interview, focus group discussion and questionnaire was voluntary with all responses anonymized. An interview guide and FGD guide with open-ended questions was designed covering livelihood concepts drawn from the literature. Questions asked to participants in focus group discussions were extracted from the interview guide while the questionnaire predominantly focused on women's experiences on farming and annual income. These questions were modified to cover more general farming, livelihood and gender issues. Open-ended questions were relied upon as they allow participants to distinctively share about farming practices and livelihood objectives more freely and, in a detailed manner which generates new perspectives (Patton, 2002; Weller et al., 2018). The interview and FGD guide helped researchers to focus and to ensure that all questions relevant to the study are covered while the questionnaire focused more on income specific information. All tools were pretested during a scoping study with participants who were not in the original sample. Later, some adjustments were made based on participants' feedback and our observations.

Each interview and focus group discussion started with an introduction and more general questions so as to ignite conversation. This was followed by topical questions on the: farming methods that women farmers use; benefits of farming methods; challenges of applying different methods of farming; contributions of farming methods to livelihood outcomes. The questionnaire primarily focused on income levels of women farmers. The sequencing of questions and their actual words were adjusted to the interview and FGD situation. The interviews lasted between 40 – 120 min; FGDs took between 60 – 130 min and surveys between 20 – 35 min. After the interview and FGD we wrote structured notes to recapitulate the interview and discussion situation and context. Sampling stopped when information saturation was attained (Weller et al., 2018). Our sample size is adequate due to its explorative nature which aims at in-depth establishment of the farming methods that women use and how they contribute to the attainment of livelihood outcomes in Eastern Uganda. This is further justified by heterogeneous sampling and the principle of information saturation (Fusch and Ness, 2015; Saunders et al., 2018).

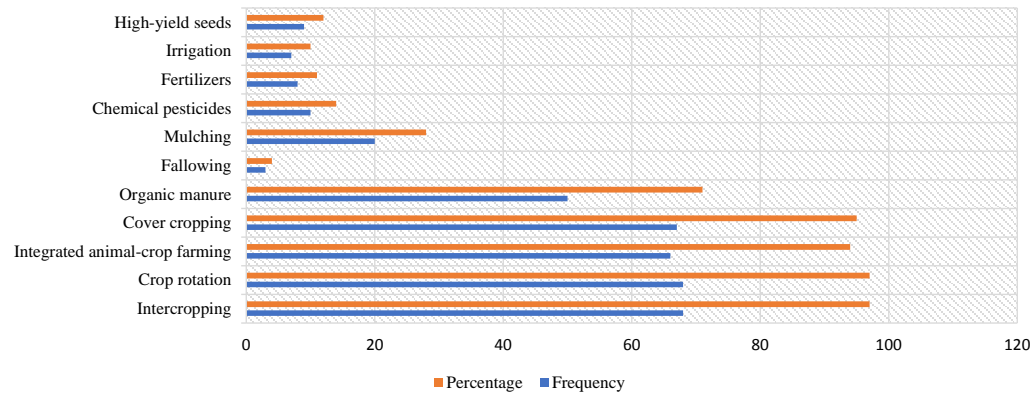


Figure 1. Farming methods that women use.
Source: Field data, 2020.

Data analysis

Participants consented to confidential use of word for word transcription. We coded interviews basing on codes that described the two districts of study (B for Budaka and K for Kapchorwa). The interviews were numbered sequentially from 1-20, while Key informant interviews were numbered with reference to the district. Letter 'I' is added to denote 'Informant' and consecutively numbered from 1- 4 such as (KI.1 and KI.2). Focus group discussions were consecutively coded basing on the district code with alphabetical letters sequenced from A- D (such as KA and KB). These codes are used in the results section to trace the interviews and focus group discussions. Survey data results were quantitatively analyzed using bivariate and multivariate statistics. Qualitative data was analyzed thematically following themes that covered farming methods that women employ and their contributions to income, food security, wellbeing and resilience to uncertainties. The multivariate probit model was used to analyze quantitative data on the relationship between farming techniques and the annual income of women farmers. Codes were inductively generated based on the empirical qualitative data. We analyzed the narratives and made observations. Our motivation to apply an inductive approach is based on the argument that we pay attention to the experiences of female farmers and establish alternative views about why women have or not attained positive livelihood outcomes (Saunders et al., 2019; Thomas, 2003). The principles of ethical research such as seeking ethical approval, informed consent, confidentiality and anonymity were adhered to.

