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CLIMATE RISK MANAGEMENT FOR LOCAL AGRICULTURAL COOPERATIVES IN RWANDA:

A TRAINING OF TRAINERS' MANUAL

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The manual is adapted from the Community Based Risk Screening Tool – Adaptation and Livelihoods (CRiSTAL) framework, which was developed by IISD and three other partners to help project managers and planners design activities that support adaptation to climate variability and change at the community level. IISD tested a first version of this manual during a training of trainers (ToT) session conducted in May 2013 in Kayonza District.

Feedback collected from participants during this pilot test has been incorporated in the current version of the manual. This manual is a living document. It is expected that updated versions will be developed in the future in response to additional experiences in the field. You are invited to send your feedback to jdekens@iisd.org.

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Module 1.
About This Manual: 10 key questions

1. What Is the Issue This Manual Aims to Address?

With its **National Cooperatives Promotion Policy,** the Government of Rwanda is encouraging community self-development through cooperatives. Like any venture, local cooperatives should develop business plans, or detailed action programs or roadmaps specifying their objectives, product(s), target market(s) and capital requirements.

Risk assessment and management should be a key component of these business plans. It refers to the process of identifying the main risks or factors that can hamper a business's performance and designing strategies to minimize and, if possible, take advantage of these risks. Risks may be financial (e.g., market price fluctuation), environmental (e.g., deforestation), political (e.g., change in trade policy), socioeconomic (e.g., changes in consumer preferences), and technological (e.g., infrastructure failures).

In Rwanda, where most agriculture is rain fed, the production of agro-products is very dependent on climatic conditions. As such, **climate risks** (i.e., risks from climate variability and change) are one of the key factors that influence the competitiveness of local agricultural cooperatives. Climate risks can have impacts on both the demand and supply sides of a specific value chain as described in Table 1.

2. What Is the Purpose of This Manual?

This guide seeks to support the integration of measures that address climate variability and change into agricultural cooperatives' activities to ensure long-term sustainability of investments and reduce the exposure and vulnerability of business activities to actual and expected climatic changes.

3. Who Is the Intended Audience?

This manual primarily targets **NGO staff and local government officials** working with agricultural cooperatives in Rwanda. It is designed as a **training of trainers (ToT) manual** that can be used by NGO staff and local government officials to train cooperative members. Local officials should represent various sectors including the environment, agriculture, water, health, social affairs and cooperatives sectors because climate change affects them all.

Table 1: Impacts of climate hazards on the demand and supply sides of a specific value chain

Climate hazards can have an impact on:	Examples of the impacts of drought on maize
1. The **consumers** of agricultural products produced by the cooperative (demand side)	• Damages to maize crops lead to reduced quality and quantity; higher prices of maize crop and products like maize flour; consumers are forced to reduce their consumption or switch their consumption habits to cheaper food products. • Consumers lose their incomes due to recurring droughts; reduced capacity to buy some food products.
2. The **inputs** (e.g., water, agricultural knowledge, financial skills, machines) required to run the cooperative (supply side)	• Reduced water availability at the production and processing stages lead to crop failure and quality deterioration of maize grains; reduced incomes.
3. The **products or services** the cooperative offers (supply side)	• Reduced quantity and quality of maize flour produced by the cooperative lead to reduced incomes.
4. **External support** from government, NGOs, and/or the private sector that feeds into the cooperative (supply side)	• Increased support in the form of subsidized fertilizer and facilitated access to loans.

4. How Is This Manual Used?

This manual helps cooperative members identify the main climate risks that can hamper their cooperative's performance and identify solutions to minimize and, if possible, take advantage of these risks. This is done by taking a **value chain approach** through an analysis of the links between climate hazards and agricultural production along the length of a value chain (from production to marketing and consumption) identified as most important to the selected cooperative.

5. When Should This Manual Be Used?

This manual can be used at different stages of a business cycle:

- **At the planning stage,** to inform the development of a cooperative's business plan (risk management analysis) or a project proposal.
- **At the implementation stage,** to revise a business plan, existing activities and/or develop new ones taking into account climate risks.
- **At the monitoring and evaluation stage,** to evaluate progress toward climate risk management (or climate adaptation). The manual can be first used at time A to create a baseline for monitoring and evaluation and then at time B to measure progress made towards climate risk management.

6. How Is the Manual Structured?

This manual is organized in **three modules**. Following this introduction (Module 1), the manual provides step-by-step instructions for data collection and analysis (Module 2) and a case study of a local agro-cooperative focusing on the maize value chain (Module 3). All terms in **bold** marked with an asterisk (*) are defined in Annex 1 of this manual. Annex 2 provides templates of tables for reporting the information collected and some examples of completed reporting tables.

7. How Long Does it Take to Apply the Manual?

The time required for the training can vary according to the objectives, the number of participants, the size of the cooperative, the number and complexity of the value chain(s) selected, and the budget and time available. Ideally, users should plan for between two and three days.

8. Where Should the Manual Be Applied?

While this manual is specifically designed for use in Rwanda, it could be applied in other contexts where farmers' associations and local cooperatives are involved in value addition of agricultural products. The training should take place in the area where the selected cooperative operates.

