Info Note

Barriers and opportunities for gender-responsive climate-smart agriculture adoption in Northern Uganda

Smallholder farmer opinions from seven districts of Uganda.

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Key messages

- Climate-smart agriculture (CSA) adoption among male and female smallholder farmers in Northern Uganda is low.
- Actor-related barriers to CSA adoption in Northern Uganda mainly derive from inadequate sensitization, information, knowledge and skills on CSA among farmers; and weak financial capacity and donor dependence.
- Context- and system-related barriers to CSA adoption in the region are linked to low institutional budgets for CSA interventions; inadequate supportive infrastructure; a weak policy environment to assure certified inputs, deeply entrenched traditional farming systems; and a customary land tenure system, which limits investment in expensive technologies.
- Boosting gender-responsive CSA adoption in the region requires an understanding of the local context; gender-equitable access to CSA information, capacity building, and input and output markets; provision of supportive infrastructure and services; enhancing farmers' adaptive capacity; and the use of gender transformative approaches.

For a decade now, climate-smart agriculture (CSA) has been promoted as an approach that sustainably increases agricultural productivity and incomes; enhances farmers' adaptive capacity and resilience to climate-related shocks; and reduces greenhouse gas emissions and increases carbon sinks, where possible (FAO 2014). By implementing CSA, developing countries are foreseen to augment the achievement of national food security, economic growth and sustainable development (Anuga et al. 2019).

Regardless of the potential benefits of CSA, existing studies reveal low rates of CSA adoption among sub-Saharan African countries (Kurgat et al. 2020; Makate et al. 2017; Arslan et al. 2014), with even lower rates visible among female farmers compared to male farmers (Assan et al. 2018; Jost et al. 2015; Ndiritu et al. 2014; Tsige et al. 2020). While vast literature points towards common barriers to CSA adoption among smallholder farmers (i.e. socio-economic, institutional, cultural, technological, attitudinal and information-related factors), variations exist in the patterns of influence of these factors across locations, making the barriers context- and actor-specific rather than universal (Eisenack et al. 2014; Kurgat et al. 2020).

This Info Note focuses on seven districts in the Northern Uganda region (Agago, Kitgum, Oyam, Lira, Amolatar, Dokolo and Napak) to investigate gender-based barriers to CSA adoption and the opportunities for gender-responsive CSA adoption among smallholder farmers in the region. The study, which is based on smallholder farmer lived experiences and opinions, was undertaken during November and December 2019 by the International Institute of Tropical Agriculture (IITA) in collaboration with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) Promotion of Climate Smart Agriculture (ProCSA) project in Uganda. The study was part of an effort to develop and promote a basket of CSA options that are gender-responsive and suitable for the specific conditions of the respective districts in the region.

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Why is gender-responsive climate-smart agriculture important?

Smallholder farmers in Africa predominantly depend on rain-fed agriculture for food security and livelihoods, making them highly vulnerable to rainfall variability and extreme weather events (Muller et al. 2011). Across many cultures in rural sub-Saharan Africa, women in farming households are responsible for household food and nutrition security and the wellbeing of other household members, while men concentrate on cash crop and livestock production (Doss 2002; Murray et al. 2016; Ndiritu et al. 2014). In the face of increasing weather unpredictability and male outmigration in search of alternative livelihoods to agriculture, rural women, especially from low income farming households, must deal with increased workloads and responsibilities on the farm and in the household (Huyer 2016). CSA is an approach to developing an enabling environment (technical, policy and investment conditions) (World Bank Group, FAO & IFAD 2015) that can help farmers and nations to ameliorate the negative impacts of climate change on production, incomes and household wellbeing (Anuga et al. 2019).

The range of CSA technologies and practices selected by countries are diverse and dependent on prevailing agroecological, climatic, economic, environmental and social situations, as well as national priorities for food security, climate change adaptation and mitigation (World Bank, FAO & IFAD 2015; World Bank 2018). Nevertheless, research reveals that the successful adoption of CSA technologies and practices among farmers in developing countries is influenced by technical, social, cultural, institutional, economic and political factors (Kristjanson et al. 2017: Sumberg 2005).