RESULTS AND DISCUSSIONS

The interviews and focus group discussions revealed that most women practice traditional agriculture with a few using the modern methods of farming as shown in Figure 1. Women mostly practice intercropping, crop rotation, integrated animal-crop farming and cover cropping (Figure 1). Few of them practice fallowing due to small farm land. In line with the techniques of farming, we further learnt that some use chemical pesticides and fertilizers. In Budaka, women use modern farming methods slightly more than those in Kapchorwa. Also, chemical pesticides are more applied than fertilizers, irrigation, and high-yield seed among other modern

methods of farming as shown (Figure 1). When we sought to understand why the modern farming practices are not widely relied on, the farmers and key informants reported inability to meet costs associated, gender-power relations and inadequate knowledge on modern farming methods as major hindrances to most women farmers. A farmer narrated the challenges that they face in using modern farming methods:

“We struggle so hard to use new technologies but obstacles like inadequate skills, tools, land and sometimes negative attitudes towards these new methods limit us” (B12).

This signifies that even though women desire to use the modern methods of farming to enhance agricultural outputs and better their livelihoods, prevailing socio-economic challenges sabotage their efforts. This aligns with the argument that women face numerous challenges in agriculture (Geburu et al., 2018; Ugwu 2019). These challenges detrimentally affect their ability to practice agriculture more productively through modern or traditional techniques of farming.

The women rely more on traditional farming practices so as to enhance diet diversities, boost soil fertility and mitigate the challenge of small land size. The traditional techniques of farming are reported to have diverse benefits which motivates farmers to apply them. A key informant observed that crop rotation just like other traditional methods of farming has many benefits:

“Crop rotation does not only improve soil fertility (...) also breaks the cycle of pests and diseases and helps in spreading risks” (KI.1).

We infer that women are inspired to rotate crops, intercrop, and cover crop because of the desire for improve livelihoods. This result corresponds with the

Table 1. Annual income of women by farming technique.

Variable name	Mean (Traditional techniques)		Mean Difference	Pooled (N=68)
	Users (n=65)	Non-users (n=3)		
Annual income	1.3(1.3e06)	1.4(1.4e06)	97369.2 (9.7e04)	1305537.0(1.7e05)
Variable name	Mean (Modern techniques)		Mean Difference	Pooled (N=68)
	Users (n=34)	Non-users (n=34)		
Annual income	1.5e06 (2.5e05)	1.1e06 (2.4e05)	-4.6e05 (3.5e05)**	1.3e06 (1.7e05)

*, **, and *** indicate statistical significance at 10, 5, and 1% level of significance respectively.

assertion that women use traditional farming techniques to enhance crop yields and diversify livelihood strategies (Tang et al., 2013). Even though the different methods are employed with clear intention, it is possible that agricultural surplus for money and food security may not be attained due to challenges that limit the effective use of modern and indigenous knowledge based methods to respond to climate change, improve soil fertility and mitigate the risks of pests and diseases.

Income

Results from the multivariate probit model show that high annual income from farming \$417^(1.5) is significantly correlated with the use of modern farming methods at 10%. The annual income of women who made use of modern farming methods was found to be significantly higher than that of the female farmers who did not make use of these techniques. This difference was found to be significant at a 1% level of significance as shown in Table 1. Interviews with most key informants also revealed that the traditional methods of farming that most women rely on are not exclusively effective in increasing crop yields. When we sought to understand in-depth why women's incomes are low, the majority of participants attributed it to unproductive agriculture that they engage in for a living. Much as low incomes cannot entirely be attributed to the traditional methods, study results show that higher income correlates with modern methods. While bearing in mind that most women apply traditional techniques of farming, this can as well affirm that the farming practices impact income levels.

