



# Enabling Climate Risk Management Along Agricultural Value Chains: Insights from the rice value chain in Uganda

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## Introduction

Agricultural value chains involve a sequence of value-adding activities that bring products from the farm to the final consumer (Miller & Da Silva, 2007). They link together input from providers, farmers, processors, retailers and consumers, creating relationships that enable the effective functioning of the value chain. Recognizing their role in poverty reduction and food security in developing countries, governments, development agencies and private sector actors are increasingly investing in agricultural value chains, providing inputs, financing and other services that support their development. At the same time, there is increasing awareness that the impacts of climate change threaten the sustainability of these value chains, potentially affecting the profits and livelihoods of all actors involved. Development of agricultural value chains must therefore be climate-resilient, with all actors along the chain actively engaged in managing climate risks.

This brief proposes a framework of core functions for climate risk management (CRM) along agricultural value chains, and highlights the role of service providers in supporting CRM efforts. It draws on findings from research conducted by IISD and its partners on the rice value chain in Uganda as well as existing resilience and adaptive capacity frameworks, applying these to the particular case of agricultural value chains. The brief primarily targets development agencies involved in agricultural value chain development in developing countries, providing insights into the necessary conditions to protect investments and enable CRM by actors all along the chain. It aims to support development actors in better targeting investments and designing interventions for value chains that are resilient to current and future climate hazards and changes.

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## Key Points

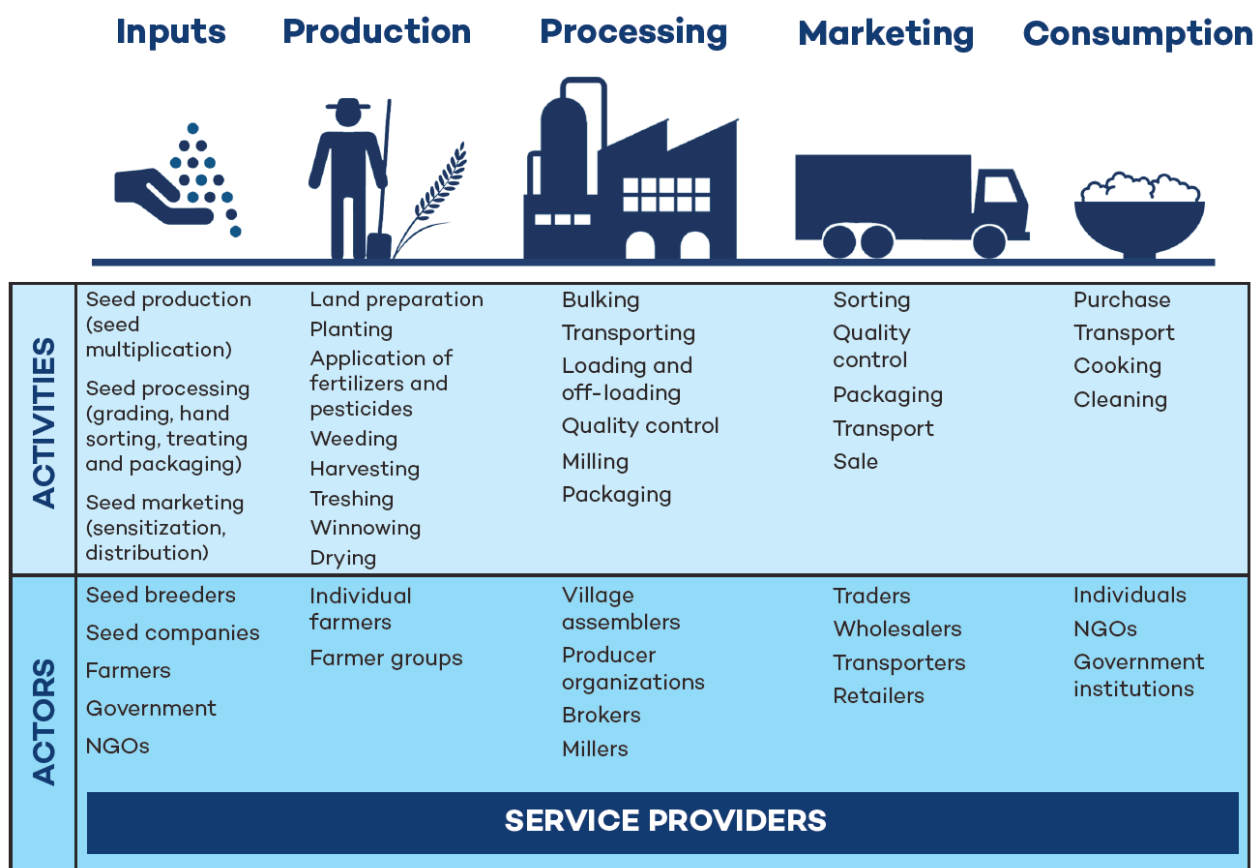
- Climate change impacts all actors on agricultural value chains, but in different ways and to different degrees.
- For investments in agricultural value chain development to have a sustainable impact in reducing poverty and increasing food security, climate resilience must be a priority outcome. To achieve this, all actors along the chain must be aware of climate risks and empowered to manage these risks.
- To build climate-resilient value chains, there are three interrelated CRM functions that all value chain actors must perform, namely: climate risk assessment; adaptive management of value chain activities; and responding to shocks.
- Service providers can play a key role by providing value chain actors with the information, knowledge and resources they require to better manage climate risks.
- Development agencies can help enhance capacities and services for CRM by actively integrating climate resilience in value chain interventions.

