

The Role of Microfinance in Climate Change Adaptation: Evidence from Rural Rwanda

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The role of microfinance in climate change adaptation: Evidence from rural Rwanda



Akamaro k'inguzanyo ntoya n'iziciriritse mu guhangana n'imihandagurikire y'ikirere: ubuhamya buturuka mu bice by'icyaro mu Rwanda

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Gushimira

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Executive summary

Climate change poses serious risks for rural livelihoods and food security in Rwanda. At the same time, a significant number of Rwandan farmers pool their resources together through cooperatives and Village Savings and Loan Associations (VSLAs) in order to increase productivity. Therefore, it is important to consider on the one hand the future impacts of climate change on the microfinance sector in Rwanda, and on the other to ensure that the benefits of microfinance can decrease rural residents' vulnerability to climate impacts. This research project focuses on the clients of Urwego Bank, one of Opportunity International UK's local partners in a development project funded by the Scottish Government, with the aim to provide microcredit loans to 8,500 smallholder farmers working in government-supported agricultural cooperatives. The study specifically investigates the impacts of small loans on the vulnerability and adaptive capacity of farmers in southern and western Rwanda (Huye and Rubavu districts).

The study involved field visits to the districts of Huye (Southern Province) and Rubavu (Western Province). Both regions are being increasingly affected by climate change in the form of increasing drought spells and erratic rainfall.

Farmers involved in this study formed part of two distinct forms of associations: a rice cooperative (Huye field site) and VSLAs specialised in potato production (Rubavu site). Membership of these allows access to Urwego Bank loans used to procure seeds and fertiliser. A total of 28 interviews were conducted: 24 with farmers (20 cooperative/VSLA members and 4 non-members), 3 with Urwego Bank staff and one with a government agency representative. The study was supplemented by analysis of documents, including government reports and policies, and grey literature.

The farmers in the study viewed loans as one of the most effective ways to increase agricultural productivity and income. Loans increase disposable incomes in the short term, allowing farmers to direct resources to other household expenses. The loans also give farmers access to higher quality seeds and fertiliser, helping them to close the 'yield gap'. Specific aspects of the Urwego Bank model, including cashless loan delivery, the timing and efficiency of loan disbursement were also valued by the farmers interviewed.

Most participants had direct experience of both droughts and floods in recent years. Farmers reported a range of adverse climate impacts on their crops, which could significantly

Umusogongero

Imihindagurikire y' ikirere igira ingaruka nyinshi ku mibereho yabatuye mu cyaro ndetse no mu bijyanye no kwihaza mu biribwa mu Rwanda. Mu Rwanda, umubare munini w' abakora ubuhinzi buhuzira mu ma koperative no mu matsinda yo kugurizanya mu rwego rwo guhuza imbaraga zabo no kongera umusaruro. Ni ngombwa rero ko tureba uko ibigo by'imari bibona ingaruka z'imihindagurikire y'ikirere ku bahinzi, ndetse nuko ibyo bigo bifasha abahinzi bato n'abaciriritse mu guhangana n'ingaruka ziterwa n' imihindagurikire y' ikirere. Ubu bushakashatsi bwibanze ku bahinzi bakorana n' Urwego Bank, umwe mu bafatanyabikorwa ba Opportunity International mu rwego rw'umushinga ugamiye guteza imbere abaturage, umushinga uterwa inkunga n'igihugu cya Scotland. Ni muri gahunda y' iki gihugu yo guteza imbere abahinzi bagera ku 8,500 binyuze mu nguzanyo ziciriritse. Ubu bushakashatsi bwazumye by' umwihariko uruhare inguzanyo ntoya n'iziciriritse zitangwa n'ibigo by'imari, zagize mu kubaka ubushobozi bw'abahinzi mu rwego rwo guhangana n'ingaruka ziterwa n'imihindagurikire y'ikirere mu Rwanda. Ubu bushakashatsi bwakorewe mu ntara ebyiri z'u Rwanda, arizo: Intara y'amajyepfo n'Intara y'iburengerazuba.

Bimwe mu byari bigize ubu bushakashatsi harimo gusura ndetse no kuganira n'abahinzi mu turere twa Huye (Intara y'amajyepfo) na Rubavu (Intara y' Uburengerazuba). Utu turere twombi dukunze kugirwaho ingaruka mbi n' imihindagurikire y' ikirere cyane igihe kirekire cy' impeshyi ndetse n' imvura igwa nabi. Abahinzi bitabiriye ibi biganiriro bari mu bwoko bubiri. Aba mbere bari bibumbiye muri koperative ihinga umuceli (mu karere ka Huye) naho aba kabiri bari bibumbiye mu itsinda ryo kubitsa no kugurizanya rihinga ibirayi (mu karere ka Rubavu). Kuba umunyamuryango muri iyi koperative n'itsinda byavuzwe haruguru bitanga ububasha bwo kubona inguzanyo muri Banki y' Urwego. Izo nguzanyo zikoreshwa nabo bahinzi mu kugura imbuto n' ifumbire. Abantu 28 nibo bitabiriye ubu bushakashatsi muri rusange. Muri uyu mubare harimo abahinzi bagera kuri 24 (20 babarizwa muri koperative cg itsinda ndetse nabandi 4 batari abanyamuryango), abakozi 3 ba Banki y' Urwego ndetse n' umukozi umwe wo mu nzego za Leta. Iyi nyigo yanasuzumye ibitabo na raporo zitangwa na Leta.

Abahinzi twaganiriyeho bagaragaje ko inguzanyo ari uburyo bwiza bwo kongera umusaruro wabo w' ubuhinzi ndetse no kwinjiza amafaranga. Inguzanyo zongera amafaranga binjiza mu gihe gito, bityo bigatuma babona amafaranga yo kwikenuza mu bindi bikenerwa byo mu rugo. Inguzanyo zituma kandi babasha kwigurira imbuto nziza n' ifumbire bituma babasha kongera umusaruro mbumbe kuri hegitari. Ubu buryo bwo gutanga

reduce harvests. These had led to food scarcity, financial difficulties - with several mentions of struggling to pay for school fees - and migration of labourers. To cope with climate impacts, participants reported to have implemented hydrological solutions (contours and water channels), changed farming practice (planting earlier, crop rotation, or climate-resilient crops), increased pesticide use, engaged in off-farm income generation or made changes to their financial management. Microloans of fertilisers were perceived to ensure at least some harvest and thus income, even in adverse conditions, which helped participants cope with climate impacts. In some instances, the seeds provided through microloans by Urwego Bank appeared to be of climate-resilient variety.

Microloans were not available for other climate adaptations, such as contour digging, irrigation or pesticide application. Overall, the loans seemed to provide greater financial flexibility which helped with general expenses. However, several participants reported that paying back the loans to the cooperative was challenging after harvests had failed. The financial and 'good agricultural practice' training provided by Urwego Bank was generally perceived as helpful by the farmers and appeared to include broader farming guidance not directly related to the seed or fertilisers provided. There was however no evidence that long-term impacts of fertiliser or pesticide use on water and soil quality were considered during the training, something that is recommended in Rwandan government policies. Non-members indicated that not having access to training could be an impediment to adaptation but that they had sometimes learned from neighbours.

Cooperatives and VSLAs serve both as a safety net and a catapult for their members' economic and social development by way of enhanced access to loans, training and markets. However, interviews with both members and non-members suggest that there is also the risk of reduced social mobility (involving technical, economic, social and political entry barriers that complicate access to such groups) and consequently growing socio-economic stratification, posing a serious challenge to inclusive development. Study findings do not support the theoretical effectiveness of the 'trickle-down' approach to development, whereby increasingly productive farmers will indirectly share their wealth with poorer farmers.

inguzanyo bwa banki y' Urwego cyane cyane gutanga inguzanyo mu buryo bw' ikoranabuhanga, kubahiriza igihe ndetse n' uburyo bunoze bwo gutanga inguzanyo byishimirwa cyane n' abahinzi twaganiriye.

Abo twaganiriye batubwiye ibyerekeye ibiza (icyanda n' imyuzure) byabaye mu myaka ya vuba ishize. Abahinzi batubwiye ingaruka zitandukanye zabaye ku bihingwa byabo zikagabanya umusaruro wabo mu buryo bugaragara. Ibyo byose byateye ibura ry' ibiribwa, kubura amafaranga ,cyane amafaranga y' ishuri ry' abana ndetse no gusuhuka aho abantu bajyaga gushaka imirimo ahandi. Mu rwego rwo guhangana n'ingaruka z' imihindagurikire y'ikirere, abahinzi twaganiriye bashyize mu bikorwa inama bagirwa zirimo gufata amazi atemba (imiringoti n' imirwanyasuri), guhinga mu buryo buboneye (gutera kare, gusimburanya imyaka ndetse no gutera imbuto yihanganira izuba), gutera imiti yica udukoko, gushaka indi mirimo yunganira ubuhinzi ndetse gucunga neza umutungo (amafaranga). Inguzanyo ntoya ziciritse zo kugura ifumbire zafashije mu kubona umusaruro bituma binjiza amafaranga mu gihe ikirere cyari kimeze nabi bityo bituma abahinzi babasha guhangana n' ingaruka z' imihindagurikire y' ikirere. Abahinzi bahawe imbuto biciye mu nguzanyo ziciriritse bahawe na Banki y'Urwego bagaragaje ko izo mbuto zihanganira ikirere.

Inguzanyo ziciriritse ntabwo zitangwa ku zindi ngamba zo guhangana n'ingaruka z' imihindagurikire y' ikirere nko gucukura imirwanyasuri, kuhira cg gutera umuti wica udukoko. Mu rusange, inguzanyo zagaragaje ko zitanga amahitamo ku byerekeye amafaranga bityo bigafasha mu kuyakoresha. Ariko nanone, abo twaganiriye batubwiye ko bagiye bagorwa no kwishyura inguzanyo kuri koperative mu gihe umusaruro wari wabaga wangijwe n' ibiza. Amahugurwa ku micungire y'amafaranga hamwe n' amahugurwa yo kunoza ubuhinzi yatanzwe na banki y' Urwego byafashije abanyamuryango ba koperative mu buryo bugaragara kandi bigishijwe uko banoza ubuhinzi bwabo muri rusange ku buryo amahugurwa atibanze gusa ku buryo bwo gukoresha neza imbuto n' ifumbire bahawe. Mu mahugurwa bahawe ntago bigeze bigishwa ku ngaruka z'igihe kirerekire ku ikoresha ry' ifumbire n' umuti wica udukoko ku mazi n' ubutaka bahingaho mu gihe byagiye bisabwa muri politiki za leta y'u Rwanda. Abatari abanyamuryango ba koperative bagaragaje ko kutabona amahugurwa byatuma batamenya uko bakumira ingaruka z'imihindagurikire y'ikirere ariko iyo byashobokaga bigiraga ku baturanyi babo.

Koperative n' amatsinda yo kuzigama no kugurizanya yagiye agaragara nk' ubuhungiro n' umusemburo w' iterambere ry' ubukungu biciye mu kubona inguzanyo, amahugurwa no kubona isoko ry'umusaruro wabo mu buryo bworoshye. Ariko abanyamuryango n' abatari abanyamuryango bagaragaje ko

Farmers reported that both the cooperative and VSLAs did not have any major issues with repaying loans for members who have defaulted, which protects Urwego Bank from financial loss. Farmers and Urwego Bank employees highlighted that there is an informal understanding between the Bank and its clients whereby there is a certain degree of flexibility in repayment if crops are negatively affected by changes in weather. While this certainly benefits the clients, questions remain on the financial sustainability of the Urwego Bank model if the frequency and intensity of climate events increases in the future.

Farmers' feedback on how their livelihoods can be improved include changes to the purpose, scope and timing of loans, training opportunities, meteorological information, crop insurance and connections to other development partners. The research team suggest a number of recommendations centred on similar issues (loan purpose, training, and crop insurance) as well as on the financial, social and environmental sustainability of the microfinance sector, the needs of young people, partnerships, the need for large-scale investments and future research directions.

hari imbogamizi mu kubasha kwinjira mu matsinda (haba imbogamizi mu buryo bwa teknikiki, bw' ubukungu, bw'imibanire na politiki byose bidindiza kuba wabasha kwinjira mu itsinda) bityo rero bigateza ingaruka yo gucama abahinzi ibyiciro by' ubukungu bituma abahinzi bose batibona nkabafashwa kwiteza imbere mu buryo bumwe. Iyi nyigo ntayo yemeranya n' ihame ry'iterambere rya "Trickle- Down" rivuga ko "uko abahinzi ba kijyambere bongera umusaruro bituma babasha kongera ubukungu bw' abahinzi bakennye.