Kurgat and colleagues (2020) cite various studies from sub-Saharan Africa which attribute the low rates of adoption or dis-adoption of CSA technologies and practices among farming households to factors including "household characteristics, household asset base, institutional (e.g. input-output markets, extension services and social groups) and farm characteristics, access to information and belief systems." Relatedly, Totin et al. (2018) draw attention to the 'technology-push' approach, which has seen the transfer of CSA technologies to end-users without adequate understanding of the local context. Makate (2019) further highlights the absence of substantial evidence or success stories of the practical incorporation of CSA technologies and approaches into agricultural systems; donor dependency of CSA initiatives; weak institutional set-up (e.g. extension systems); and the lack of supportive policies and policy strategies, as factors which have affected the scaling of CSA adoption in Africa.

Societal normative understandings of gender relations determine aspects such as household division of labor, ownership of productive assets, access to resources and decision-making power (Assan et al. 2018). Relating to agriculture, women in many farming households across sub-Saharan Africa are responsible for a large share of labor-intensive agricultural tasks such as land preparation, planting, weeding and post-harvest activities of drying, processing and preparation (Doss 2013; Kristjanson et al. 2017), with limited access to mechanized tools (Beuchelt and Badstue 2013; Murray et al. 2016). Additionally, women are responsible for off-farm household tasks such as cooking, cleaning, caring for children, caring for the sick, collecting firewood and fetching water, all of which limit their ability to participate in community-based developmental initiatives (Murray et al. 2016; Huyer 2016). Gender-specific studies attribute the lower uptake of CSA technology and practices among women compared to men to factors, including:

- women's lower likelihood of receiving information on CSA compared to men (Jost et al. 2015; Tall et al. 2014);
- time constraints that limit women's' availability to learn about new agricultural practices (Huyer 2016);
- financial constraints, including limited access to credit (Jost et al. 2015; Kristjanson et al. 2017);
- lack of technologies and tools that are culturally and physically appropriate for use by women (Carr and Hartl 2010; Murray et al. 2016);
- women's weaker land tenure security (Ndiritu et al. 2014); and
- the additional labor requirements that are associated with implementing some CSA practices (Kristjanson et al. 2017), among others.

The foregoing differences between women and men rationalize the salience of gender attributes in fostering CSA adoption and its successful implementation. A gender-responsive approach to CSA recognizes this and undertakes to address the differences in priorities, roles, responsibilities, access to and control of resources between men and women during the design, promotion and application of CSA technologies and practices (Nyasimi and Huyer 2017). The goal of gender-responsive CSA is to ensure that women and men can equally benefit from CSA interventions (World Bank, FAO & IFAD 2015) and that existing injustices in gender and power relations are not reproduced (Gonda 2016).

Methodology

The study adopted an actor-centered approach (Eisenack et al. 2014) focusing on the lived experiences and

opinions of male and female smallholder farmers at community level. The scope of the study was the seven districts of Agago and Kitgum (Acholi sub-region); Oyam, Lira, Amolatar and Dokolo (Lango sub-region); and Napak (Karamoja region). In each district, two sub-counties were selected to represent 'better-off' and 'worse-off' locations respectively, in relation to a composite set of criteria (i.e. environmental, social, economic and demographic characteristics; agroecology; access to services—input and output markets, health, safe water; and distance from the district headquarters). The selection of the sub-county study sites was informed by District Development Plans and District Profile Reports prepared by the Uganda Bureau of Statistics.