## Climate Impacts on the Rice Value Chain in Uganda

Rice is an increasingly important crop for Uganda's economic growth and food security. It is currently the second most important cereal crop in Uganda in terms of production volume (after maize) (Kilimo Trust, 2012). Consumption of rice is on the rise in Africa, driven by population growth, rapid urbanization and changing diets. This trend is expected to continue (Seck, Mohanty & Wopereis, 2012), leading the Government of Uganda to prioritize development of the rice sector, as a means of improving household food security and incomes, with a view toward producing a surplus for export (Ministry of Agriculture, Animal Industry and Fisheries, 2012). However, rice has also been identified as a crop that is particularly vulnerable to climate change due to its sensitivity to changes in weather conditions (United States Agency for International Development, 2013). With Uganda expected to experience rising temperatures and changes in the distribution of rainfall over the seasons, as well as an increase in the frequency and intensity of extreme weather events (USAID, 2013; Rautenbach, Botai, Nsubuga, Shongwe & Beucher, 2014; Climate Service Center, 2013), climate risk management will be critical to realizing the country's objectives for rice development.

A value chain approach is useful in analyzing climate risks, as it looks beyond production and fosters a more systemic approach to risk management (Dekens & Bagamba, 2014). Figure 1 provides an overview of the key stages of an agricultural value chain, using the rice value chain in Uganda as an example. It describes the activities that occur at each of the stages, from inputs through to consumption, and the actors involved at each stage. This is a simplified representation—in reality, some activities such as quality control occur throughout the value chain stages and some actors perform activities that cut across different stages. Service providers, such as extension services and institutions offering financial services, also play a critical role in supporting actors throughout the chain.





**Figure 1:** Overview of the rice value chain in Uganda<sup>1</sup>

The initial phase of the research explored how climate hazards affect the actors and activities at these different stages, through interviews and focus group discussions with value chain actors in northern and eastern Uganda. In these areas, the key climate hazards affecting the value chain are droughts, floods, hail storms and changes in seasonal patterns. The research found that all stages of the value chain are exposed to climate risks; however, the actors are affected in different ways and to different degrees. Farmers, particularly smallholders, are highly vulnerable because their incomes and food security are directly dependent on agricultural production. However, as all of the actors further along the chain rely on crop production for their business activities, and any losses experienced by farmers have implications for them in terms of supply of the products they are processing, trading and transporting. Production losses affect input providers as well, as they may face both reduced supply of seeds and reduced demand for inputs. Transporters also face some direct impacts from floods in terms of disruption of transportation networks. All of the actors along the chain are also consumers of the foodstuffs, and are therefore affected in terms of lower incomes and higher prices, increasing the risk of food insecurity.