Abahinzi bagaragaje ko koperative n' amatsinda yo kuzigama no kugurizanya bitigeze bigira ikibazo mu kwishyurira inguzanyo abahinzi babo bananiwe kwiyishyurira bityo rero bikaba byaratumye Banki y' Urwego itagwa mu gihombo. Abahinzi n'abakozi ba Banki y'Urwego bagaragaje y' uko hari ukumvikana hagati ya banki n' abakiliya bayo aho bafite uburyo bumvikanyeho mu kwishyurira inguzanyo n' urugero rwo kwihangana igihe ibihingwa byagizweho ingaruka n'ibiza. Mu gihe ibi bigira ingaruka nziza ku bahinzi, ikibazo kibazwa ni uburambe bw' ubu buryo bukoreshwa na Banki y' Urwego mu gihe inshuro ndetse n' ingano y' ibiza biterwa n' imihindagurikire y'ikirere bikomeje kwiyongera mu gihe kizaza.

Ibyifuzo by' abahinzi ku buryo ubuzima bwabo bwahindurwa bukaba bwiza birimo guhindura impamvu, ingano n' igihe inguzanyo zitangirwa; amahugurwa, amakuru ku iteganyagihe, ubwishingizi bw' ibihingwa ndetse no guhuzwa n' abandi bafatanyabikorwa mu iterambere. Ikipe yakoze ubushakashatsi yagaragaje ibyifuzo by' abahinzi bisa n' ibyavuzwe haruguru (impamvu y' inguzanyo, amahugurwa n' ubwishingizi bw' ibihingwa). Iyi kipe yagaragaje kandi uko uburambe bw' urwego rw' imari mu by' ubukungu, imibanire ndetse no kubungabunga ibidukikije bwakwitabwaho; ibyifuzo by' urubyiruko, ubufatanye, ishoramari ryagutse n' icyerekezo cy'ubushakashatsi bw'ahazaza.

1 Introduction and study aims

Climate change impacts are expected to significantly affect the Rwandan farming sector. Agriculture is a major part of Rwanda's economy accounting for 33% of GDP, and the main export crops of tea and coffee and local subsistence crops are highly sensitive to rain variability (Ministry of Environment 2019). Over the last two decades, parts of the country have experienced periods of severe flooding and drought spells, resulting in loss of life, destruction of infrastructure, and severe damage to crops affecting more than two million people (MIDIMAR 2015, 1). With temperatures in Africa projected to rise faster than the global average this coming century (Niang et al. 2014), these impacts are likely to increase in frequency and intensity, posing a serious risk for local livelihoods and food security in Rwanda.

At the same time, due to historical factors and long-standing government policy, a significant number of Rwandan smallholders form part of various groups that pool resources together in order to increase productivity and overall incomes, including farmer cooperatives and village savings and loan associations (VSLAs). In many cases, these institutions depend on various forms of microfinance. However, emerging research suggests that climate impacts may affect the viability of both such poverty-reducing financial products (Fenton et al. 2015) and the resilience of their beneficiaries (Hammill et al. 2009). Therefore, it is important to consider the future impacts of climate change on the microfinance sector in Rwanda on the one hand, and to ensure that the benefits of microfinance can decrease rural residents' vulnerability to climate impacts, on the other.



Figure 1: Southern Rwandan countryside

Since September 2017, Opportunity International UK (OIUK) and Urwego Bank (its local partner) have been implementing a development assistance project in Rwanda financed primarily by the Scottish Government. Amongst the various outputs of the project, of specific relevance for this study is the provision of microcredit loans to 8,500 smallholder farmers working in government-supported agricultural cooperatives in the Southern and Western provinces of Rwanda. Such loans are meant to provide access to improved agricultural inputs, seeds and fertilisers in particular, with the aim to increase agricultural production. The provision of these microloans is part of a broader array of interventions carried out as part of the project itself, which also include training on good agricultural practices and financial literacy as well as the promotion of a culture of savings and the improved provision of financial services at the community level.

This research project focuses on the clients of Urwego Bank. It specifically investigates the impacts of small loans on the vulnerability and adaptive capacity of farmers in southern and western Rwanda (Huye and Rubavu Districts) and assesses how climate change may impact these microfinance products in the future.

The study aimed to establish:

- 1 How climate variability affects Rwanda farmers' livelihoods;
- 2 How microfinance affects their ability to adapt to it;
- 3 How climate variability is likely to affect microfinance schemes in the country.

In the next chapter, a brief overview of the current state of knowledge on the link between climate change and microfinance is provided, including the synergies and tensions between the two concepts, followed by a synopsis of the current climate change adaptation policy context in Rwanda. Next, the methodology chapter presents detailed information on fieldwork, interviews, sampling and project field sites. The evidence-based chapters subsequently unpack the relationship between microfinance, climate change and the resulting local adaptation strategies, as well as the broader socio-economic implications of access to microfinance in rural Rwanda and an analysis of how climate change may impact the microfinance industry. The report ends with recommendations provided by both the project participants and research team.

2 Microfinance and climate change: What we know

There is increasing interest in using microfinance to mobilise climate change adaptation in the Global South (Green Climate Fund 2019). Microfinance can be defined as formalized financial services to low-income households excluded from the conventional banking sector. In the literature, the extent to which microfinance actually facilitates adaptation remains largely unknown due to limited empirical data and evidence based analysis (Fenton et al. 2015, 269; Dowla 2018). This chapter is a brief overview of the current knowledge about the impacts, opportunities and limitations of using microfinance to increase the adaptive capacity of agricultural communities vulnerable to climate change.

2.1 Microfinance and Adaptation: Synergies and tensions

Adaptation can be defined as the process of effectively managing climate change risks, hazards, and opportunities to ensure resilience (Fenton et al. 2015). Proponents suggest that microfinance institutions (MFIs) are well-placed to promote adaptation products, training and programmes because they have established distribution channels to a client-base of working-poor who tend to live in areas vulnerable to climate change impacts and are otherwise unable to access credit (Agrawala and Carraro 2010). Microfinance institutions can increase the resilience of households by supplying collateral-free credit to build up capital assets and by providing coping mechanisms (i.e. higher incomes, access to credit, insurance services, savings) for consumption smoothing during climatic shocks (Dowla 2018). Moreover, local groups whose members access microfinance usually operate on a local-level model of decision-making, allowing them to enjoy relatively high legitimacy (Rippey 2012). Evidence from other parts of the world suggests that credit can be a valuable instrument for reducing vulnerability if MFIs adjust financial modalities to allow repayment flexibility during climatic shocks (e.g. extend repayment periods, lower installment amounts, vary the amounts and number of repayments, and even abandon joint liability) (Fenton et al. 2015).

To further facilitate adaptation, literature suggests that MFIs can 'climate-proof' traditional loan products. For example, agricultural loans could be made conditional on planting drought and saline tolerant crops or for improving irrigation. MFIs could also opt for investing in new climate-proof products and programs commonly suggested in the literature including (a) dissemination of climate-change knowledge to clients about impacts and remedies, (b) offering weather warning by SMS to allow clients to respond and prepare, (c) offering existing microinsurance but with affordable

coverage and sliding co payments, (d) offering new types of sought-after insurance (i.e. livestock, crop) that automatically responds to climate fluctuations, (e) adding low-cost or value-added remittance services (i.e. pensions, insurance, savings) and integrating mobile money, (f) expanding the use of renewable energy, (g) protecting natural capital through conservation jobs programs, and (h) scaling up local agricultural initiatives using local knowledge of sustainable practices (Agrawala and Carraro 2010; Rippey 2012; Fenton et al. 2015; Chirambo 2017; Dowla 2018, 81-83). Climate-proofing products and programs in this way is said to be mutually beneficial because it increases the climate resilience of MFIs' clients while enhancing financial stability for MFI themselves.

However, the literature cautions against unrealistic expectations of microfinance as a tool for adaptation and raises concerns about several limitations of microfinance loans for building adaptive capacity. The first limitation is the depth of microfinance outreach. Microfinance may not be an effective adaptation tool if the extreme poor are an adaptation priority group (Hammill et al. 2008). In general, microfinance clients are the economically active households living at the poverty line or just below it. However, microfinance does not typically extend to the 'extreme poor' or 'destitute' households, nor does it target socially excluded groups. Government social protection programs, such as Rwanda's Vision 2020 Umurenge Programme (VUP), shows evidence of being a more effective tool for reducing climate vulnerability of the extreme poor (Siegel et al. 2011).

The second concern is whether microcredit offers households a viable pathway towards adaptation by increasing future productivity gains through diversified livelihoods (Fenton et al. 2015). In a systematic review of microfinance in sub-Saharan Africa, van Rooyen et al. (2012) found strong evidence that microcredit had positive impacts on food security and nutrition in households, but they found limited evidence that microcredit had a positive impact on incomes, asset accumulation and business diversification over the long term. If microcredit primarily serves as a coping mechanism to smooth consumption during a disaster, then its role is to merely sustain the survival economy of households instead of providing long-term pathways out of climatic vulnerability and poverty.

The third limitation is that microcredit can be maladaptive when it leads to over-indebtedness. In a study of adaptive capacity in Bangladesh, Fenton et. al (2017) found that 'one-fifth of all loans in the village were obtained for repayment of existing loans'. This was partially because the design of microcredit as a short-term product with immediate repayment schedules did not allow enough time for income generating activities.

Finally, while microfinance is often promoted as a tool for empowering women, research from other parts of the world suggests that local gender inequalities may actually cause female clients to lose access to the obtained funds while remaining liable for the debt, itself (Paprocki 2016).

2.2 Potential impacts of climate change on microfinance

Evidence from across the world suggests that problems with microfinance loan repayments correlate with declines in agricultural productivity caused by climate change impacts (Fenton et al. 2015, Dowla 2018). In Rwanda, floods and landslides reduce arable land use while rising temperatures increase evapotranspiration and lead to accelerated crop growth, providing less grain and causing an overall crop yield reduction for farmers (Ministry of Environment 2018). Rising temperatures also increase crop and livestock disease outbreaks, resulting in asset losses and further declines in crop yield, which in turn cause profit losses for farmers, rising food prices and an increase in household poverty and financial insecurity.

As a result, microfinance clients dependent on small-scale or subsistence farming may struggle to service original microloan repayment schedules leading them to take on additional high-interest loans from moneylenders, deplete savings, or sell livelihood assets, if possible (Hammill et al. 2008; Fenton et al. 2017). Consequently, this may cause liquidity problems for microfinance institutions (MFIs) because the destruction of client assets and income can lead to large-scale defaults on loans, draining of compulsory savings, and an erosion of bank capital (Dowla 2018).

3 Rwandan policy context

Rwanda has articulated a commitment to mainstreaming the environment and climate-proofing agenda into national economic development policies and medium-term sectoral strategies (Ministry of Environment 2019). This chapter highlights current policies underpinning Rwanda's agricultural development model and adaptation trajectory. A key route through which the Government of Rwanda aims to support rural populations is the development of various types of cooperatives and related forms of associations. Cooperatives are viewed by the Government of Rwanda as a potential vehicle for increasing employment and income-generating activities, savings and investment, technical capacity, social well-being and economic development, among other goals (MINICOM 2018).

3.1 Cooperatives, VSLAs and microfinance

A cooperative is a formally registered enterprise with shared, collective ownership by its members. Decisions are made democratically so that each member has a voice in how profits are distributed, what activities to pursue and whether to apply for loans. All cooperatives, of which there were close to nine thousand as of 2018 (MINICOM 2018, 18), are regulated and supported by the Rwanda Cooperative Agency (RCA), a government body responsible for developing cooperatives' capacity and access to capital, technology and new management approaches and techniques. Rwandan cooperatives can be found in different sectors, including services, trading, processing, transport, or agriculture, among others. Agricultural cooperatives account for 29% of cooperatives with an estimated 2,399 registered enterprises and close to 300,000 members (MINICOM 2018, 19). They usually have a physical space for holding meetings and storing the crops and own agricultural equipment used by members (see Figures 2 and 3).



Figure 2: Farming equipment belonging to the rice cooperative in Huye



Figure 3 : Outside view of the cooperative headquarters in Huye

On the other hand, Umurenge SACCOs (savings and credit cooperatives established in 2008) were designed to increase rural savings and access to loans in Rwanda. SACCOs are also used as a channel to provide compensation to local people contracted to work through the Crop Intensification Programme by the Ministry of Agriculture and to collect health insurance contributions by the Ministry of Health (AFI 2014). SACCOs are locally based and locally run cooperative banks that seek to make linkages with smaller, informal savings groups known as VSLAs (Village Savings and Loans Associations). Within a VSLA, each member saves regularly and is able to apply for small loans from the pool of joint savings. By working through a SACCO, groups have access to more formal banking products and larger loans. VSLAs from Rubavu form part of this study. However, rather than relying on SACCOs in this case, the VSLAs studied here have been instituted by Urwego Bank, whereby the loans are granted directly by the Bank.