A total of 55 focus group discussions (28 male, 27 female) were held with 544 farmers (276 male, 268 female) in 14 sub-counties in the study region. The farmer participants were randomly selected from lists of male and female farmer groups that are registered in the respective sub-counties in each of the districts. Each male and female focus group discussion consisted of 8 to 12 farmers. For purposes of this Info Note, the guiding questions elicited farmer opinions on: (i) observed changes in the environment and climate in the past decade; (ii) perceptions of climate change and whether it should be an object of concern; (iii) knowledge of CSA technologies and practices; (iv) sources of information on CSA technologies and practices; (v) types of CSA technologies and practices adopted and whether they are still being implemented; (vi) the requirements for implementation of CSA technologies and practices and how they were acquired or accessed; (vii) the changes in traditional roles and responsibilities that resulted from adoption of the CSA technologies or practices; (viii) the benefits and/or burdens experienced from implementing the CSA technology or practice; (ix) obstacles that may prevent the adoption or cause the dis-adoption of CSA technologies and practices; and (x) how the obstacles to CSA adoption may be overcome.

All focus group discussions were recorded, translated from local dialects to English, transcribed and imported into NVIVO 12 software for thematic content analysis. The initial level of coding in NVIVO mirrored the questions that were asked. The second level of coding merged like ideas into single codes, while the third level of coding involved thorough content analysis and the fitting of the data into four respective themes (actor-related barriers; context-related barriers; system-related barriers; opportunities for CSA adoption) deduced from the data.

Contextual overview of the study region

Over the past decade, the districts in Acholi sub-region (Kitgum, Agago) and parts of Lango sub-region (Lira, Dokolo, Oyam) have been rebuilding economies following a two-decade insurgency (1986-2006) led by the rebels of the Lord's Resistance Army. Similarly, the Karamoja region (Napak) has experienced decades of insecurity and tensions arising from inter-clan and inter-tribal armed cattle raids, as well as conflicts between pastoralist and agro-pastoralist communities (Advisory Consortium on Conflict Sensitivity 2013). In all seven districts of the study, agriculture is the main source of livelihood, with most households (over 70 percent) engaged in crop farming as the main enterprise, alongside livestock rearing and poultry keeping (UBOS 2016). In the north and north-eastern parts of Napak district, which are drier, livestock rearing is more prominent. The poverty level in the Northern Uganda region is 32.5 percent compared to the national average of 21.4 percent (UBOS 2018). Within the region, Karamoja sub-region has the highest poverty level at 60.2 percent, followed by Acholi sub-region at 33.4 percent and Lango sub-region at 15.6 percent respectively (UBOS 2018).

In the four districts of Lango sub-region (Oyam, Lira, Dokolo, Amolatar) the Lango people are the main ethnic group, while in the two districts of the Acholi sub-region (Kitgum, Agago) Acholi people are the main ethnic group. In Napak district, the Karimojong tribe is mainly concentrated in the rangelands, while the Tepeth tribe dominate the mountains (UNDP 2014). Culturally, the Acholi, Lango, Karimojong and Tepeth people are organized in clans with elders and clan heads who are responsible for administering justice; ensuring that cultural traditions, rules and regulations are upheld; and settling land disputes, among others.

In all seven districts, land is customarily owned by clan members. Focus group discussions in the six districts of Acholi and Lango sub-regions revealed that men, as household heads, control land, livestock, cash crops, income and household labor. Women have partial control over land use and may be consulted in decisions regarding the sale of major household assets such as land and livestock. In Napak district, focus group discussions revealed that men control land, livestock and household income, while women are solely responsible for managing the home, including construction of the house and feeding the family. Across the seven districts, women and girls are predominantly responsible for non-agricultural activities such as collecting firewood, fetching water and other household chores.

Five out of the seven districts (Kitgum, Oyam, Lira, Dokolo, Amolatar) have a bi-modal rainfall pattern during the months of April to May and August to October, with an average annual rainfall ranging from 1,200 to 1,600 millimeters. The remaining two districts (Agago and Napak) have a unimodal rainfall pattern, with the wet season during the months of April to October and the dry season from November to March. The average annual rainfall in Napak district ranges from 300 to 1,200 millimeters, while Agago district receives and average

annual rainfall of 1,330 millimeters. Across the seven districts, the average daily minimum temperatures range from 17 to 22.5 degrees centigrade, while the average daily maximum temperatures range from 25.5 to 33.5 degrees centigrade (District Hazard, Risk and Vulnerability Profile reports as cited in Bamanyaki and Aogon 2020a).