The degree of impact is determined not only by the exposure of the actors and their assets to climate risks, but also by the ability of actors to anticipate and respond to the impacts. Generally speaking, actors further along the chain are in a better position to deal with negative impacts because they have diversified supply sources and tend to have more assets (for example, cash savings) to buffer shocks and stresses. Farmers, on the other hand, have fewer assets and alternatives available in terms of income sources. These findings highlight the importance of strengthening adaptive capacity, especially for farmers and other vulnerable value chain actors.

<sup>1</sup> As the research in Uganda was conducted in partnership with a seed company, the information gathered on the inputs stage was focused on activities and actors related to seed production and distribution.

## Climate Risk Management Along Agricultural Value Chains

The findings from Uganda provide a snapshot of the types of risks that climate hazards currently pose to agricultural value chains. On a broader scale, the increased uncertainty and more frequent extremes projected by climate models for many developing countries represent a real threat to realizing the benefits of agricultural value chain development. According to the International Fund for Agricultural Development (IFAD), “some agricultural value chains may no longer be economically viable over timespans of as little as 20 years, as climate change pushes beyond the thresholds of crop, pasture or fisheries suitability in the areas of production” (International Fund for Agricultural Development [IFAD], 2015, p. 3). Furthermore, investment in these value chains may prove to be maladaptive, exposing value chain actors to greater risk and higher opportunity costs over time (IFAD, 2015).

Clearly, climate resilience must be a priority outcome if investments in value chain development are to have a sustainable impact in reducing poverty and increasing food security. To achieve this, all actors along the chain must be aware of climate risks and empowered to manage these risks on an ongoing basis. Given the context-specific nature of climate hazards and changes, approaches to CRM must be tailored to the particular ecological and socioeconomic environment in which the value chain operates. However, there are three interrelated functions<sup>2</sup> that all value chain actors must perform in order to build climate-resilient value chains,

namely: climate risk assessment; adaptive management of value chain activities; and responding to shocks.<sup>3</sup> These core functions focus on what value chain actors need to do in order to manage climate risks (versus what *resources* or *assets* they have that enable them to adapt). These functions represent elements of an ongoing process of managing climate risks, wherein actors may be engaged in more than one function at a time, with the climate risk assessment function both informing and informed by adaptive management and responses to shocks, as shown in Figure 2.