Financial inclusion through microfinance is a top development priority for Rwanda and there are current policies which regulate and promote the functioning of microfinance institutions. The National Microfinance Policy Implementation Strategy 2013-2017 set the policy goals of reducing financial exclusion of the 'economically active poor' in Rwanda and it aimed to deepen and diversify microfinance service provision for those already included (MINECOFIN 2013, 6- 8). SACCOs and VSLAs are specified as a key strategic intervention for agricultural development in the National Strategy for Transformation 2017-2024 and the policy target is that by 2024, all Rwandan farmers will have access to credit and financial services (MINECOFIN 2017, 23-24).

3.2 Rwanda's adaptation policies

The Government of Rwanda has instituted a number of policies and strategies to promote 'green growth', address climate change and protect the environment. Key examples of this are the Green Growth and Climate Resilience Strategy (Ministry of Environment 2011) and the Rwanda National Environment and Climate Change Policy (Ministry of Environment 2019), which outline Rwanda's vision as a developed, climate-resilient, low-carbon economy by 2050. Specific practices that are encouraged include adaptation and mitigation actions in agroforestry, protection of lakes and riverbanks, protection of hillsides against erosion and restoration of some critical ecosystems. Other recommendations in this context are to improve the construction of houses by using more durable materials, harvest rainwater in water tanks, or to dig underground pits (soakaways) which prevent erosion (Ministry of Environment 2018). Agriculture is designated as a priority sector for adaptation and the green growth policy aims to promote sustainable intensification of small-scale farming and agricultural diversity for local and export markets.



Figure 4: A tea plantation in Rubavu

At the international level, as a signatory to the United Nations Framework Convention on Climate Change (UNFCCC), Rwanda developed a National Adaptation Programme of Action (NAPA) for reducing vulnerability to climate change impacts (Republic of Rwanda 2006). NAPA updates are outlined in Rwanda's Second National Communication to the UNFCCC (Republic of Rwanda 2012) and their Third National Communication to the UNFCCC (Republic of Rwanda 2018a), in which the Rwandan government outlined a number of proposed adaptation measures for the agriculture sector, many of which mirror suggestions in the literature on climate-proof microfinance products (Republic of Rwanda 2018a, 143). Rwanda also submitted an Intended Nationally Determined Contribution (INDC) (Republic of Rwanda

2015). Recent NAPA communications and their INDC are largely based on the GGCRS (Ministry of Environment 2011).

Lack of capacity and climate-change knowledge seems to be a limitation for adaptation programs in Rwanda. In the Third National Communication, Rwanda reported that capacity building gaps exist at all levels - amongst policy makers in government, associations, cooperatives, technical extension officers and farmers, themselves (Republic of Rwanda 2018a, 207). The government has set out a number of proposed education and information sharing priorities to address this problem.

Cooperatives are central to Rwanda's development model for achieving the Sustainable Development Goals and responding to climate change, which is outlined in the National Policy on Cooperatives Rwanda (MINICOM 2018, 4) and sectoral development policies. The National Strategy for Transformation 2017-2024 (NST1) recognizes that low climate change resilience in the agricultural sector is a cross-cutting policy issue which impedes economic growth, hinders poverty reduction, increases food insecurity and impacts the well-being of smallholder farmers (MINECOFIN 2017, 9-11). In response, the NST1 and the National Agriculture Policy encourages farmers to establish or join cooperatives to improve productivity and pursue 'climate-smart agriculture' (MINAGRI 2018, 17). The policy idea is that agricultural cooperatives strengthen the adaptive capacity of individual farmers by providing access to credit and financial services, social protection programs, improved seed and fertilizer suppliers, cooperative irrigation schemes, soil and water conservation expertise, high-productivity technologies such as greenhouses and hydroponics, and enhanced bargaining power in agricultural value-chains (MINECOFIN 2017, 23-25 and 50; MINAGRI 2018, 17 and 27; MINICOM 2018, 8).

4 Methodology

In order to achieve the aims set out above, this research project followed a qualitative approach based on participant observation, semi-structured interviews, field visits and document analysis. Fieldwork was carried out across a two-week period in July 2019 and included field visits to two field sites in the districts of Huye (Southern Province) and Rubavu (Western Province). The study also included field visits to various farming sites, including cooperative and VSLA members' fields, product processing facilities, and a local dam used to provide irrigation.

4.1 Interviews and sampling

The research team carried out a total of 28 semi-structured interviews. This included 20 Urwego Bank clients (10 farmers belonging to a rice cooperative in Huye and 10 farmers forming part of VSLAs in Rubavu) and 4 farmers not associated with any group and thus not receiving loans from Urwego Bank. In addition, the sample also included 3 Urwego Bank staff members in Huye, Rubavu and Kigali (one each) and a government representative co-responsible for national environmental policy based in the capital (see Table 1). Interviews with farmers took place at the cooperative headquarters (Huye) and a local school and restaurant (Rubavu), while those with Urwego Bank staff and the government official were held at the interviewees' workplaces. Each interview was carried out in the presence of translators who had previous experience working with farmers and carrying out research. All interviews were audio-recorded, translated from Kinyarwanda (if necessary) and transcribed directly into English by a research project staff member. The 24 interviewed farmers were compensated for their time and transport costs.

The goal of interviews with farmers belonging to the cooperative and VSLAs was to gain insight into their direct experiences of receiving loans from Urwego Bank, and the ways in which this has contributed to their ability to adapt to climate change. Farmers were also asked more broadly about the impact of recent weather changes and the differences between those who can and cannot access loans. Interviews with non-members focused on the reasons why they had not joined the cooperative or VSLAs included in the study, and an exploration of the alternative strategies that were used if and when their crops were affected by adverse weather events. Urwego Bank staff were interviewed in order to understand the loan processes in more detail and help answer how climate variability might affect MFIs.

Participant affiliation	District	Gender	Interview language
Cooperative member	Huye	Female	Kinyarwanda
Cooperative member		Female	
Non-member		Female	
Cooperative member		Female	
Cooperative member		Female	
Cooperative member		Female	
Cooperative member		Male	
Cooperative member		Male	
Non-member		Male	
Cooperative member		Male	
Cooperative member		Male	
Cooperative member		Male	
VSLA member		Rubavu	
VSLA member	Female		
VSLA member	Female		
VSLA member	Female		
VSLA member	Female		
Non-member	Female		
VSLA member	Female		
VSLA member	Female		
VSLA member	Female		
VSLA member	Male		
Non-member	Male		
VSLA member	Male		
Urwego Bank employee	Huye		Male
Urwego Bank employee	Kigali	Male	English
Urwego Bank employee	Rubavu	Female	Kinyarwanda
Government official	Kigali	Male	English

Table 1. A summary of interviewed participants

In terms of participant selection, cooperative and VSLA members were chosen randomly from a list of 40 clients supplied by Urwego Bank, while non-clients were identified via snowball sampling after consulting with cooperative and VSLA members themselves. Urwego Bank staff were also selected via snowball sampling, while the government official was identified through online search. Within the total sample of 24 farmers interviewed (both members and non-members), 15 were women. The sample contains an equal number of residents of Huye and Rubavu (see below). The choice of these two districts was established in consultation with OI UK and is based on the areas in which the organisation funds Urwego Bank activities.



Figure 5: The main hall of the cooperative headquarters in Huye where rice is stored and meetings are organized

4.2 Field sites

Farmers involved in this study formed part of two distinct forms of associations: a cooperative (Huye field site) and VSLAs (Rubavu site). Cooperatives are generally larger and more institutionalized; they must be registered with the Rwanda Cooperative Agency (RCA). In the case of the rice cooperative, membership is contingent on securing rice paddies by purchasing cooperative shares. VSLAs are relatively smaller and more informal. Their access thresholds are lower and usually limited to paying membership dues, and they do not offer any official redress or compliance channels. The following sections provide more details on each field site.



Figure 6: A terraced landscape in Huye district

Huye District

This field site is located in the Huye District in the south of Rwanda within a rice growing cooperative of over 250 active members. This area has a rainfall distribution pattern of 1,200 mm per year and an annual average temperature of 19°C (USAID 2019, Rwanda Meteorology Agency n.d.), with a reported increase in aridity over the past few years. While hill slopes are terraced and used for subsistence farming (see Figure 6), much of the land located in local valleys is covered in rice paddies owned by the Government of Rwanda under the Rwanda Environmental Management Authority, which are in turn rented to members of agricultural cooperatives in the area as part of the Government's land use consolidation programme. The paddy sizes reported by interviewees ranged from 16 to 56 acres. The paddies are irrigated by a government-funded dam, which is managed by a local committee that includes members of the cooperative included in our study (see Figures 7 and 8). In addition to rice paddies rented via the cooperative, interviewees all have hillside plots closer to their homes, on which they grow crops for personal consumption and sale at local markets. The research team interviewed two farmers who do not belong to the rice cooperative here.



Figures 7 and 8: Local dam in the Huye District, which provides water to the cooperative's rice paddies downstream. Side view (top) and downstream view (bottom).

The cooperative is a legal entity that receives the loan from Urwego Bank and disburses it amongst the members. The loan takes the form of a voucher for seeds and fertiliser rather than cash, and repayment is made through the cooperative. In this way, any defaulted loan is repaid by the cooperative and then recuperated from individual members. The loans taken from Urwego Bank are only used for rice cultivation as part of the cooperative activities and cannot be applied to the plots used for subsistence.

Rubavu District

The second field site is located in the Rubavu District in north-western part of Rwanda. Rainfall in Rubavu varies between 1,200 mm and 1,500 mm per year (Rwanda Meteorology Agency n.d.). The north-western part of the District has very rich but shallow volcanic soil, while the south-eastern part is characterized by deep soils but poor, often acidic, sandy clay affected by high erosion (Republic of Rwanda 2018b).

Participants in Rubavu were members of a number of different VSLAs of between 20 and 30 members that were established with the support of Urwego Bank in the north-western part of the District. The main local crop is potato (locally referred to as 'Irish potato'), popular in this region due to the level of rainfall and fertile volcanic soil. Two non-members were also interviewed here.



Figure 9: Potato field in Rubavu



Figure 10: Pyrethrum field in Rubavu

Unlike in Huye, VSLA members in Rubavu do not form a cooperative, and therefore do not rent land next to one another. Instead, they cultivate potatoes alongside crops for personal consumption and local sale (Figure 9). Some also grow pyrethrum which is sold to a local facility that processes it into a natural pesticide (Figure 10). As in the case of the Huye rice cooperative, VSLAs in Rubavu receive loans from Urwego Bank and are responsible for disbursing the fertiliser and managing repayment. They are also liable for loan repayment on behalf of all their members.

5 Microloans and their impacts on farming

Farmers see loans as one of the most effective ways to increase agricultural productivity and income. First, loans increase their disposable incomes in the short term. Not having to spend their savings on inputs such as seeds or fertilizer, they are able to direct financial resources towards other household expenses, such as education and housing:

Because of this loan I got from Urwego, I managed to pay school fees for my children and I have a house which (...) I hope will soon be finished.

VSLA member, Rubavu

Second, being able to use higher-quality seeds and sufficient amounts of fertilizer when required increases the sheer productivity of farmers and helps them close the 'yield gap' – the difference between actual and potential yields in their fields (Taylor 2014). Loans are granted for specific agricultural inputs: seeds and fertiliser.

Further to these benefits, there were specific aspects of the Urwego Bank model of lending that was highly valued by the clients which are outlined below.

5.1 Loan delivery model

In the context of this study, Urwego Bank loans were provided to farmers for seeds and fertilisers. The Bank buys the products on behalf of the borrowers who then pick up the items at a local store. This mode of lending was valued by the participants who felt that it meant that they were able to directly invest in their farming activities. One stated:

Urwego provides loans for seeds and fertilizers and loans are not given in cash. So it is helpful because if we were given money, we would use it for other household needs and we would not invest it in the farming. So, Urwego improves our farming activities.

VSLA member, Rubavu

Another key aspect of the Urwego Bank model that was seen as valuable to farmers was the seasonal repayment schedule. This allowed farmers to repay only once the harvest had come in. It was felt that this made repayment easier and more manageable:

Urwego gives loans to farmers and they allow them to pay back on a seasonal basis and at the end of the season, [when] we are harvesting rice, maize and beans, it is easier for everyone to pay back their loans.