The adoption of CSA technologies and practices among smallholder farmers in the region is low, with variations observed in application across the districts and sub-regions (Bamanyaki and Aogon 2020a). The common agricultural practices currently being implemented by some farmers in the region include row planting with recommended spacing; crop diversification; use of improved varieties (seed, livestock); crop rotation and intercropping; improved livestock production and management (improved breeds, zero grazing); integrated soil fertility management using synthetic and/or organic fertilizers; agroforestry; livelihood diversification; and post-harvest management practices such as the use of tarpaulins for drying harvested crops instead of on bare ground and the storage of harvested crops in granaries or sacks on pallets (Bamanyaki and Aogon 2020a).

Gender-based barriers to CSA adoption

Following Moser and Ekstrom (2010), gender-based barriers to CSA adoption may be described as impediments that can stop, delay or divert the process of women and men embracing and applying technologies and practices that minimize the negative effects of climate change on agriculture. Although various frameworks exist to guide the systematic analysis of barriers to climate change adaptation (see Eisenack et al. 2014; Jones and Boyd 2011; Moser and Ekstrom 2010), three interdependent structural elements underlie the different frameworks, notably: (i) the actors involved in making adaptation choices; (ii) the context (e.g. social, economic, political, biophysical, institutional) in which actors act; and (iii) the system of concern that is at risk of being affected by climate change (Eisenack et al. 2014; Moser and Ekstrom 2010). This section adopts the foregoing broad categorization to highlight the barriers to CSA adoption and/or causes of CSA dis-adoption as discussed by male and female focus group participants in the region accordingly.

I. Actor-related barriers

Actor-related barriers stem from perceptions, values and beliefs of individual and collective actors regarding: climate change and its effects; climate risk and the need to take responsive action; adaptive capacity to climate change; availability, accessibility, credibility and relevance of CSA information; interaction with relevant actors inside and outside of the government; and the willingness to utilize the acquired knowledge and information on CSA, among others (Moser and Ekstrom 2010). Focus group discussions with male and female farmers across the seven districts demonstrated an awareness of climate change and its effects and affirmed the need to take responsive action (Bamanyaki and Aogon 2020b). Table 1 summarizes the actor-related barriers to CSA adoption as expressed by male and female farmers in the study region.

Table 1: Actor-related barriers to CSA adoption by gender.

Female responses	Male responses
■ Inadequate access to information and training on CSA. ■ Low levels of literacy affect comprehension and effective implementation of new farming practices. ■ Some practices, like row planting, are time consuming and laborious to implement. ■ Apathy by some farmer group members towards CSA application discourages others. ■ Preference for organic farming. ■ Dependence on donors and government for inputs. ■ Fear of making losses from theft. ■ Limited financial capacity to implement (i.e. hire labor, purchase inputs, etc).	■ Inadequate knowledge and information on CSA. ■ Limited financial resources to implement. ■ Expectance of handouts in form of inputs and equipment from donors ■ Low willingness to replace traditional farming methods with new practices ■ Association of superior technology with genetic modification ■ Anticipation of heavier workload associated with new practices ■ Poor management of new practices leading to loss of interest and dis-adoption.

From the responses in Table 1, the low adoption of CSA among male and female farmers in the region appears to mainly derive from inadequate sensitization, information, knowledge and skills on CSA technologies and practices. The low receptivity to CSA information could also be linked to weak financial capacity among many farmers coupled with a history of dependence on external assistance (donors and government) in form of handouts.

II. Context-related barriers

Context-related barriers include social, economic, political, organizational and institutional factors that can

affect the adoption of CSA technologies and practices by smallholder farmers. Table 2 highlights the opinions expressed by male and female farmers in the study region accordingly.

Table 2: Context-related barriers to CSA adoption by gender.