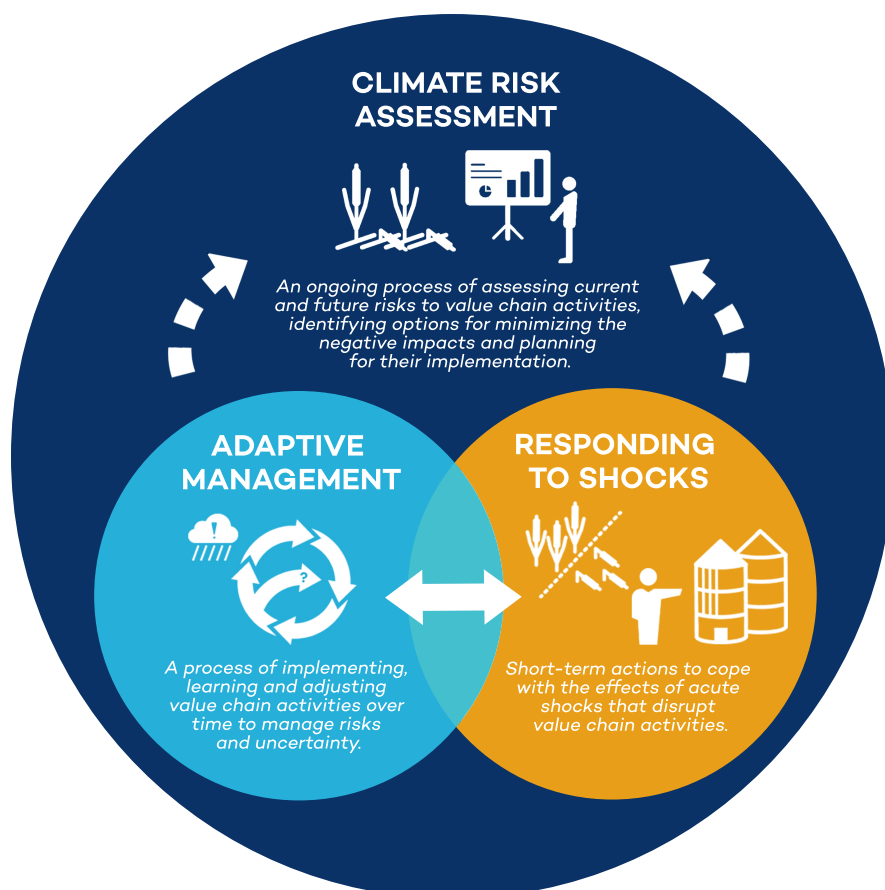


Figure 2: Core CRM functions for agricultural value chain actors

<sup>2</sup> The use of functions as an organizing principle for the framework is inspired by the National Adaptive Capacity Framework developed by the World Resources Institute (WRI) (WRI, 2009).

<sup>3</sup> These functions are aligned with the 3As framework for resilience applied in the Building Resilience and Adaptation to Climate Extremes and Disasters (BRACED) program, which highlights anticipatory, adaptive and absorptive capacities as key to building resilience (Bahadur, Peters, Wilkinson, Pichon, Gray, & Tanner, 2015).



**Climate risk assessment** is a key step in any climate change adaptation process. For value chain actors, it involves understanding current and future climate risks, analyzing the implications for value chain activities and assessing different options for minimizing the negative impacts. With this analysis, they can engage in forward-looking and flexible planning processes (Africa Climate Change Resilience Alliance, n.d.) that maximize their business potential while taking climate risks into account. To do this, value chain actors must have access to climate and weather information, as well as the ability to use it for planning and decision making. Climate risk assessment is generally undertaken when key decisions are being made, including on investments and timing of activities such as planting or purchasing. As noted above, experiences with adaptive management and responding to shocks will influence how climate risks are assessed and the plans made.

**Adaptive management** is a flexible approach that allows value chain actors to address risks and uncertainty (Walters, 1996) and adapt to changes over time. It is an iterative learning process, which is informed by weather and climate information and supported by knowledge of costs and benefits of different options in relation to different scenarios. For value chain actors, it involves monitoring both the context in terms of climate risks and the performance of value chain activities, and making adjustments or taking actions in response to what is being observed as well as past experiences. The types of actions taken may include diversification of activities, products and income sources; protecting key assets from climate hazards; and improving efficiency in management of resources needed for value chain activities (IFAD, 2015).

**Responding to shocks** involves short-term actions to cope with shocks that cannot be avoided through adaptive management. In a changing climate, where extreme weather events are expected to increase in frequency and intensity, it is likely that value chain actors will be affected by hazards that disrupt their activities and have negative effects on their income and food security. Actors must be prepared to absorb these shocks, through their own coping mechanisms and/or with external support that aids them in responding. For value chain actors, having reserves (of cash, seeds, food, etc.) in place and having alternative income sources is important; however, in extreme situations they may need to rely on safety nets and emergency response mechanisms. As shown in the diagram, adaptive management and responses to shocks are closely linked. With increased resilience, value chain actors will ideally be less dependent on coping mechanisms and increasingly able to manage risks through adaptive management.





The core CRM functions described above are relevant at all of the stages of the value chain, but their practical implementation will differ depending on the actor. For example:

- Climate risk assessment by farmers is likely to involve assessment of different crops and varieties in terms of their performance under different weather conditions, while for traders and transporters it will focus on alternative product sources and transport options.
- Adaptive management for input providers may require stocking of different types of inputs depending on expected conditions for the growing season. Farmers may need to adjust timing of planting and harvest, invest in climate-resilient seed varieties and/or diversify the crops planted in order to manage uncertainty in rainfall patterns. Millers, traders and transporters will need to adapt to fluctuations in product supply, for example by expanding their operational area, while consumers may need to rely on alternative food sources depending on availability of key staples.
- Responses to shocks will depend on the actor, the nature of the shock and the resources and services available. Farmers may rely on social safety nets such as community grain banks, while actors further along the chain may pursue more individualized strategies such as migration for paid labour.