Cooperative member, Huye

5.2 Timing and efficiency of loan delivery

Many of the farmers said that a key reason for choosing Urwego Bank over other microfinance providers was the speed at which the loans were provided:

We first worked with other banks but since we started working with Urwego Bank, it is fast and it is good because we get fertilisers on time.

Cooperative member, Huye

The timing of the loan is another key factor, as farmers sometimes require investment for the next season before having sold their crops from the previous one:

Urwego gives us money for buying agricultural inputs, that is seeds and fertilizer. Urwego gives out loans to us so that we don't delay planting and fertilizer application for the next season even when our harvested rice is not yet ready for the market.

Cooperative member, Huye

The value of having access to the Urwego Bank loans is vital as there can be lasting implications for those who are forced to work with institutions that do not work in the same way. Non-members reported applying for loans with other entities and receiving the funds after it was simply too late to apply the inputs and salvage the crops:

My husband no longer wants to take loans because he does not appreciate working with banks. One time, he requested a loan and it was delayed to the extent that the loan was disbursed when the crops had already been damaged in the fields. That time we did not harvest at all yet we had to pay back that loan.

Non-member, Rubavu

5.3 Training

The vast majority of cooperative and VSLA members indicated training sessions as one of the key benefits of membership. Importantly, in the case of VSLAs, participating in training sessions is a prerequisite for securing a loan:

People who choose to form a group invite us and we first train them. If they accept to abide by the rules and regulations, then we ask them to register with the sector authority. If their group gets registered, then we give them loans.

Urwego Bank Employee

Training sessions are provided by Urwego Bank to complement the loans and include sessions on loan management, cooperative management, income generating activities, sustainable/climate-smart agriculture, or post-harvest processing. And while Urwego Bank do not offer training sessions on climate change, Bank employees outlined some of the general training that is offered which focuses on practical solutions:

We talk about mitigating climate change effects in general... We sensitize them to plant on time in both seasons, then we help them to avoid losses when their harvest reduces because of climate change issues.

Urwego Bank Employee

While loans are not available for digging contours to prevent hillside erosion, one participant recalled that contours had been covered in the training, indicating that training provision can extend beyond the immediate relevance to the loan.



Figure 11: Drying rice harvested by the cooperative members in the Huye District

Most participants confirmed that they had been trained in 'good agricultural practice', but what exactly was meant by this was not specifically explored in the interviews. A sustainability analysis of Rwanda's Crop Intensification Program indicated that it did not fully consider interventions and funding to avoid possible future damages from intensive agriculture or externalities from the use of chemical inputs (Cantore, 2010). The new Rwanda National Environment and Climate Change Policy (2019) has significant attention for various adverse effects such as the impact on agricultural run-off (fertilisers and pesticides) on water pollution, particularly important in the absence of drinking water treatment facilities. It also addresses soil degradation:

Inadequate resilient soil conservation practices, the use of chemical fertilisers and associated agriculture low yields are resulting into over-cultivation and subsequent soil degradation and pollution. The impact has been a vicious cycle of erosion and reduced soil fertility and productive capacity.

Ministry of Environment 2019, 22

Participants gave no indication that these risks to the environment were covered as part of 'good agricultural practice', which instead seemed to focus on increasing yield even in challenging weather conditions, suggesting that certain aspects of Cantore's analysis still apply in practice. In addition to the benefits related to good agricultural practices, training in this context has the aim of ensuring the cohesion and appropriate leadership of the newly created group:

Before giving us the loans, they first train us on how to form a group [with] people living in the same neighbourhood, people who are already friends so that when we form a group, it will continue to be strong. During training, they will provide transport and we also have lunch (...).

VSLA member, Rubavu

[The training session] helped the cooperative members to understand their responsibilities in the cooperative and to know the cooperative needs. We have also learned how we can direct our leaders once they have made mistakes.

Cooperative member, Huye

The benefits of increasing community networks through cooperative membership has been noted by the interviewed government official:

[F]rom some testimonies, from people in cooperatives, they testify that being in a cooperative helped them progress. Sharing ideas with others. Working together and also benefiting from opportunities coming from cooperatives makes them reach [a] step ahead and developing their households themselves. There is a difference in that way [as] the people say: "on my own, I will not achieve this but with the cooperative I achieved this" because at the end of the year, they have some dividends that they share and their capital and all their project continues growing. So I may say that the people in cooperatives experience some growth.

Government Official

Capacity building of this kind has the dual benefit of providing transferable skills to farmers, who can in turn share them with their family members and neighbours including those who are not co-operative members on the one hand, and increasing the likelihood the loan will be repaid, on the other. Overall, participants were appreciative of being able to benefit from training sessions offered by the Bank.

6 Local impacts of climate change

The government representative described a range of climate change impacts on multiple sectors in Rwanda. For instance, the country relies heavily on hydroelectricity, so that when this sector is impacted other sectors are affected by loss of power. Roads and houses have been destroyed by floods and landslides, which also affects the mining sector. However, they indicated that the sector most affected was the agricultural sector along with smallholders. The sections below report on the impacts on farming in the rural communities of Huye and Rubavu.

6.1 Impacts on farming

There was a widespread impression that the weather had changed, mostly notably with regard to changes in rainfall patterns. Flooding, drought, delayed and unusually heavy rainfall were all mentioned, the latter also resulting in erosion and landslides. Participants agreed this affected farming negatively:

It is difficult now to be a farmer because of the changing weather conditions.

Cooperative member, Huye

Nearly all interviewed farmers had experienced reduced crop yield due to unpredictable rainfall patterns and many recalled both floods and droughts within the last five years. Impacts on harvest were often severe, with several participants reporting losses of between 50% and 100% of the crop.

The government representative underscored the gravity of these impacts given the fact that a large proportion of the population relies on agriculture. Amongst the participating farmers, the impacts reported were broadly similar regardless of whether or not the participant was a cooperative or VSLA member. There were however some regional differences in the frequency with which drought and heavy rain were mentioned. While about half of all participants in both areas reported heavy rains, droughts were mentioned more commonly in Huye. There were also differences in the specific impacts these had on farming, as outlined below.

In Huye, heavy rain was mentioned by about half of all participants and had led to a wide range of specific impacts on infrastructure, farm management, production and consequently farmers' financial situation. The dam used to irrigate the rice paddies in this area had been damaged by heavy rains and was leaking. Some participants mentioned that rice paddies had gotten covered in mud, and one mentioned waterlogging.

The heavy rains had led to disease in the rice crops and reduced germination. Participants also mentioned that there had been landslides, soil erosion and crops being washed away. On the hillside plots, bean crops had been reduced as heavy rains damaged flowering plants:

Sometimes those rains are not enough and the seeds don't germinate. Another time, they germinate very well, and when they reach the flowering stage, they will not have enough rainfall. We had a case where we had a very heavy rainfall when beans were at the flowering stage and the flowers fell and we failed to get pods.

Cooperative member, Huye

Nearly all participants in Huye also mentioned drought, which led to pest or disease infestation and drying up of crops. Moreover, the damage to the dam had rendered them less able to cope with drought. All impacts ultimately led to reduced yields, food scarcity and a hike in food prices.

In Rubavu, heavy rain was mentioned by just over half of all participants. Here, the main crop is Irish potato. There was almost universal agreement on the impact of heavy rains on this crop, which was widely reported to be attacked by diseases due to the rains. This led to increased need for 'pesticides', 'medicines', or 'plant treatments', as mentioned by nearly half of participating farmers:

Heavy rainfalls render Irish potato susceptible to pests and disease so that it requires spraying with pesticides immediately.

VSLA member, Rubavu

Drought was mentioned by two participants, while another one pointed out 'a lot of sun' [VSLA member, Rubavu], reportedly leading to spoiled crops, stalled growth and ultimately a reduced harvest.

A particularly interesting comment was that a participant perceived that young people were not interested in getting involved in agriculture, because of unresolved challenges - most of which arose from weather and climate. Specific impacts of drought and heavy rain in each district are summarised in Table 2.

Location	Impacts associated with drought	Impacts associated with heavy rain or flooding
Huye	Reduced yield	Reduced yield
	Areas near rice paddies become overpopulated/overused	Seeds don't germinate
		Water logging
		Heavy rain damages (bean) flowers
		Erosion / Washing away of soil
		Washing away of crops
		Rice parcels covered in mud
		Rain delays farming activities
	Rice parcels 'taken away' by flooding	
Rubavu	Crops destroyed by too much sun	Damaged / spoiled / rotten crops
	Potatoes don't grow very well	Smaller potato size
	Harvest reduced drastically	Reduced yield
	Pest infestation	Irish potato attacked by diseases Unknown crop diseases

Table 2. Climate impacts as reported by interviewed farmers in Huye and Rubavu.

6.2 Social impacts

From the examples outlined in the previous section it is clear that many of the farmers have experienced negative impacts of climate change, which has often led to reduced harvests. When asked about what this meant for other aspects of their lives, multiple impacts were apparent, with the three main categories being food scarcity, spending and financial management, and labourers and migration.

Food scarcity

Many participants reported that they had struggled to feed their families. Not only did they have less produce from their own fields, but less food was also available on the market while prices had increased. Such impacts were reported to be widespread:

The problem of food scarcity was common in all households and in this area in general.

Cooperative member, Huye

Some also indicated they that due to reduced food reserves, they had been unable to help others:

I cannot even give to my neighbour who is in need because it is not even enough for me. I have to be cautious.

Cooperative member, Huye

This is significant in that it indicates a very real risk to the most vulnerable people having to forego acts of mutual help in a society where government welfare is limited.

One participant also mentioned that the variety of available food was reduced:

A balanced diet becomes a problem to some families as some foodstuffs were not available on the local market.

Cooperative member, Huye

It was noticeable in these conversations that many respondents used the term 'food security' in common parlance: clearly there is a high level of awareness of the issue.

Broader spending and financial management

The impact on household expenditure went beyond food. In this context, school fees were mentioned most frequently, but other essential areas of spending were also affected:

The weather and climate changes affects us in many ways because when the production is low, we don't get enough money to buy some basic things needed in life like food, medical insurance, clothes, school fees and so on.

Cooperative member, Huye

Larger spending projects, such as house construction, were also reported to have been delayed or cancelled. Reduced income had also affected financial management. Several participants reported that they had found it difficult to pay back loans to their cooperative, and one had failed to do so. They had lost their investment or had to use their savings to pay back their loan. Some said they had found it hard to pay labourers and had taken out loans or rented out land in order to be able to do so.

Labourers and migration

The above indicates not only that impacts may span multiple years, but also that those reliant on employment opportunities in other peoples' fields may find it harder to find

any. It was observed that casual labourers were the first to be affected, and are the first to be forced to migrate whenever there is a weather or climate issue. In the context of migration, one respondent explained that drought results in the movement of people looking for fertile fields. Some were also reported to go to urban areas or to areas unaffected by erratic rainfall, while some 'prefer to stay and wait for the rain to come' [Cooperative member, Huye]. A respondent in Huye explained:

Sometimes there is movement of people looking for fertile farm fields as they live off agriculture. Most of the times, you will find out that areas that are near the marshlands are overpopulated.

Cooperative member, Huye

The vulnerability of labourers in particular poses challenges for achieving inclusive development and adaptation, which will be discussed in more detail below.

7 Adaptation and microfinance

7.1 Autonomous adaptation strategies in Huye and Rubavu

Autonomous adaptations include any strategies employed independently by farmers to respond to the impacts of climate change on their crop production (Pelling 2011). When asked about their autonomous adaptation measures, farmers describe a variety of examples, including those related directly to farming and farm management, and others linked to the social context in families and farming communities. These adaptations are summarised in Table 3.

Location	Adaptations to drought	Adaptations to heavy rain	Other types of adaptation
Huye	Water channels	Digging contours	Off-farm commercial activities
	Irrigation	Clearing irrigation channels to allow water to pass	Planting early / on time
	Growing nearer marshland		Growing food security crops
	Drought tolerant crops		Cautious investment
			Use appropriate seed for expected conditions
	Storing part of the harvest		
Rubavu	Rainwater harvesting	Growing a different variety	Buying pesticide before start of season
	Drought/heat resistant crops	Rotate (potatoes) with maize	Spraying immediately
		Digging contours	Crop rotation
		Rainwater harvesting	Planting on time
	Fertilisers		

Table 3. Different types of adaptations as reported by the interviewed farmers in Huye and Rubavu.

Farming adaptations

In both field sites, many farmers mentioned that planting ‘early’ or ‘on time’ was a sensible adaptation, although no guarantee for success:

One season, I tried to plant two weeks after the on-set of rains but it did not work out as the heavy rainfall occurred later during the season and destroyed our crops.