It is observed that intercropping, crop rotation and cover cropping that female farmers practice contributes to women's low income levels and other multifaceted livelihood challenges. Nkala et al. (2011) and Ugwu (2019) show that women are the most vulnerable to stresses and shocks like drought, floods, pests and diseases than their male counterparts. So, if these limitations are not dealt with, the positive trickledown effect of high agricultural outputs and surplus for cash are detrimentally affected. According to Nkala et al. (2011) and ChuanChuan et al. (2017) when income earned from farming increases, food security and the general

wellbeing of farmers also increases; while vulnerability to climate change shocks and risks reduces. However, this might not be the case always especially in the context of women farmers who rarely make autonomous decisions regarding farming methods and marketing agricultural products. The women further ascribed their livelihood challenges to inappropriate use of crop rotation, intercropping and cover cropping as well as limited financial and technical support from government. Most women also recounted the frustration of working so hard only for the men to reap from their 'sweat'. In the interviews and focus group discussions the men attested to the fact that some men control all resources and do not give women the opportunity to take part in deciding how resources are expended in the family (KA, KB, BC, BD). We learnt that with the low income levels and unproductive agriculture, women continue working tirelessly in the agriculture value-chain and still shovel to provide food for their households. Relatedly, Ugwu (2019) perceives that although women work strenuously in agriculture their livelihoods remain poor. We would have emphatically asserted that the traditional methods of farming that women apply have significantly resulted to food insecurity and poor wellbeing but this appears not to be a sole contributor. There are other socio-economic factors like limited access to resources and inadequate knowledge and skills which hamper the application of modern and traditional methods of farming.

The majority of women farmers claim that the modern farming techniques are more effective in increasing agricultural yields although a few argue contrary to this assertion. When asked in detail what methods of farming improve income levels, it was reported that the modern ones like fertilizers quicken the growth and quality of crops. As a result, they are more effective in boosting incomes, most participants reported. This demonstrates farmers' confidence in the effectiveness of pesticides in mitigating crop pests and diseases and enhancing livelihood aspirations unlike the traditional methods. It also corresponds with the claim that modern farming techniques reduce stress on the farmers and increases crop yields (Dang et al., 2019; Hautala, 2013; Rao, 2014). So, it can be noted that majority of women still experience stress and remain vulnerable to climate change, pests and diseases and the adverse effects of

low crop yields.

The participants holding a contrary view highlighted that the traditional methods would improve incomes of farmers but they are slow in enhancing the growth of crops. In addition, the challenges of climate change, high incidence of pests and disease and small land size requires a farmer to use the modern and traditional methods if they are to reap more from agriculture. As a result, many desire to cultivate applying modern farming practices. This was further confirmed when some farmers narrated how they tussle with local knowledge to alleviate the risks of pests and diseases.

“I normally use a concoction of ash and urine to spray my crops against pests and diseases but do not work well. Some pests die while others do not. This makes me desire the new methods which I see work” (B14).

A key informant explained why farmers need to rethink the strategies because there are so many environmental-related changes which pose a burden on agriculture.

“Currently, there are several risks and challenges in farming. Many farmers are complaining of low crop yields, infertile soil, climate change and pests and diseases. All these can be prevented through irrigation, fertilizers, and organic manure... pesticides” (K1.1).

From these results we deduce that there is no single method of farming that can claim superiority over the others for boosting agricultural outputs, food security, wellbeing and resilience to unforeseen circumstances. Much as it is upheld that traditional farming techniques are central to the sustainable attainment of food security (Singh and Singh, 2017), knowledge and skills on effective application of modern and indigenous farming practices is vital. Therefore, paying keen attention on equipping women to use affordable and effective methods to enhance crop yields is imperative.

The challenges that farmers overly experience in the current milieu requires innovative techniques of farming (BI.4). Men ably practice modern farming to increase their earnings from agriculture because they own and control land. Women reap very meager proceeds and spend all that they have realized to support the family which is the inverse of what the majority of men do in the rural areas. Men are reported to invest much of their earnings in improved farming techniques and other non-farm economic activities compared to the women (KF. B). As a result, women's income remains low as they struggle to provide food, water, fuel, clothing and medical care for the family. We observed that positive livelihood outcomes are attainable through social cooperation and when farming alleviates socio-economic setbacks such as low incomes, high illiteracy levels, lack of technical knowledge, poor soils, and small land size that limit gainful use of farming methods. In cases when women

independently bear the burden of providing for the family they are left with no financial resources to spend on purchasing fertilizers, organic manure, pesticides and high-yield seeds. Correspondingly, it is asserted that low income levels and inadequate land for cultivation obscure the utilization of fertilizers, irrigation and fallowing (Rao, 2014). When farming harnesses women's agricultural earnings, food security and wellbeing are enhanced thus the need to address women's challenges in agriculture.