All of the CRM functions will be most effective when applied in a well-functioning value chain, wherein the products move smoothly through the chain, and the different actors are linked together in mutually beneficial relationships based on communication and trust. CRM along agricultural value chains will often involve trade-offs—between actors, between short- and long-term benefits or between different business objectives. An understanding of the costs and benefits of different CRM options is key to effective functioning and adaptive management of value chains (IFAD, 2015).

## The Role of Services in Enabling CRM

The research in Uganda highlighted the critical role played by service providers in supporting value chain development, as well as their potential role in enabling CRM. To realize this potential, investment in services is needed to build the capacity of service providers to work with value chain actors to ensure that they have the information, knowledge, and resources needed to perform the key CRM functions.

They rely on systems and structures that are gender-equitable and inclusive of the most vulnerable people. As discussed further in the following section, timely and effective service provision is a key enabling factor for value chain development.

There are a number of core services that underpin implementation of all of the core CRM functions:



**Climate information services** are critical for all decision makers, from smallholder farmers to banks to government agricultural investment programs. Past and current climate trends, future projections and seasonal and weather forecasts support climate risk assessment, while early warnings for climate extremes can enhance preparedness for shocks.



**Financial services**, including credit, savings and insurance, offered by commercial banks or microfinance institutions, represent an essential resource for CRM. Affordable access to finance facilitates planning, diversification of activities and income sources and provides a buffer when shocks are experienced. It also enables innovation and experimentation, which are key for adaptive management.



**Market information systems**, which provide information on pricing, supply and demand of different commodities, play a key role in allowing value chain actors to diversify their activities and maximize their incomes. When combined with climate information, market information supports risk analysis and can inform decisions about value chain activities, including input purchases, which commodities to invest in and when to keep a reserve of a particular product. This enables timely and efficient purchase and sale of products, including during periods of stress.



**Infrastructure**, such as roads, storage facilities and information and communication technologies, is critical for the effective and efficient functioning of value chains. When infrastructure is affected by hazards such as floods or heavy rainfall, it has negative implications for the value chain actors that depend on it. To support CRM, investments in infrastructure services must be climate-resilient, constructing key structures and facilities to withstand increases in the frequency and intensity of extreme weather events.

In addition to these core services, some services specifically enable adaptive management of value chain activities, such as agricultural research, development and agricultural extension services, when they integrate CRM and actively promoting climate-resilient practices and technologies. These service providers, alongside other development agencies such as NGOs, may also provide technical assistance on climate risk analysis, assessment of CRM options and planning. At the input stage, certification, standards and monitoring are important to ensure quality of products, including climate-resilient seeds. Finally, some services, such as emergency response services provided by government or NGOs, are specifically targeted toward supporting people in responding to shocks.

## Enabling CRM Along Agricultural Value Chains: The way forward

In order to realize the potential of agricultural value chain development for poverty reduction and food security, development agencies must actively integrate climate resilience in value chain interventions. Recent analysis has identified a few key barriers to CRM by value chain actors (IFAD, 2015; Dekens & Bingi, 2014; Dekens & Bagamba, 2014; Overseas Development Institute and Pathways to Resilience in Semi-Arid Economies, 2015):

- Limited access to information on current and future climate-related risks.
- The uncertainty associated with climate change projections.
- Limitations in human capacity to analyze risks and put CRM strategies in place.
- Limited access to financial resources to invest in CRM.
- Limited documented evidence on climate impacts and CRM options at value chain stages other than production.
- Lack of policy direction to provide incentives for CRM.
- Lack of clarity on benefits of CRM in terms of achieving business objectives.