Female responses	Male responses
■ Lack of certified input and equipment dealers within the sub-counties. ■ Inadequate supportive services for CSA implementation, e.g. irrigation schemes, extension services. ■ Inadequate access to land. ■ Limited decision-making powers to implement new farming practices on family land. ■ Very few farmers are targeted as beneficiaries for training and demonstration on CSA. ■ Mismatch in timing of CSA training sessions and farming seasons. ■ Donor-funded project ended mid-way causing farmers to revert to traditional practices (Kitgum). ■ Low prices for outputs compared to high costs or inputs (e.g. improved seeds, fertilizers, pesticides).	■ Farmers received training on crop-related CSA practices, whereas the interest was livestock farming. ■ High cost of input and equipment in markets. ■ Poor road infrastructure affects access to input and output markets. ■ Poor quality inputs (seeds, fertilizer, pesticides) on the market. ■ Very few farmers are targeted by government and non-government organizations to receive CSA information. ■ Inadequate follow-up support and monitoring by organizations and extension staff during CSA application to address emerging challenges.

From Table 2, economic barriers relate to the inaccessibility to quality input, equipment and product markets. Institutional barriers include low budgets for CSA interventions, which limit, among others, the number of farmer beneficiaries reached in a target community with CSA information and skills; the timing and adequacy of training sessions provided to farmers; and follow-up support to farmers during CSA application. Other institutional barriers relate to the inadequacy of supportive infrastructure (e.g. water for production, good road networks) and a weak policy environment that does not assure the availability of certified CSA technologies in local markets. Cultural barriers to CSA adoption include the inadequate access to land and limited decision-making power to adopt CSA practices on household land, both of which were expressed by female focus group participants.

III. System-related barriers

System-related barriers to CSA adoption are associated with the largely subsistence-based crop and/or livestock farming systems that need to be managed or altered to withstand climate change, as well as ecological and physical barriers that are attributed to environmental conditions (Moser and Ekstrom 2010; Jones and Boyd 2011). Table 3 presents the opinions expressed during focus group discussions with male and female farmers in the region.

Table 3: System-related barriers to CSA adoption by gender.

Female responses	Male responses
■ Recurrent dry spells affect the growth and performance of improved seedlings. ■ Open grazing, which is prevalent in the region, destroys gardens causing losses.	■ Incompatibility between improved livestock management practices and nomadic pastoralism (Napak). ■ Heavily fragmented land for subsistence production renders investment in CSA futile. ■ Reluctance to plant trees on crop farms (i.e. practice agroforestry) to avoid competition with crops.

From Table 3, system-related barriers to CSA adoption, according to farmer opinions, are largely associated with recurrent drought, the customary land tenure system (i.e. limited private ownership and therefore low incentive to invest in expensive technologies and practices); high fragmentation of land for subsistence farming; and deeply entrenched traditional farming practices such as open grazing and nomadic pastoralism which are incompatible with CSA practices.

Opportunities for gender-responsive CSA adoption

As put forward by Moser and Ekstrom (2010), the barriers to climate change adaptation "*can be overcome with concerted effort, creative management, change of thinking, prioritization and related shifts in resources, land uses, institutions, etc.*" A gender-responsive approach to CSA would involve, among others, a gender analysis of the needs and priorities of male and female farmers, an identification of barriers to CSA adoption, followed by the

development of strategies to address the barriers identified and the monitoring of short-, medium- and long-term benefits during CSA application (Nyasimi and Huyer 2017).

Drawing from the actor-, context- and system-related barriers to CSA adoption presented in the foregoing section, it follows that policies, strategies and interventions aimed at boosting gender-responsive CSA adoption among smallholder farmers in the region should emphasize the following:

- *An understanding of the local context:*

Prior engagement with male and female farmers at community level is necessary to understand perceptions, values and beliefs regarding climate change, climate risks and gender-specific vulnerabilities, and farmer priorities and needs relating to CSA. An analysis should also be undertaken of the economic, social, cultural, institutional, political and environmental contexts to guide the development of appropriate CSA technologies and practices that suit the respective conditions of target communities (see also Totin et al. 2018).

- *Gender-equitable access to CSA information and capacity building:*

Efforts to increase CSA information, knowledge and skills among smallholder farmers in the region should accord equal opportunity for the effective participation of male and female farmers. This may be achieved through the development of suitable content (relevant for both male and female farming interests) and use of appropriate delivery methods that consider the literacy levels, learning and retention abilities and time constraints of male and female farmers, among others.