Cooperative member, Huye

To cope with heavy rains, farmers in both field sites have undertaken contour digging (terracing) to avoid fertile soil and crops being washed away by heavy rains. This was particularly important on the hillside plots, which are owned or rented by individuals rather than cooperatives, and therefore are generally cultivated without outside help. In Huye, farmers additionally attempted to protect the marshland by using irrigation channels for flood mitigation:

When flooding happens, we try to drain the irrigation channels so that water can easily pass without submerging rice fields.

Cooperative member, Huye, 6

The government representative also reported that farmers occasionally dig pits to channel the excess water away from crops and soils, as a cheaper alternative to storing it in a plastic tank – although with the downside that it cannot be used for irrigation:

There is water that is flowing from your roof, if you don't have the capacity to buy a plastic tank, you dig nearby so the water that's flowing will flow into that pit [...] so it cannot destroy the landscape. [...] If you dig, you don't use that water [...] Lot of the times that water gets filtered so it also benefits the whole environment. But personally you not use it.

Government official

In response to drought, farmers in Huye referred to the need for water channels and irrigation, thanks to which the fields in the valley were easier to supply with sufficient amounts of water. However, others did not have access to a pump and referred to high costs of irrigation, especially on the hillside plots.

Several farmers also reported that they had changed crops or crop varieties:

The seed type we keep depends on the weather; we plant seeds according to which one can withstand heavy rains or resist the sun.

VSLA member, Rubavu

Some also referred to food security crops, such as growing sweet potato and cassava in the paddies. Tomatoes were said to be not as profitable as the usual crop (rice) but still provided some income which helped pay for inputs in the following season. Sometimes a different variety of the same crop (for instance, of potato in Rubavu) was reported to give better results given the changed weather conditions.

The changes in the type of seed required, due to altered weather patterns, meant that it was not always possible to use seeds saved from the previous year, increasing costs and reliance on loans.

In Rubavu, where the susceptibility of Irish potatoes to pests and diseases was a particular problem, farmers responded by applying pesticides, which they said were necessary to obtain before the start of the season. One individual mentioned a shortage of 'plant treatments' [VSLA member, Rubavu]. Some interviewees also mentioned crop rotation as an adaptation measure. One farmer indicated they invested in farming more cautiously because of climate change:

You will again invest in the next season or year but this time you will be cautious and invest a small quantity.

Cooperative member, Huye

When asked about the government's response to climate change, the government representative mentioned a wider range of agricultural adaptations, such as agro-forestry, conservation projects, protection of riverbanks and ecosystem restoration, but these were not reflected in the interviews with farmers.

Societal adaptations

Options for individuals' adaptation outside farming were limited to being more cautious with money or finding alternative sources of income.

A number of participants mentioned that the unpredictability of the weather and thus the size of harvest had encouraged them to reduce their spending or increase their financial savings:

I will be spending only on necessities.

Cooperative member, Huye

One interviewee reported having to rely on their savings when the harvest was poor, or on renting out their field to someone else to collect rent income. Another farmer mentioned storing part of their harvest to ensure food security:

I store 20% of the produce so that I may always be food secure

Cooperative member, Huye

Some participants had sought alternative employment when farming was not going well. One reported that casual labour in construction provided an alternative income, others were planning on opening a hardware store or expanding their existing trading business.

7.2 Role of other actors in adaptation strategies

Beyond the specific, individual-level strategies described above, interviewees made some reference to the importance of external support for adapting to climate change.

The District Authority was reported to have provided relief in the form of food aid to affected farmers in response to widespread food scarcity following a drought [Cooperative member, Huye]. In one case, a farmer had received a replacement cow for one they lost.

The government also invests in adaptation infrastructure. The interviewed government official referred to rainwater harvesting, specifically building dams, being promoted by his Ministry. This statement is supported by Rwanda's recent national agriculture policies (MINAGRI 2017 & 2018), which identify the expansion and modernisation of irrigation infrastructure as one of key measures to promote sustainable water management for climate-resilience in farming and rural areas. However, the policy also suggests caution with regard to large-scale infrastructure as "[...] such schemes can have important negative environmental impacts including soil salinization, alkalization, acidification or water logging" (MINAGRI 2017, 24).

This was also reflected in the experiences of the cooperative members in Huye, where an irrigation system fed through dam storage was crucial to supply water in dry periods. However, this dam had a defect that caused a water leak, ultimately reducing the harvest in the local area.

Of course, poverty constrains the adaptations farmers can undertake themselves. One participant mentioned having to take out loans to be able to irrigate their fields. Talking about alternatives for those who cannot afford irrigation, one participant reported that:

There is nothing we can do as we don't have money. It is a big loss in production.

Cooperative member, Huye

7.3 How microfinance affects adaptation

When asked about adaptations, there were few references to whether these were enabled by microfinance products. However, when prompted specifically on the topic, most farmers recognised that loans did help adapt to climate change, predominantly because fertilisers ensure there is at least some yield even in seasons with adverse weather:

These loans from Urwego Bank help us to cope with the changing weather because if you apply fertilisers and there is a good rainfall, you get a good yield. For those who are not able to get loans, they will not have good yield. So, if we apply fertilizers and the rainfall is not enough in the paddies, we manage to get some yield but those who did not apply any fertilizer will get nothing. So, for me, getting a loan helps to cope with the weather changes.

Cooperative member, Huye

This experience was echoed by many, in both study areas. One farmer also mentioned that higher production generally reduced vulnerability:

I got a good production, so when weather and climate change occurs, I will be in stable condition.

Cooperative member, Huye

Several farmers, mostly in Rubavu, reported that although the loan was only for fertiliser, this still meant there was more financial flexibility which allowed them to pay for other things – school fees, house construction and buying pesticide – even when the harvest was poor. For others, VSLA loans offer more flexibility:

We get [the money for pesticides] from the saving groups because URWEGO bank only give us fertilizers.

VSLA member, Rubavu

One participant in Rubavu reported that she had been able to buy a second parcel of land thanks to a loan:

Without the loan, I couldn't afford to buy another parcel which was not destroyed because the other one is destroyed by the rain.

VSLA member, Rubavu

Others, on the other hand, did not see the loans as particularly helpful for coping with climate change or identified specific adaptations for which the microfinance loans provided by Urwego Bank are not a solution:

No. It is not helping. Instead we need the crop insurance whereby if any weather change happens, we can get refunded.

Cooperative member, Huye

Some reported that paying back the loans could be difficult if adverse weather had led to a reduced harvest:

When you don't harvest because of the weather, you have to look for other means to pay back their loan.

Cooperative member, Huye

The cooperative's buffer function was evident in the example given by a member who recalled that the cooperative repaid the loan on behalf of another member whose harvest had failed:

It happened when a cooperative member did not harvest [anything] and had no money to pay back. The cooperative has had to pay back the loan, then the member will have to reimburse the cooperative after.

Cooperative member, Huye

In extreme cases, the failure of a harvest and the inability to repay a loan lead to the farmer having to sell their land:

It is rare but sometimes it is loans they owe the bank that cause them to sell their parcels but it is not common.

Cooperative member, Huye

One participant mentioned that cooperative loans, which came in the form of fertiliser, did not really help in relation to adaptation. However, they had used personal loans to buy drought-tolerant crops and invest in off-farm income generating activity [Cooperative member, Huye]. This latter mention is particularly salient, as it follows the recommendations by the National Agriculture Policy (MINAGRI 2018) and as part of the 'Vision 2050' in the recent 'National Environment and Climate Change Policy' (Ministry of Environment, 2019).

Money is also required for erosion control and irrigation, for which loans are not available:

We need to have erosion control measures; otherwise, crops are taken away by the flowing water. When there is a drought, we need to do irrigation which costs a lot of money. To get that money we need to go to the bank [...].

Cooperative member, Huye

Finally, an Urwego employee outlined that the Bank tries to offer crops or seeds that are suitable for the specific climate of the area in order to ensure that crops are climate resilient:

We have a shortage of rainfall in the east and we offer the crops, we offer the crops that are quickly maturing, they grow very fast, so they can escape that weather condition.

Urwego Bank employee

8 Challenges for Inclusive Development and Adaptation

8.1 Cooperatives and VSLAs: A safety net for farmers

As noted in the Methodology section, the study involved members of cooperatives and VSLAs, which have some key differences in terms of level of formality and access thresholds. However, the vast majority of participants, regardless of which kind of group they made part, reported multiple benefits to membership. Alongside the access to loans and training delivered by Urwego Bank, cooperatives and VSLAs both act as a safety net for farmers and there are clear benefits that arise from being a member of a collective. Due to high risk, financial institutions have been very reluctant to grant loans to individual farmers who generally are not considered to be a viable client base. This also means that individual loans are offered with worse terms and less support. The financial risk associated with individual farmers, however, is minimised in the case of cooperatives and VSLAs which act as guarantors and take the burden of repayment onto themselves if a member defaults on a loan. As explained by one of Urwego Bank staff members:

Q: What happens when a farmer fails to pay back their loan?

A: They have a social grant within their group. We take money for repayment from that social grant. If the loan is higher, then other group members must pay back the loan of that farmer. Usually they don't fail to pay back their loan because they want loans for the next season.

Urwego Bank Employee

A specific benefit of cooperatives is that they can facilitate market access and negotiate higher sale prices. As cooperatives tend to be much larger than VSLAs (as in the case of the rice cooperative in Huye which groups over 250 local farmers), they are more likely to secure a stable demand for the products after the harvest, a market risk indicated in interviews with Urwego Bank staff. At the same time, cooperatives whose members have access to capital via loans and have received training are better positioned to negotiate with buyers since they can usually guarantee to deliver yields. Next to the ability to secure loans, avoiding the market risk of not being able to sell one's crops is among the key incentives to join cooperatives:

Q: Why did you join the cooperative ?

A: When you join a cooperative, you have easy access to the market and when you join a cooperative, you have access to loans.

VSLA member, Rubavu

In fact, it has been reported that those unaffiliated with the cooperative tend to sell at lower prices, disrupting the local market:

The sector authorities are trying to group [non-affiliated farmers] in a cooperative because these farmers were selling their produce to the local market at low prices, [while] the milled rice from the factory was expensive and it was creating price fluctuations.

Cooperative member, Huye

This demonstrates that cooperatives promote the financial interests of rice producers within the crop value chain by being able to negotiate better prices for their members. This also saves them time and money they would otherwise need to spend looking for the market for their goods. The benefits associated with facilitated market access and securing higher prices for the crops include increased incomes and, consequently, enhance cooperative members' quality of life in a similar fashion that access to agricultural inputs does.



Figure 12: Rice paddies and vegetable plots downstream from the dam in Huye

The findings from this research project thus suggest a number of actual and potential impacts of the cooperatives and VSLAs through which Urwego Bank currently deliver loans, specifically in relation to adaptation to climate change. Cooperatives and savings group serve both as a safety net and a catapult for their members' economic and social development by way of enhanced access to loans, training and markets. However, interviews with both members and non-members suggest that there is also the risk of reduced social mobility and growing stratification, which pose a serious challenge to inclusive development. This is in line with studies suggesting that rural development is frequently not inclusive (Andersson Djurfeldt 2013, Taylor 2014). Together, they can have profound impacts on how individual members or households will be able to respond to climate change impacts.

8.2 Social mobility

While the benefits associated with cooperative and VSLA membership are clear, interviewed members and non-members alike pointed to a number of social, economic and political entry barriers that complicate access to such groups, which is likely to negatively affect upward social mobility. In general, these barriers are more pronounced in the case of cooperatives compared to the VSLAs.

Financial barriers

Membership in the cooperative requires purchasing shares, which grant access to rice paddies, along with paying any associated fees and taxes. In the case of the VSLAs, there is effectively a membership entry fee of around 10% of the future loan amount. These costs are often beyond the financial reach of many rural residents:

It is not easy to join the cooperative. [In theory], we can easily buy a parcel of land in the marshland. You will have to pay water user association fees to concerned authorities. (...) If means allow, I will join the cooperative that is to say have [enough to pay for] the membership fees, i.e. the cooperative share and have a parcel of land in the marshland. Farming for people who don't belong to cooperatives is not easy.

Cooperative member, Huye

Q: What is the main reason for people not wanting to join the cooperatives?

A: Some of them face obstacles of not having enough money to pay the fees needed and they don't have parcels that are not accepted to be part of cooperatives.

Cooperative member, Huye

Crucially, share prices are not fixed and have gradually increased since the cooperative was established in the early 1990s:

Q: When you joined the cooperative, how much was a share by that time?

A: It has been twelve years [since I joined] and a share was worth 20,000 Rwandan Francs RWF.

Q: How much is a share now estimated at?