To overcome these barriers and enable CRM along agricultural value chains, a few key areas of action for development agencies can be identified.

**Developing the capacity of value chain actors to manage climate risks:** Development agencies can work directly with value chain actors to enhance their CRM capacity, for example through raising awareness on climate change and technical assistance for risk analysis and CRM options. One way of achieving this is to integrate CRM issues in existing training and business development programs targeting value chain actors. Partnerships with local government and/or private sector institutions can facilitate access to and efficient management of critical resources for value chain activities, such as water and climate-resilient inputs (for example heat-tolerant seeds). Development interventions can also support income diversification, for example by assisting small business development or by raising awareness about employment opportunities outside the value chain.



**Strengthening the services provided to value chain actors:** Service providers are critical for value chain development, and have a key role to play in supporting CRM by value chain actors. Areas for further investment include: capacity development for climate information service providers to generate, tailor, and disseminate seasonal and weather forecasts and early warnings in a timely and accessible manner for different value chain actors; partnerships with research institutions and agricultural extension services to build knowledge on climate-resilient agricultural practices and technologies; and supporting financial service providers to develop new or adjusted products and services that enable CRM along value chains, while also reducing risks to the providers themselves. Development agencies can also work with local institutions to strengthen market information systems to enable efficient functioning of value chains.

**Generating evidence on costs and benefits of value chain CRM:** Further evidence is needed to demonstrate the business case for CRM along agricultural value chains, including the costs and benefits of different CRM options for actors along the value chain. Cost-benefit analysis in this context must also consider environmental and social dimensions; however, a compelling economic case is critical to promote investment by value chain actors as well as other stakeholders in the private and public sectors. Development agencies can contribute to this by incorporating indicators of climate resilience in monitoring and evaluation (M&E) systems for value chain development interventions. This will inform exploration of the trade-offs associated with different options and support the establishment of incentives for CRM by value chain actors.

**Strengthening the enabling environment:** Both the value chain approach and CRM must be integrated into broader policies and systems. A key entry point is agricultural development policies and programs, where a value chain approach can promote a more systemic way of addressing challenges in the agricultural sector. This provides a basis for consideration of climate issues, going beyond production to promote CRM along entire value chains. The existence and effectiveness of safety net programs and disaster risk management systems are also critical, particularly in relation to supporting value chain actors in responding to shocks. Development agencies can play a useful role in bringing these issues forward through interactions and partnerships with government, civil society and private sector actors.

### **Private Sector Investment in a changing climate: Resilient rice value chain development in Uganda (PSI-Climate)**

The PSI-Climate initiative explored how domestic private sector investment decisions can enable climate risk management (CRM) by different actors along the rice value chain in Uganda. Led by IISD, the project was implemented in partnership with the Economic Policy Research Center (EPRC) and the Ministry of Finance, Planning and Economic Development (MoFPED) during the period 2014-2016. Case study research was conducted in collaboration with a domestic seed company, Equator Seeds Ltd in Northern Uganda, and a commercial bank, (Centenary Bank Ltd.) in Eastern Uganda. The research utilized a participatory and qualitative approach, with data collected through focus group discussions, semi-structured interviews and dialogue processes with key actors along the selected rice value chains, as well as relevant experts. For more information about the initiative, please see: <http://www.iisd.org/project/psi-climate-uganda>.