- *Adequate and timely funding of CSA interventions:*

Adequate funding of CSA interventions by government departments and other development partners is necessary to facilitate beneficiary expansion; adequacy in training and demonstration sessions provided; provision of routine extension advice and periodic monitoring and evaluation of the progress of CSA application among farmers in the respective target communities.

- *Gender-equitable access to high quality input markets and linkages to output markets:*

The investment in climate-smart technologies such as improved seeds requires timely and reliable access to good quality seed in the vicinity of farmers. Farmers are also encouraged to invest in climate-smart technologies and practices when they have an assurance of markets with good prices for their produce that will enable them to make returns on their investments. Gender-equitable access to high quality inputs at sub-county level may be fostered through the provision of free or subsidized inputs to male and female farmers at community; the development of an enabling policy and operating environment that attracts certified input suppliers to locate businesses in the sub-counties; facilitating farmer linkages to output markets through contract farming with industries; and improvement in road networks to ease the mobility and time spent by farmers to and from markets.

- *Provision of supportive infrastructure and services:*

In drought-prone areas such as the Northern Uganda region, access to water for production is critical to sustain the adoption of CSA. Consequently, investment in macro water harvesting systems (dams, valley tanks, windmills) or micro systems (retention ponds, stock water, reservoirs) combined with capacity building of technical personnel within the districts to ensure the sustainable design of efficient irrigation systems is crucial. Additionally, cost-effective access to appropriate machines and equipment by farmers is envisaged to boost CSA adoption.

- *Boosting farmers' adaptive capacity:*

The adoption of CSA entails investment costs, which may be financed by farmers through accumulated savings or loans from village savings and loan associations or formal financial institutions. In a context of high poverty levels among households, farmer membership to groups and associations at community level affords the combination of resources to acquire CSA technologies or implement labor-intensive CSA practices. Additionally, the adoption of CSA by women may be enhanced through the specific provision of financial support to boost the capacity of women's farmer groups.

- *Use of gender-transformative approaches*

Interventions that seek to actively challenge gender and power inequalities that constrain women's access to, ownership of, or control of productive assets such as land, labor and technology should be undertaken. This would require strategic engagement with cultural leaders (elders and clan heads) as champions or advocates for women's empowerment and gender equity in agriculture. Gender analyses of existing formal institutions (policies, laws, ordinances, regulations) relating to climate change, CSA and natural resource management should be undertaken to inform the revision or development of guiding documents that are gender-responsive and foster women's empowerment.

Conclusion

This Info Note has utilized smallholder farmer opinions to investigate gender-based barriers to CSA adoption in seven districts of the Northern Uganda region and identified opportunities for enhancing the adoption of gender-responsive CSA among smallholder farmers in the region. Linkages may be seen across actor-, context-

and system-related barriers to CSA adoption. The study has revealed that the low adoption among male and female farmers alike is largely associated with inadequate sensitization, knowledge and skills in CSA; weak financial capacity to apply CSA; inaccessibility to quality input, equipment and product markets; customary land tenure system, which limits investment in expensive technologies and practices; and an incompatibility of deeply entrenched traditional farming practices with CSA.

In light of the identified barriers, suggestions for consideration in the development of policies, strategies and interventions to enhance the adoption of gender-responsive CSA in the region are: (i) an understanding of the local context, farmer needs and priorities from a gender perspective; (ii) ensuring gender-equitable access to CSA information and capacity building; (iii) adequate and timely funding of CSA interventions; (iv) facilitating gender-equitable access to high quality input markets and linkages to output markets; (v) provision of supportive infrastructure and services; (vi) boosting farmers' adaptive capacity; and (vii) the use of gender-transformative approaches to especially address cultural barriers. Noting that this study was based on smallholder perspectives only, the preceding recommendations are not intended to be exhaustive. Further research that incorporates the perspectives of other stakeholders (district leadership, technical experts, cultural leaders etc.) is useful to boost gender-responsive CSA adoption in the region.

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