We learnt that the inappropriate use of traditional methods by female farmers escalate low incomes (BI.4). Although these methods would enhance incomes, they are inhibited by the manner in which they are applied. A case in point is intercropping where by some females overcrowd their gardens. After noticing dwindling crop yields, some women have modified their intercropping strategy (BC). During this study, it was reported that some now segment their crops with proper spacing and this has improved crop yields and incomes (BD). This investigation through interviews with farmers and key informants as well as focus group discussions reveals that the traditional methods are capable of improving income levels. Nevertheless, inadequate knowledge and skills, resources and gender-power relations are the major setbacks. Low levels of income worsen the inability of rural women to make use of farming methods that enhance positive livelihood outcomes. They do not harvest what is adequate for food and surplus for cash (KA, KB, BC, BD). This aligns with Keane (2018) who asserts that women are vulnerable due to inequalities in access to land and other critical resources, education and training and power over agricultural decision-making. In reference to this result, we observe that farming knowledge and skills are critical in promoting effective use of different farming methods. If women are equipped technically, socially and economically to make use of modern and traditional farming techniques to boost agricultural outputs, they will be better placed to transform their own wellbeing and that of their households.

Food availability, access and utilization

In the focus group discussions and interviews we sought to understand what changes have occurred over time that directly or indirectly affect the availability of food. Study participants noted that soils have generally lost fertility, there are more pests and diseases, extreme weather variations and land for cultivation has become small than it was some decades ago. We learnt that these changes have detrimentally affected crop yields and the ability of many households to gain income through agricultural surplus. When we pursued this matter in-depth, we learnt that other than access and consumption of food, access to other necessities of life like education, health care, shelter and clothing have been undermined as well. A key informant explained how food availability has been

affected:

“Most farmers harvest very poor nowadays because of soil infertility. Whenever the harvest is poor, there is food shortage because most farmers grow food” (K1.2).

A farmer further explained how difficult it is to adequately access food in a household.

“It is a ‘night mare’ (..) to have adequate food throughout the year. A woman has to scratch her head thoroughly if the children are to eat every day” (K7).

The contemporary agricultural challenges affect farming outputs and access to food. This supposes that there is need for complimentary application of modern and traditional farming practices so as to increase agricultural yields. Although most participants linked the difficulties that they face in accessing food to poor methods of farming, it was observed that some women have given up trying to use methods that are affordable like crop rotation. During the focus group discussions, some farmers reported negligence as a contributor to food insecurity.

Moreover, we investigated how the responsibility of providing food for the family is shared. The purpose of this was to corroborate how issues pertaining access to food are collectively addressed in seasons of poor harvest. It was vehemently reported that women plan how to feed their children and other household members because they are traditionally obliged to cultivate food (KA, KB, BC, BD). It is her duty to ensure that there is food in the ‘granary’ despite the harvest a male farmer asserted (B18). Besides, the female farmers grieved over the current difficulties of providing food for the family single-handily. This suggests that if women exclusively depend on traditional farming practices and these methods inadequately boosts crop yields, households will experience food insecurity.

We also wanted to know the contribution of farming methods to the food situation in the area. It was reported that the current climatic changes dictate that farmers use improved farming methods if they are harvest enough food. We noted through interviews and focus group discussions that this condition is quite peculiar from that of the past decades. Women would plant crops without fertilizers, organic manure or spraying crops with pesticides and they would still harvest much food. A farmer shared how they used to have plenty of food in the past years:

“In the 1980s and 1990’s, we used to have plenty of food and people were generous. Now, all this has changed. People are so many, crop yields are low, land has become small, the climate has changed and people have also become selfish” (K9).