## References

- Africa Climate Change Resilience Alliance (ACCRA) (n.d.). *The ACCRA Local Adaptive Capacity framework*. Brief developed by CARE, ODI, Oxfam, Save the Children and World Vision. Retrieved from [http://community.eldis.org/.59d669a7/ACCRA%20Local\\_Adaptive%20Policy\\_new.pdf](http://community.eldis.org/.59d669a7/ACCRA%20Local_Adaptive%20Policy_new.pdf)
- Bahadur, A.V., Peters, K., Wilkinson, E., Pichon, F., Gray, K., & Tanner, T. (2015). *The 3As: Tracking resilience across BRACED* (Working paper). BRACED. Retrieved from <https://www.odi.org/publications/9840-braced-climate-resilience-adaptation-disaster-risk-reduction>
- Climate Service Center. (2013). *Climate Fact Sheet Uganda*. KfW Development Bank, BMZ and Climate Service Center Germany. Retrieved from [http://www.climate-service-center.de/036238/index\\_0036238.html.en](http://www.climate-service-center.de/036238/index_0036238.html.en)
- Dekens, J., & Bagamba, F. (2014). *Promoting an integrated approach to climate adaptation: Lessons from the coffee value chain in Uganda*. Winnipeg: IISD. Retrieved from [http://www.iisd.org/sites/default/files/publications/value\\_chains\\_coffee\\_uganda\\_briefing\\_note.pdf](http://www.iisd.org/sites/default/files/publications/value_chains_coffee_uganda_briefing_note.pdf)
- Dekens, J., & Bingi, S. (2014). *Agro-value chain finance and climate adaptation: The role of the banking sector* (Briefing note). Winnipeg: IISD. Retrieved from [http://www.iisd.org/sites/default/files/publications/agro\\_value\\_chain\\_bank\\_sector.pdf](http://www.iisd.org/sites/default/files/publications/agro_value_chain_bank_sector.pdf)
- International Fund for Agricultural Development (IFAD). (2015). *How to do climate change risk assessments in value chain projects*. IFAD Policy and Technical Advisory Division. Retrieved from <https://www.ifad.org/documents/10180/30b467a1-d00d-49af-b36b-be2b075c85d2>
- Kilimo Trust. (2012). *Development of inclusive markets in agriculture and trade (DIMAT): the nature and markets of rice value chains in Uganda*. UNDP.
- Lemma, A., Jouanjean, M-A, & Darko, E. (2015). *Climate change, private sector and value chains: Constraints and adaptation strategies* (Working paper). Overseas Development Institute (ODI) and Pathways to Resilience in Semi-Arid Economies (PRISE). Retrieved from <http://prise.odi.org/research/climate-change-private-sector-and-value-chains-constraints-and-adaptation-strategies/>
- Miller, C. & da Silva, C. (2007). *Value chain financing in agriculture*. Enterprise Development and Microfinance 13(2/3), Practical Action Publishing, Rugby.
- Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) (2012). *Uganda National Rice Development Strategy 2008-2018*. Government of Uganda.
- Rautenbach, H., Botai, J., Nsubuga, W. F., Shongwe, M., & Beucher, O. (2014). *Economic assessment of the impacts of climate change in Uganda. Regional-scale climate change projections of annual, seasonal and monthly near-surface temperatures and rainfall in Uganda*. Climate Change Unit, Ministry of Water and Environment, Uganda and Climate & Development Knowledge Network.
- Seck, P. A., Mohanty, S. & Wopereis, M.C.S. (2012). Crops that feed the world 7: Rice. In *Food Security* 4, 7-24.
- United States Agency for International Development (USAID). (2013). *Uganda Climate Change Vulnerability Assessment Report*. Prepared by Patricia Caffrey, Timothy Finan, Sylwia Trzaska, David Miller, Rita Laker-Ojok and Samuel Huston. Retrieved from <https://www.climatelinks.org/resources/uganda-climate-change-vulnerability-assessment-report>
- Walters C. (1986). Adaptive management of renewable resources. Cited in IISD, TERI (The Energy and Resources Institute), and IDRC (International Development Research Centre). (2006). New York: MacMillan. *Designing policies in a world of uncertainty, change and surprise: Adaptive policymaking for agriculture and water resources in the face of climate change*. Retrieved from [https://www.iisd.org/pdf/2006/climate\\_designing\\_policies.pdf](https://www.iisd.org/pdf/2006/climate_designing_policies.pdf)
- World Resources Institute (WRI). (2009). *The National Adaptive Capacity Framework: Key institutional functions for a changing climate* (Pilot draft). Retrieved from [http://www.wri.org/sites/default/files/nac\\_framework\\_2009-12.pdf](http://www.wri.org/sites/default/files/nac_framework_2009-12.pdf)

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