A: [N]ormally, a share is estimated at 105,000 RWF and it may vary according to the general assembly meeting's resolutions.

Cooperative member, Huye

Therefore, between 2007 and 2019, the share price has increased over threefold (adjusted for inflation) as a result of internal cooperative decision-making at the assembly level. This has limited the pool of potential new members in the local area. Young people, in particular, are increasingly unable to get on the 'cooperative membership ladder' due to these growing financial entry costs. Importantly, the cooperative leaders and members are aware of this, which is why they have introduced a 'special offer' for young farmers, reducing

the share price from the mentioned 105,000 RWF to 40,000 RWF. A current cooperative member reported "some but still few" young people joining as a result of this policy.

Technical barriers

Technical capacity building and training forms an integral part of Urwego Bank's microloan packages. Since establishing an association such as a VSLA that will be sustainable over the long term requires considerable effort, farmers are equipped with various skills to facilitate this. Moreover, training in agricultural practices helps maximize the yields once inputs have been applied, increasing farmer incomes and reducing the default risk for the Bank.

As mentioned earlier, farmers broadly praise having access to these training sessions and the knowledge and skills they offer them. However, because access to these sessions is restricted to the Bank's clients, this creates technical capacity-related inequalities within local areas. In the words of a farmer in the Huye district who does not form part of the rice cooperative:

Only this cooperative receives support and trainings, for us we are not supported at all. Some of the cooperative members whose rice parcels are adjacent to our parcels do show us some techniques and advise us on pesticide use. Otherwise, we don't receive any support at all.

Cooperative member, Huye

Save for the informal flow of information between Bank clients and non-clients, it is reasonable to assume that there is a growing gap between increasingly trained farmers and those who do not have access to this knowledge. This is likely to translate into increasing income inequalities in the long term, with the trained farmers having a technical advantage when it comes to agricultural practices.

Sociocultural and political barriers

The potential of microfinance to increase social mobility may also be impaired due to sociocultural factors. Two key barriers have been identified by the participants in this context: aversion to taking loans and the lack of solidarity among rural residents. First, many farmers simply do not trust lending institutions or, in the words of multiple participants, are simply 'afraid' of taking loans. This may also apply to members of cooperatives and VSLAs who, despite the association acting as a guarantor, are still reluctant to borrow not only due to the financial implications (they are liable to repay the loan to the group eventually) but also because of the associated social costs.

Second, a participant from the Rubavu district indicated that certain people are not willing to engage in collective action with other residents:

Q: People who don't belong to cooperatives or groups... What could be the reason behind that?

A: They are just like that; they don't wish to work with others. For them, they don't understand how you can pay [off the loan] for someone who never got a yield when they got a harvest.

Q: Do you also have that perspective?

A: No, because I understand that I may not get a yield [someday] and the person I paid for can also pay for me.

VSLA member, Rubavu, 8

Thus, lack of community cohesion is another obstacle for the successful functioning of cooperatives and VSLAs. Its causes may be due to individual or social characteristics and may stem from, for instance, historical or cultural experiences of the local population. Changing local attitudes towards collective action which relies on social capital is a challenging task that requires context-specific, long-term measures. It is reasonable to assume that collective activities such as training sessions could change local attitudes towards working together. However, as indicated above, those are restricted to individuals who already form part of groups and enjoy access to loans.

A final entry barrier mentioned by the participants is the sheer availability of land, in this case in the irrigated marshland. In other words, there simply is not enough irrigated land provided by government-funded infrastructure to accommodate all local farmers. This is explained in further detail by one of the key members of the rice cooperative in Huye:

This cooperative has parcels of land in the marshland but all the residents of this area cannot be in this cooperative. Normally, the people who first get the parcels in the marshlands after designing it are the one who form the cooperative. The remaining people will be working on the hillside.

Cooperative member, Huye

Thus, the availability of rice paddies came at least partially on a first-come-first-served basis, with latecomers – particularly young people as noted above – put at a disadvantage. Moreover, despite the reported unavailability of new land, it should be noted that there are considerable differences in plot sizes among the cooperative members, which ranged from 16 acres to 56 acres within the study sample. Figure 13 represents a number of different plots leased by the cooperative members.



Figure 13: Rice paddy plots in the valley downstream from the dam in Huye

8.3 Social stratification

In summary, interviews with local farmers suggest that financial, technical, sociocultural and political barriers in both districts demonstrate the marked inequality in access to loans, technical skills and knowledge among rural residents. It is evident that cooperatives and VSLAs are in many ways beneficial for their members, but this does not come without broader social, economic and political consequences for the general population. The collected data suggests that the current microfinance landscape in the studied districts has the potential to increase socio-economic inequalities, with the increasingly productive farmers benefiting from loans and other membership perks by steadily increasing their incomes and quality of life, thus creating a growing social divide between them and non-members who do not have access to associations and thus loans.

Alongside the above-mentioned differences in plot sizes, the reliance of cooperative (and to a lesser extent VSLA) members on labourers illustrates this inequality. Participants reported hiring as many as 65 labourers to work in their fields and paddies. These individuals have been reported to come from both nearby and distant localities. The activities they are intermittently (and seldom permanently) hired for include: first ploughing, second ploughing, levelling, planting, multiple weedings, guarding the field, harvesting, drying, and packing. An example of the hiring pattern is provided by a rice farmer from Huye:

In season A, when there are a lot of agricultural activities, I hire three daily labourers for a period of two weeks. In the marshland, I hire one labourer casually as I work there myself. During the planting period, I hire four casual labourers and three casual labourers for rice planting and weeding activities respectively. After weeding activities, I will hire one guard in the rice parcels who works there on a monthly basis. When harvesting comes, I will hire two labourers and I will need two other casual labourers who will help me during the rice drying process.

Cooperative member, Huye

When asked about those individuals' motivations to become labourers, interviewees mentioned small sizes of their plots and the inability to cultivate them. In the first case, farmers with small plots (usually limited to the hillside) will offer their services to more productive neighbours after they have concluded their own farm activities. In this case, the labourer will receive additional income on top of their own, usually limited production:

Q: Those labourers, do they own their farms or they don't?

A: Sometimes they do but their lands are very small. Therefore, when they finish planting on their small piece of land, they come to help us on ours.

VSLA member, Rubavu

In the second case, farmers resort to agricultural labour due to their inability to secure appropriate inputs (seeds, fertilizers, pesticides, etc.) for their own plots.

Q: Those labourers, don't they own their farms?

A: They have their farms but they are small and they don't have money to feed their family so they come to work as casual labourers.

Cooperative member, Huye

Frequently, however, their fields do not simply lie fallow. In the Rubavu district, many farmers spoke about the practice of renting out land to other farmers given these circumstances, allowing the labourer to supplement their livelihood through rent income. Usually, plots are rented out for up to two seasons. In certain cases, however, as reported by this participant, a confluence of difficult circumstances can lead a farmer not only to rent the plot out but outright sell it:

Q: Who did you buy from those farm fields?

A: It is my neighbour who is also a farmer.

Q: Why did they sell that farm field to you?

A: I think that they had other problems to solve that required money.

VSLA member, Rubavu

These findings indicate that many farmers with very small plots often struggle to maintain sufficient production to maintain themselves and their families. Unable to access loans, training or markets – the usual safety net benefits of cooperatives and VSLAs – they are compelled to cease independent farming temporarily, and sometimes permanently. Given the experience of many developing countries (see: Makana 2009, Taylor 2014, del Prete et al. 2018) and the growing impacts of climate change which will require applying more inputs, it is likely that this trend of land consolidation on the part of more productive farmers will continue.

The increasing dependence of less productive farmers on agricultural labour is particularly problematic given the predicted changes in Rwanda's climate. As reported by a member of the Huye rice cooperative:

Those casual labourers are the first ones to be affected because they get money from daily work. So, if there is no work in the marshland, they will migrate. The parcels owners will then do the farming activities by themselves. The casual labourers in this marshland are the first people who will migrate whenever there is a climate and weather change issue.

VSLA member, Rubavu

This suggests that with progressing climate change, labourers will lose their employment (albeit casual) and be forced to migrate to other places in search of work. It is evident that given these circumstances, it is impossible to continue farming, and renting out or selling one's field becomes necessary.

It is important to note that the above scenario disproves the theoretical effectiveness of the 'trickle-down' approach to development, whereby increasingly productive farmers will indirectly share their wealth with poorer farmers, in this case by hiring the latter as labourers, has been increasingly subjected to criticism and was ultimately rebuked by the International Monetary Fund (Dabla-Norris et al. 2015). It would be unreasonable to assume that the more productive farmers will be able to support labourers during acute climate episodes in any comprehensive manner, and therefore working as an agricultural labourer should not be considered a viable or desired adaptation strategy.

9 Impacts of climate change on microfinance products

Interviewees reported that both the cooperative and VSLAs did not encounter any major issues with repaying loans for individual members who have defaulted. This suggests that the guarantor role of these groups is working well and successfully protects Urwego Bank from financial loss. In these cases, farmers on behalf of whom cooperatives and VSLAs repay the loan are still liable to compensate the group, regardless of whether they produced any harvest that season or not. However, this model appears to have a tipping point. When pressed on this issue, a member of a VSLA in Rubavu reported that if everyone was to be affected by a bad season, the group would have little choice other than to ask the Bank for an extension:

Q: If [farmers defaulting on a loan] become like 10 ... will the group have enough money to pay for them?

A: The group has enough money to pay for them all.

Q: If the whole group doesn't get a harvest, what could happen?

A: We could call [Urwego] and tell them about the problem we faced and they come and observe then we request them to add us more time of paying the loan.

VSLA member, Rubavu

Thus, based on the reports from the farmers, it appears that there is an informal understanding between Urwego Bank and the clients it serves. When crops have been affected by particular changes in the weather there is flexibility in the repayment of the loan. This was confirmed during the interview with a Urwego Bank employee who stated that the Bank would consider extensions to the loan in the event of damaged crops on a case-by-case basis:

The Bank will go to the field to assess the harvest the farmers got and the damage caused by the drought. After assessment, the Bank can agree on the extension of the payback period to the next season.

Urwego Bank Employee

Whilst there was an understanding of the need to provide this kind of flexibility, another Bank employee acknowledged that this did have implications for the sustainability of the business model:

[T]he Bank loses, when ... clients are not paying the bank, the bank loses, yeah, but we are trying to set out the strategy of working with a crop insurance.

Urwego Bank Employee

There are clear benefits for the farmers when Urwego Bank can offer this level of flexibility. However, as raised by one of the employees, there is the potential for the Bank to lose out in these cases. The repayment rates at Urwego Bank remain relatively high, but as the frequency and intensity of climate events increases there are questions about the sustainability of the business model in its current form. The potential for crop insurance is one way in which the Bank is seeking to adapt its practices to the changing climate context.

Changes in climate require that microfinance institutions diversify the products offered to clients, and carry out further training and capacity building. MFIs can also find ways to work with existing climate initiatives in both the public and private sector. This has the potential to open up opportunities for finding new benefits, markets and sources of finance (Rippey 2009). CGAP (Consultative Group to Assist the Poor), a think tank, have also called on MFIs, as organisations that represent large numbers of people likely to be most affected by climate change, to play a 'prominent role in raising awareness around climate change, adding their voices to those who are demanding prompt, effective action' (Rippey 2009).

10 Recommendations

This section includes feedback from project participants who were asked to express their opinions and suggestions for Urwego Bank, as well as recommendations for Opportunity International and the Bank by the research team.

10.1 Participants' feedback

During interviews and conversations with the project staff, participants had an opportunity to discuss their own recommendations for improving their livelihoods. Their feedback, collated here, pertains to the microfinance products offered by Urwego Bank (including their purpose, availability and timing), training, crop insurance, meteorological information, geotechnical expertise, and partnerships with other development partners. These recommendations, discussed in greater detail below, in many cases reflect the programme actions contained in Rwanda's Third Communication and other documents on the country's climate risks and adaptation needs mentioned in Section 2.

Microfinance products

Feedback on loan purpose was particularly ample. First, given the narrow range of agricultural inputs currently covered by Urwego Bank loans, it is no surprise that farmers would like to see this offer considerably broadened. In particular, they suggest for loans to cover more kinds of agricultural inputs and technologies. In this context, potato farmers associated in VSLAs in Rubavu mentioned fungicides due to their high price (the most widely used ones in the area being Dethane and Ridomil):

Since Urwego provide us with loans for seeds and fertilizers, it would be better if they would also give us loans for fungicides so that it can be a complete, basic package for Irish potato growers.

VSLA member, Rubavu

You can request [from] Urwego to provide [us with] fungicide to apply to potatoes following the loan we are given because fungicides are very expensive for us so it is difficult to get them.