The women expressed that they are food insecure and

that this situation has been worsened by inability to make use of some methods of farming like irrigation, organic manure, fertilizers, pesticides and high-yield seeds. Therefore, they experience food scarcity during some months of the year. The months of January - May were earmarked as predominantly characterized by scarcity of food and most households have only one meal a day. A farmer explained the strategies that most women use to ensure that the family feeds throughout the year:

“Even though most women store cereals during harvest time to ensure food availability, it’s normally not adequate to sustain the family until the next harvesting season. As a result, those with birds and goats resort to selling them while the majority economizes. Most households have one meal in a day during these months” (BC).

The traditional farming techniques that the majority of rural women make use of have not helped much to increase crop yields. This has contributed to the challenges that households face in the access and consumption of food, a key informant explained. It was also reported that crop rotation and intercropping which many practice is unable to support sustainable food production because so much has changed with regards to the climate and soil fertility. Other than farming methods, this study reveals that poor gender relations have also exacerbated food insecurity. Our results disclose that in most villages the men were farming rice, coffee, maize, beans, tomatoes, onions, watermelon and other vegetables for sell or were occupied in non-farm activities. Very few dedicated their efforts to supporting their spouses to cultivate food (KA, KB, BC, BD). On top of that, women are not allowed to freely decide what farming strategies to apply. For instance, if a woman wants to use fertilizers she has to seek the approval of her spouse or that of any other male who has granted her permission to cultivate on the land. A female farmer desperately recollected, with all these difficulties, we just give the children what is available and what we can afford as mothers;

“We eat sweet potatoes everyday just look at my skin, hhhh, it’s very dry. Sometimes the children desire to eat rice, meat and matoke but we can’t afford, our lives are miserable” (B16).

We established that most women share similar experiences regarding access and utilization of food. Through the interviews and focused group discussions the study learnt that many resort to one specific type of food because of scarcity and inability to meet the costs of purchasing other types of food for the family. Drawing from the experiences of women, we note that it’s futile for women to attain food security since they are barred from making independent decisions regarding what methods of farming to use.

The traditional methods of farming that women farmers’

use more widely may not be autonomously responsible for food insecurity as we have seen in this study. There is interplay between other social and economic impediments such as spousal support and access to resources like land and credit. However, considering that food production is closely linked to agriculture, the methods of farming applied becomes one of the main contributors to food security or insecurity. We note that there are circumstances under which traditional methods of farming may fail to improve food production just as other scholars have stated (Baba et al., 2015; Tang et al., 2013). For that reason, building the capacity of women farmers to use different modern and traditional farming practices can equip them to become more food secure.

Wellbeing and resilience to uncertainty

The inability of the majority of rural women to use irrigation and agroforestry affects adaptation to persistent weather extremes and this was found to detrimentally affect crop yields and general wellbeing (KI.1, BI.2). While investigating how farming techniques connects with the happiness and comfort of women, we learnt that they have often been affected by low capacity to respond to climate change. In 2019 rain delayed but when it finally began falling it was too erratic that crops were washed away (KA, KB). By the time of this study, most households were finding trouble accessing food and other essentials. Further interrogations showed that women and children have many times been subjected to suffering due to climate variations and other eventualities such as the 'Armyworm' which infested maize across Uganda in 2016 and in the subsequent years. In this case, the study expresses that it is not about women using modern or traditional methods of farming but rather applying methods that can reasonably moderate the risks of climate change such as flooding, drought and high incidence of pests and disease. For instance, Tang et al. (2013) observes that agroforestry and terracing are effective in preventing soil erosion and regulating the flow of running water. So, if the women use one or more of these farming techniques, agricultural losses can be mitigated, resulting to improved wellbeing.

We asked our participants how farming methods relates to the hindrances that they face in attaining improved wellbeing. It was mentioned that, inter cropping, crop rotation and cover cropping which women predominantly use do not mitigate the risks of climate change. In an interview with a key informant it was established that many families were devastated by flooding and drought with the heaviest burden on women and children who ultimately 'live on the farm'. A key informant explained what the situation would have been if alternative methods of farming were used:

"You see Sebei is hilly, but our farmers do not use

terraces or plant trees. We trained them how to dig trenches but most of them don't care" (KI.2).

With crops being washed away, we learnt that the harvest was very poor and most households failed to provide food and even meet medical bills. Farmers intimated that whenever there is no food and household members especially children cannot clothe, access medical and scholastic materials there is so much misery and fear for the unknown. A female participant explained how she feels whenever she can't provide for her children:

"I have always struggled (...) to provide food, clothes, books and pens for my children. But, sometimes I fail. This makes me feel worthless as a mother" (B4).

As participants continued sharing their experiences, we discovered that their general wellbeing which resonates around good health, self-esteem, happiness, prosperity and a sense of contentment is poor. It was also disclosed through the focus group discussions and interviews that the women are unable to access specialized medical care. In line with this, the females narrated that poverty makes it impossible to access descent shelter, soap, sugar and to pay school fees for the children. There is so much fulfilment in educating children a woman farmer recounted. We asked questions to know how farming methods interlinks with health. It was explained that some methods are vigorous and manual. This explains why they have persistent backache and chest pain and also face cyclic poor health. In agreement with this finding, it is stated that the general wellbeing of women farmers is poor despite practicing farming (FAO, 2018; Hautala, 2013). Farming methods ought to be thoughtfully selected and wisely utilized so ensure improved agricultural production and health.

We also aimed to understand if the traditional methods of farming have enhanced the attainment of assets that can increase resilience to seasonality, trends, stress and shocks. We found that women do not have adequate household assets such as cows, goats, birds and sheep that would enable them continue living decently even after an eventuality. Some few women reported to own birds (chicken) but most of them had died due to coccidiosis. Cows and goats were mostly owned by men, with women caring for these animals. When further asked if this is linked to the methods of farming, it was explained that although poor methods of farming accounts for the loss of birds and women's limited acquisition of assets other factors contribute as well. These influences include negligence on the side of farmers, inadequate access to veterinary services, unequal power relations and knowledge gaps on farming methods. The interplay of these issues is found to limit the capacity of women to respond to shocks, increase vulnerability and detrimentally affect wellbeing. If their methods of farming

were capable of addressing farming challenges, they would have acquired assets through proceeds from agriculture. It is indicated that women's agricultural yields are often low (Ahammad et al., 2020). This limits acquisition of assets that they would rely on in times of uncertainty.

Conclusions

Our study aimed to understand the contributions of the farming methods that women employ to the attainment of livelihood outcomes. The results show that most women use traditional farming techniques such as intercropping, crop rotation and cover cropping with very few applying fertilizers and pesticides. We note that the methods that women use have not adequately enhanced the attainment of positive livelihood outcomes such as income, food security and improved wellbeing. Much as these practices have the ability to increase income, food security and wellbeing through enhanced agricultural outputs, knowledge and skills gaps on how to gainfully apply them is an encumbrance. Furthermore, small land size, climatic changes and high incidence of pests and disease also continues to undermine women's efforts to achieve improved wellbeing. Since women predominantly derive their livelihood from agriculture high agricultural outputs is expected to positively correlate with their wellbeing whereas low agricultural outputs correspond with poor wellbeing. This also links to the different methods of farming that women apply as they distinctly contribute to agricultural yields. Often times, agricultural practices determine whether or not agricultural yields will sufficiently alleviate low incomes, food shortages, diet deficiencies and enhance access to medical care, shelter and education. With regards to our study, we note that women have not adequately attained the aforementioned outcomes despite engaging actively in agriculture. The limitations that women experience in farming such as inadequate farming knowledge and skills, small land size, climate change, high incidence of pests and diseases and infertile soil are multidimensional and they jeopardize the attainment of positive livelihood outcomes. For that reason, there are no single methods of farming that can exclusively enhance the attainment of livelihood aspirations. Although it is beyond the focus of this study, we observe that gender power relations greatly determine whether or not women apply methods that enhance positive livelihood outcomes. This has been cited by most women as a hindrance accounting for the low income and poor general wellbeing.

Recommendations

There is need for women to be supported and encouraged to corroborate the application of indigenous knowledge-transform their livelihoods. Considering that this study

represents a preliminary insight into understanding the contributions of farming methods to the livelihood outcomes, it broadens the space for further in-depth research on the socio-economic limitations and hindrances to livelihood aspirations. This will inform policy makers how to and in what areas to invest in agriculture so as to enhance livelihoods outcomes. There is also need to delve more to understand how gender relations explicitly shape women's utilization of the different methods of farming and attainment of livelihood outcomes

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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