VSLA member, Rubavu

Other types of inputs mentioned include high-yield crop varieties (farmers noted the current ones may not be well-suited for the local climate) and organic manure which could be supplied by purchasing a cow:

I wish I could be given a cow so that I can have organic manure for my hillside farm. In that case, I will no longer be dependent on chemical fertilizers from Tubura. Rather, I will have organic fertilizer which I will use in my hillside fields as an alternative source of fertilizer.

Cooperative member, Huye

Second, despite the relatively small size of current loans, farmers noted their potential for facilitating access to technology, including irrigation equipment, erosion control and agro-processing facilities. This particular feedback came from rice farmers in Huye whose scale of operations is considerably larger than in the case of their VSLA counterparts in Rubavu. Interestingly, however, these suggestions pertain to these farmers' hillside farms rather than their rice paddies:

On the hillside, when there is heavy rainfall, we need to have erosion control measures, otherwise crops are taken away by the flowing water. When there is drought, we need to do irrigation which costs a lot of money. To get that money we need to go to the bank to give us that money.

Cooperative member, Huye

The need for irrigation equipment, and particularly water pumps that could serve the fields located on hillsides, is particularly relevant given the observed impacts of climate change. In other words, farmers see irrigation systems as an obvious adaptation measure to increasingly frequent drought spells in the Huye area.

Third, farmers in both localities have suggested that loans may not be directly related to their agricultural production. Here, they have suggested using loans to pay for their children's school fees. Doing so would make their savings available for investing in income-generating activities, which would be used to repay the loan.

Fourth, loans are also seen as a potential way to pay for agricultural labour. The interviewed farmers reportedly hired between 3 and 65 labourers, usually on a seasonal basis. The loans are seen as a way to ensure enough workers can be hired, particularly during key growth stages:

I wish Urwego could give us loans for paying labourers especially during the weeding activities.

Cooperative member, Huye

Finally, at least one farmer in Huye suggested using the loan for buying more land, which she saw as an effective way to guarantee increased productivity and thus income.

In addition to the loan purpose, farmers have also expressed concerns about the availability and timing of loans. A rice farmer from Huye expressed the need for making personal loans available, since such loans "go a long way for farmers." Relatedly, farmers grouped in the cooperative expressed hope that loans could be granted for their hillside plots (which do not form part of the cooperative marshland). This would not only increase their productivity but also allow them to benefit from the seasonal repayment model which is almost universally preferred to monthly repayments:

For your information, we take loans from Tubura for the seeds and fertilizers for the hillsides, and you know in Tubura, we pay on a monthly basis. I wish that Urwego could extend their loans to the hillside on a seasonal basis. So, Tubura will not provide another loan unless you pay back the previous loan. And this is contrary to Urwego which still provides loans until your harvest is marketable.

Cooperative member, Huye

In terms of timing, a number of participants implied that loan disbursement could happen earlier compared to the current situation, though most of them recognize that Urwego Bank's loan processing times are usually shorter than in the case of their competitors. In addition, one participant complained about the necessity to travel to the local Huye branch to secure a loan.

Finally, the interviewed farmers who do not belong to the rice cooperative or the potato farmer VSLAs and therefore do not have access to Urwego Bank loans, expressed deep interest in joining these associations as a means to improve their livelihoods:

We want loans. They should trust us and give us loans without a guarantee. We shall pay [them] back. And we will have improved our lives. [...] if you are in contact with the Urwego Bank management, kindly request them on our behalf to give out loans and trainings on agriculture to people who don't belong in the cooperatives.

Farmer, Huye

Training

As mentioned above, loan provision is normally accompanied by capacity building activities, including various kinds of training. Farmers in both districts broadly recognize their value and mention more training sessions as a means to increase their production or diversify their income:

We need also support in form of training on how we can improve our production per hectare and pest and disease control on our crops. It can help us increase our production. [...] What we want is that Urwego help us in getting field trips, trainings, coaching so that we can improve our knowledge on how to increase our production in both quality and quantity. [...] [Urwego] may assist us to create off-farm income generating activities.

Cooperative member, Huye

In this context, farmers mention field trips and training on: farming techniques (crop choices, fertilizer use, pest and disease control), crop insurance, mechanization, soil testing (to choose the correct fertilizer) and saving. Importantly, the significance of training is also recognized among those who do not form part of the cooperative or VSLAs and therefore have no access to it.

Meteorological information

Members of the rice cooperative spoke broadly about the need for more robust weather information, which they currently access over the radio. In this context, farmers would like more direct access to specialists who could advise them on the most recent forecasts for their area, given the broadly recognized uncertainties associated with climate impacts:

Urwego can help us in bringing technicians in weather forecast who can teach us how we can face or prevent damages caused by climate change.

Cooperative member, Huye

They could inform us about when there will be heavy rainfall. They could advise us on the best agricultural practices, early maturing varieties, best fertilizer to apply in order to increase production.

Cooperative member, Huye

In their responses, farmers implied that this could be provided as part of the training and support package, rather than through loans that could finance the provision of such information (assuming it is available). However, it should be recognised that any such information is dependent on the existence of nationwide hydromet services and is not an initiative that could be restricted to a small area or even funded through small loans by Urwego Bank or any other microfinance institution.



Figure 14: Rice paddies in Huye

Crop insurance

Crop insurance was a common theme among the rice farmers in Huye, who were aware of the Rwandan Government's plans to roll out a public crop insurance program in the near future:

The government should put in place the crop insurance program so that I can be assured that I will be paid back when my crops get affected by the drought. So if crop insurance is there, I will invest in other off-farm income generating activity because I will be quite sure that I am insured in my farming.

Cooperative member, Huye

Crop insurance is seen as a complementary product to loans. This is evident given a theoretical scenario in which a farmer has taken a loan to increase their productivity in a particularly dry year, leaving them with little to no income and a loan to repay. Some participants suggested that without insurance, farmers will grow reluctant to cultivate crops because of increasingly erratic weather patterns. Therefore, access to insurance would grant farmers the certainty that they would not have to reach for their savings, which could instead be invested in other income-generating activities.

Low-cost weather based index insurance has shown to reduce the risk for farmers when the technical design of contracts account for local market vulnerabilities and when local farmers are consulted on crops, risks and growing calendars (Peterson 2012). However, academic studies suggest that index insurance may not be a sustainable tool for adaptation amongst smallholder farmers in Africa because insurance premiums are likely to increase in tandem with expected increases in climate variability (Peterson 2012, 572). As a result, poor small-holder farmers may be priced out of the insurance market and face an increased risk of non-renewal of contracts and limitations on claims. Moreover, this tool could have the perverse effect of expanding risk rather than mitigating small-farmer vulnerability because index insurance links small-holder farmers more closely to erratic global market price fluctuations (Isakson 2015).

Connections to other development partners

One of the leading members of the rice cooperative noted that while banks will continue to market loans, there is a need for the cooperative to find other partners to increase its revenue and become more financially stable:

Two years ago, we started to save money, two million [Rwandan francs] annually [equivalent to £1600 approximately]. So far we don't have any projects but we think if we get partners, donors, we are ready to start because [of this] start-up capital.

Cooperative member, Huye

This demonstrates that larger associations such as the rice cooperative in Huye are becoming increasingly productive and financially independent, and seek to expand their network of partnerships beyond microfinance institutions.

10.2 Recommendations from the research team

Feedback provided from farmers ranged from adjusting Urwego Bank loan offering to creating partnerships with other organisations and accessing weather information. Many of these suggestions should be duly taken into consideration by the banking sector, aid organisations and the Government. In certain cases, however, a number of social, environmental and financial caveats need to be made to avoid maladaptation. These are discussed below.

Loan purpose

There was significant feedback from clients who would like Urwego Bank to expand the range of loan services that are offered, suggesting exploration of different options for expansion. For instance, certain farmers would like to see a whole 'input package' (seeds, fertilizer, fungicide) financed by the loan. However, there is a need to proceed with caution so as not to add to the debt burden of farmers who have fluctuating incomes, particularly given the effects of climate change. The reason that loans are manageable for current clients is that they are repaid on a seasonal basis. For loans related to other farming activities, there would be a need for a financial viability assessment of the enterprise to ensure that there is enough yield to repay more than one type of loan. If loans for non-farming activities (e.g. school fees, healthcare) are to be considered, it would be necessary to assess how the seasonal repayment principle could be applied. It must be remembered that more loans have the potential to make farmers more vulnerable to climate change impacts in the long term.

Training

Given the generally low marginal cost of inviting more attendees to training sessions, Urwego Bank should consider extending the training offer to a broader segment of the rural population. This can also have positive effects in the long run when current non-clients may achieve a level of production that would warrant establishing a cooperative and/or requesting loans. In fact, low awareness about how loans actually work has been cited by a number of current Bank clients as a potential reason why their fellow residents are not interested in loans. Training on climate change, including its causes and impacts on farming, is also recommended. Some climate adaptations and interventions can have adverse impacts on soil quality, water quality and the local environment and other externalities, such as identified by Cantore (2010). To ensure the long-term future of Rwanda's agricultural sector, training on sustainability aspects of farm management should be included.

Crop insurance

As the Rwandan Government continue to rollout a public programme of crop insurance, Urwego Bank can play a role in ensuring that it is accessible and reaches those who need it the most. Urwego Bank have a good reputation and relationships with cooperatives which would be valuable in this process.

Financial sustainability

Questions remain about the sustainability of the overall system given the anticipated increase in the frequency and intensity of climate change impacts on farming. It is clear that Urwego Bank are responding to the impacts of climate on people's ability to repay but so far this has been done on an ad-hoc basis at an informal level. This has been feasible so far, but as climate change intensifies, work should be carried out to consider the longer term viability of the institution in cases of delayed, or missed, repayment. As mentioned above, farmers predict requesting extensions in case of failed harvests, which could cause liquidity problems for MFIs.

Social sustainability

It is necessary to ensure that social mobility is not impaired due to certain farmers drawing significant financial benefits from microfinance and the potentially widening gap between the poorest and those benefiting from microfinance. This project did not set out to investigate the need of the poorest households specifically, but it is clear that cooperative or VSLA membership in Rwanda is nowhere near universal, and non-members do not have comparable access to microfinance which might increase social stratification. Non-members were clearly interested in microfinance but there may be other avenues for supporting their needs and livelihoods by the public or aid sector, which should be considered.

Environmental sustainability

While farmers report that increasing the use of agricultural inputs can deliver higher yields in the short term, what needs to be considered are the long-term implications of intensive farming methods for the local environment, as identified by Cantore (2010). Rwanda's government policies and also the government representative interviewed placed appropriate emphasis on the importance of environmental sustainability and highlighted the environmental risks of intensification of agriculture, in particular of increased fertiliser and pesticide application, to water quality, soil quality and natural ecosystems. Although soil erosion was a common issue, there was no evidence in the responses either from Urwego Bank interviewees or from farmers that there can be a link between inorganic fertiliser use and soil degradation (although it should be said they were not explicitly asked about this) and they mainly appeared to focus on increasing short-term yields. It is important to ensure that productive

ecosystem services are not prioritised over supporting and regulatory ecosystem services. To this end, the governmental emphasis on environmental sustainability would need to be carried through to farmers and should be supported by appropriate financial services provision.

Young people

Evidence suggests that young people become less interested in pursuing agricultural livelihoods because of multiple challenges including those related to increasingly erratic weather. As a country with a predominantly young population, schemes to promote young people's entry into cooperatives (such as assistance with purchasing the first share in a cooperative) or VSLAs should be strongly considered. It is recommended that MFIs, aid organisations and government entities work with young people specifically to find out their attitudes towards farming as a profession and identify challenges or barriers for entering the farming sector.

Partnerships

Evidence suggests that successful cooperatives are already looking for outside partners to increase their productivity. It is therefore recommended that loan providers think strategically about their positioning relative to highly profitable cooperatives, perhaps envisioning new kinds of products and services and brokering partnerships with other development agents, both public and private, that could be of relevance to their clients. This also reflects participants' feedback on the need to forge partnerships with other institutions (suggesting MFIs could partner with donors and government institutions). At a higher level, complementary approaches that can be taken by other parts of the financial sector (including, for instance, the public sector) should also be explored, as diversification of delivery platforms that go beyond private or for-profit entities could increase the prospects for inclusive development. Specifically, it should be considered what the role of the public sector and the potential for supporting those at the bottom of the socio-economic ladder (Categories I and II) could be. It is also important to remember that microfinance should not become a replacement for social protection systems.

Large-scale investment

While not within the remit of MFIs due to very high costs, there is a need for creating possibilities for capital investment into larger scale technologies whilst being aware of the long-term climate impacts that may affect their efficacy. This is because community- or individual-level investments in development activities facilitated by microfinance may not be sufficient to ensure continued human development in rural Rwanda. For instance, it would be unreasonable to expect the microfinance sector to facilitate the establishment of a nationwide hydromet service. Development based solely on microfinance and deprived of sustained public investment is

more likely to lead to reactive, ad-hoc coping strategies in the face of intensifying climate impacts rather than sustainable, long-term adaptation of livelihoods and poverty alleviation.

Future research

As mentioned earlier in this report, there still exists limited empirical evidence on the relationship between climate change, adaptation, and microfinance. In order to address this gap, a number of different research directions are recommended.

First, due to its narrow scope, this study was limited to providing a snapshot of the current situation of farmers benefitting from Urwego Bank loans. More longitudinal studies spanning multiple years are needed to assess the ways access to microloans affects local farmers' adaptive capacity and vulnerability and the long-term implications of this relationship.

Second, while it is the eastern province of Rwanda that has been impacted the most by the impacts of climate change, this research was conducted in the Southern and Western provinces of the country. This may limit the application of the findings to those areas that are not experiencing the most severe climate events. Nevertheless, many of the participants interviewed did outline experiences of changes in weather that had affected their crops, particularly in Huye where farmers are reporting erratic rainfall and prolonged dry spells. Further research in areas more severely affected by climate change is recommended.

Third, the implications of microloans for climate and social justice need to be studied in more detail in line with the principles of climate justice, which recognises that the poorest in society will bear the brunt of climate impacts, leading to increased inequalities on global, national and local scales. The principle of climate justice, which the Scottish Government advocates, poses the poorest in society will bear the brunt of climate impacts, leading to increased inequalities on global, national and local scales. Because these people did not contribute to climate change in any significant manner, there is a strong ethical imperative for research foregrounding their needs and circumstances in Rwanda and beyond. This project was focused primarily on members of cooperatives and VSLAs. To fully understand the impacts of microfinance on stratification and social mobility, more extensive engagement with those who do not belong to cooperatives or VSLAs and are economically non-active is needed. If microfinance is to be provided in accordance with climate justice principles, it is imperative that its socio-economic and political impacts are duly investigated. Relatedly, this strand of research should also study the reasons why certain individuals end up not joining cooperatives and VSLAs, along with the associated implications of non-membership.

Finally, evidence suggests a potentially synergistic relationship between microloans and crop insurance, whereby the former provides financial resources for necessary agricultural inputs while the latter protects farmers from financial loss due to erratic weather. This study did not focus on this link. More research is required to understand the trade-offs, opportunities and practical implications of providing these two financial instruments jointly.

Bibliography

AFI. (2014). "Rwanda's Financial Inclusion Success Story: Umurenge SACCOs." AFI Case Study. Bangkok: Alliance for Financial Inclusion.

https://www.afi-global.org/sites/default/files/publications/afi_case_study_rwanda_finalweb.pdf.

Agrawala, S., & Carraro, M. (2010) 'Assessing the role of microfinance in fostering adaptation to climate change'. OECD Environmental Working Paper No. 15, 2010, OECD publishing <doi:10.1787/5kmlcz34fg9v-en>

Andersson Djurfeldt, A. (2013). "African Re-Agrarianization? Accumulation or Pro-Poor Agricultural Growth?" *World Development* 41 (January): 217-31.

<https://doi.org/10.1016/j.worlddev.2012.06.013>.

Cantore, N. (2010) *The Crop Intensification Program in Rwanda: a sustainability analysis*. ODI, London.

Chirambo, D. (2017) *Enhancing climate change resilience through microfinance: Redefining the climate finance paradigm to promote inclusive growth in Africa*. *Journal of Developing Societies*, 33:1, 150-173.

Dabla-Norris, E., K. Kochhar, N. Suphaphiphat, F. Ricka, and E. Tsounta. (2015). "Causes and Consequences of Income Inequality: A Global Perspective." *Staff Discussion Notes* 15 (13): 1.

<https://doi.org/10.5089/9781513555188.006>.

Dawson, N., A. Martin, and T. Sikor. (2016). "Green Revolution in Sub-Saharan Africa: Implications of Imposed Innovation for the Wellbeing of Rural Smallholders." *World Development* 78 (February): 204-18.

<https://doi.org/10.1016/j.worlddev.2015.10.008>.

Dowla, A. (2018) 'Climate change and microfinance'. *Business Strategy & Development*, 1:2, 78-87.

Fenton, A., Paavola, J., & Tallontire, A. (2015) 'Microfinance and climate change adaptation: an overview of the current literature'. *Enterprise development and microfinance*, 26:3, 262-273.

Fenton, A., Paavola, J., & Tallontire, A. (2017). 'The role of microfinance in household livelihood adaptation in Satkhira District, Southwest Bangladesh'. *World Development*, 92, 192-202.

Green Climate Fund (2019). GFC: Driving the transformation to a climate-resilient financial system. Available at: https://www.greenclimate.fund/documents/20182/194568/GFC_Driving_the_transformation_to_a_climate-resilient_financial_system.pdf/325790aa-cb9c-1821-3b34-6e5948cbbc34

Hammill, A., Matthew, R., & McCarter, E. (2008).

'Microfinance and climate change adaptation'. *Institute of Development Studies Bulletin* Volume 39:4

Isakson, S. R. (2015) 'Derivatives for development? Small farmer vulnerability and the financialization of climate risk management'. *Journal of Agrarian Change*, 15:4, 569-580.

Makana, N. E. (2009). *Peasant Response to Agricultural Innovations: Land Consolidation, Agrarian Diversification and Technical Change. The Case of Bungoma District in Western Kenya, 1954-1960*. *Ufahamu: A Journal of African Studies*, 35(1). Retrieved from

<https://escholarship.org/uc/item/4rh67483>

MIDIMAR (2015) *The National Risk Atlas of Rwanda*. Ministry of Disaster Management and Refugees. Kigali: Republic of Rwanda. Available at:

http://minema.gov.rw/uploads/tx_download/National_Risk_Atlas_of_Rwanda_electronic_version.pdf (Accessed 4 June 2019)

Mikulewicz, M. (2019). "Thwarting Adaptation's Potential? A Critique of Resilience and Climate-Resilient Development." *Geoforum*, June.

<https://doi.org/10.1016/j.geoforum.2019.05.010>.

MINAGRI (2017) *National Agriculture Policy*. Ministry of Agriculture and Animal Resources. Kigali: Republic of Rwanda. Available at:

<http://extwprlegs1.fao.org/docs/pdf/rwa174291.pdf>

MINAGRI (2018) *National Agriculture Policy*. Ministry of Agriculture and Animal Resources. Kigali: Republic of Rwanda. Available at:

https://www.minagri.gov.rw/fileadmin/user_upload/webstore/National_Agriculture_Policy_-_2018___Approved_by_Cabinet.pdf (Accessed 2 December 2019)

MINECOFIN (2013) *National Microfinance Policy Implementation Strategy 2013-2017: A Roadmap to Financial Inclusion*. Ministry of Finance and Economic Planning. Kigali: Republic. Available at:

http://www.minecofin.gov.rw/fileadmin/templates/documents/National_Microfinance_Policy_Implementation_Strategy.pdf (Accessed 2 December 2019)

MINECOFIN (2017) *National Strategy for Transformation 2017-2024 (NST1)*. Ministry of Finance and Economic Planning. Kigali: Republic of Rwanda. Available at: http://www.minecofin.gov.rw/fileadmin/user_upload/NST_A5_booklet_final_2.04.19_WEB.pdf (Accessed 27 November 2019)

MINICOM (2018) *National Policy on Cooperatives in Rwanda: Towards Private Cooperative Enterprises and Business Entities for Socio-Economic Transformation*. Ministry of Trade and Industry. Kigali: Republic of Rwanda.

- Available at:
http://www.rca.gov.rw/uploads/media/2019_03_20_Cooperative_Policy_ENGLISH.___5_.pdf [Accessed 2 December 2019]
- Ministry of Environment (2011) Green Growth and Climate Resilience: National Strategy for Climate Change and Low Carbon Development. Environment Management Authority, Kigali: Republic of Rwanda. Available at: <https://www.environment.gov.rw/index.php?id=21> [Accessed 22 November 2019]
- Ministry of Environment (2018) FP073: Strengthening climate resilience of rural communities in Northern Rwanda. Ministry of Environment. Kigali: Republic of Rwanda. Available at: <https://www.greenclimate.fund/projects/fp073> [Accessed 4 June 2019]
- Ministry of Environment (2019) National Environment and Climate Change Policy. Ministry of Environment. Kigali: Republic of Rwanda. Available at: <http://www.fonerwa.org/sites/default/files/Rwanda%20National%20Environment%20and%20Climate%20Change%20Policy%202019.pdf> [Accessed 22 November 2019]
- Ngabitsinze, J.C., A. Mukashema, M. Ikirezi, and F. Niyitanga. (2011). "Planning and Costing Adaptation of Perennial Crop Systems to Climate Change: Coffee and Banana in Rwanda Case Study Report." London, UK: International Institute for Environment and Development (IIED).
- Niang, I., O. Ruppel, M. Abdrabo, A. Essel, C. Lennard, J. Padgham, and P. Urquhart. (2014). "Africa." In *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, edited by V.R. Barros, C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, et al., 1199-1265. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.
- Paprocki, K. (2016) "Selling our own skin: Social dispossession through microcredit in rural Bangladesh". *Geoforum*, 74, 29-38.
- Pelling, M. (2011). *Adaptation to Climate Change*. New York: Routledge.
- Peterson, N. D. (2012). 'Developing climate adaptation: the intersection of climate research and development programmes in index insurance'. *Development and Change*, 43:2, 557-584.
- del Prete, D. & Ghins, L. & Magrini, E. & Pauw, K., (2018). "Land consolidation, specialization, and household diets: Evidence from Rwanda." IFPRI discussion papers 1728, International Food Policy Research Institute (IFPRI).
- Republic of Rwanda (2006). NAPA-Rwanda: National Adaptation Programmes of Action to Climate Change. Ministry of Environment and Lands. Kigali: Republic of Rwanda. Available at: <https://unfccc.int/resource/docs/napa/rwa01e.pdf> [Accessed 4 June 2019]
- Republic of Rwanda (2012). Second National Communication: Report to the United Nations Framework Convention on Climate Change. Republic of Rwanda, Kigali. Available at: <https://unfccc.int/documents/140790> [Accessed 22 November 2019]
- Republic of Rwanda (2015). Intended Nationally Determined Contribution. Republic of Rwanda, Kigali. Available at: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Rwanda%20First/INDC_Rwanda_Nov.2015.pdf [Accessed 22 November 2019]
- Republic of Rwanda (2018a). Third National Communication: Report to the United Nations Framework Convention on Climate Change. Republic of Rwanda, Kigali. Available at: <https://unfccc.int/documents/184307> [Accessed 22 November 2019]
- Republic of Rwanda. (2018b). "Summary of Rubavu District Development Strategy: 2018-2024." Gisenyi: Republic of Rwanda. http://www.rubavu.gov.rw/fileadmin/templates/raports/RUBAVU_Final_DDS_-Summary_Version__31_DEC_2018.pdf.
- Rippey, P. (2009). "Microfinance and Climate Change: Threats and Opportunities." 53. Focus Notes. Washington, DC: Consultative Group to Assist the Poor.
- Rippey, P. (2012). "Microfinance and Climate Change: Threats and Opportunities." In *Greening the Financial Sector*, edited by Doris Köhn, 215-39. Berlin, Heidelberg: Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-05087-9_8.
- Rwanda Meteorology Agency. (n.d.) "Climatology of Rwanda." n.d. <https://meteorwanda.gov.rw/index.php?id=30>.
- van Rooyen, C., Stewart, R., & de Wet, T. (2012). 'The impact of microfinance in Sub-Saharan Africa: A systematic review of the evidence'. *World Development*, 40:11, 2249-2262.
- Siegel, P. B., Gatsinzi, J., & Kettlewell, A. (2011). 'Adaptive Social Protection in Rwanda: 'Climate proofing' the Vision 2020 Umurenge Programme'. *IDS Bulletin*, 42:6, 71-78.
- Taylor, M. (2014). *The Political Ecology of Climate Change Adaptation: Livelihoods, Agrarian Change and the Conflicts of Development*. Abingdon; New York: Routledge.
- USAID. (2019). "Climate Change Risk Profile: Rwanda." United States Agency for International Development. https://www.climatelinks.org/sites/default/files/asset/document/2019_USAID-ATLAS-Rwanda-Climate-Risk-Profile.pdf.



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