9. What Resources Are Needed?

Table 2 (below) lists the resources required to conduct the training.

10. How to Record the Information?

It is extremely important that the training organizer document the entire process by taking detailed notes of all the discussions (formal and informal) and photos of all key outputs (e.g., maps, tables, group discussions). Specific attention should be paid to document the participants' narratives in their own words and to distinguish in the analysis "what people say" from the organizer's analysis of "what people say."

Table 2. Resources required to conduct the training

	Resources required
Knowledge	Basic knowledge about cooperatives and value-chain development, climate variability and change, participatory approaches and rapid rural appraisal tools.
Skills	Gender-sensitive facilitation skills (incl. ability to probe for information from participants). Ability to be fully functional in local language(s).
Participants	Between 8 and 25 participants (cooperative members, district officials, NGO staff). Make sure that women and other social groups that compose the cooperative are well represented.
Training team	Minimum two facilitators (one moderator and one notetaker), the facilitation team should include both men and women.
Materials	Flipchart paper, coloured paper, coloured markers, clipboards, notebooks, camera.
Costs	The meeting costs and human resources will vary according to the number of participants and the location where the training takes place.

Module 2.
About the Approach: 10 step-by-step instructions

Table 3 provides an overview of the approach used to integrate **climate adaptation*** into the specific **value chain(s)*** selected. Data collection and analysis are organized according to a 10-step process (described in details in this module), divided into three stages that aim to:

A. Understand the business context: The "what," "where," and "when" of the selected **agricultural value chain***.

B. Understand the climate context: The location, **frequency*** and **intensity*** of **climate hazards*** currently and in the future in the context of **climate change*** in the area where the **cooperative*** operates.

C. Evaluate the implications of different climate hazards for the cooperative: The impacts of climate hazards on each stage of the selected value chain and the current and alternative **responses*** to support climate adaptation.

Table 3. Overall framework for data collection and analysis

Phases	A: Understand the business context	B: Understand the climate context	C: Evaluate the implications for the cooperative
Steps	1. Map the key elements of the selected agricultural value chain 2. Map the location of key activities in the area where the business operates 3. Map the timing of key activities throughout the year 4. Identify the **inputs***, **outputs***, and **external services*** most important to the development of the selected value chain	5. Summarize information on observed and projected climate change in the area where the selected cooperative operates 6. Map the key climate and non-climate hazards affecting the selected value chain	7. Identify the cooperative's most climate-sensitive inputs, outputs and external services 8. Explore potential **climate impacts*** 9. Explore current and potential **responses*** 10. Provide recommendations for **climate mainstreaming***
Approach & tools	• Review of the cooperative business plan (if available) and any other relevant information about the cooperative • Group discussions with cooperative members	• Review of climate change information at the national and regional levels • Group discussions with cooperative members	• Group discussions with cooperative members
Main outputs	• List of inputs, outputs and external services that are most important to the cooperative and at what stage of the selected value chain	• Main actual and future potential climate hazards affecting the business	• List of revised and/or alternative responses to climate impacts that maximize multiple co-benefits along the value chain

PHASE A | Understand the business context

STEP 1: MAP THE KEY ELEMENTS OF THE SELECTED AGRICULTURAL VALUE CHAIN

Purpose

- To understand the core stages and main activities of the selected agricultural value chain that are important for the **cooperative.***

Process

- First, ask participants to define the meaning of **value chain*** in the context of their business. Clarify that value addition need not be limited to economic value. For example, some products may also gain nutritional value along the chain.
- Second, ask participants to select an agricultural value chain that is most important in the context of their **agricultural cooperative*** (presently and/or in the future).
- Finally, ask participants to discuss the following questions:
  - What are the **overall purpose and objectives of the cooperative** for the specific value chain in question in the short term (up to the next five years)? And in the longer term (within the next 10 years and beyond)?
  - What are the **core processes or stages of the selected value chain**? Core stages often include: production, processing, marketing and consumption stages. Probe the participants to be as specific as possible.
  - What **activities** are carried out by the members under each level of the value chain? These may be activities that the cooperative is already doing and/or activities that they are planning to do in the future. Again, probe the participants to be as specific as possible. For example, activities at the production level of a coffee value chain may include at least the following: growing, weeding, pest and disease management, pruning, harvesting, drying, storing, transporting, and selling. Ask the participants to clarify which activities are mainly done by women, men or both by adding a symbol (e.g., "W" for women, "M" for men, and "All" for both men and women) aside each activity.

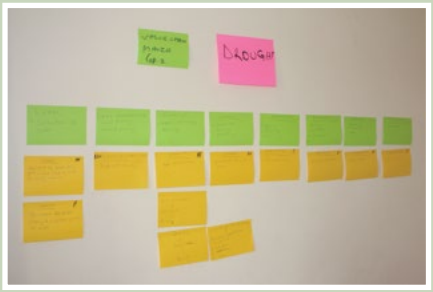

Figure 1. Example of a value chain mapping exercise.
It shows the core stages of a value chain (top row meta-cards in green) and key activities under each stage (subsequent rows meta-cards in yellow).
(Photo: Matt McCandless)

Tips

- If there are more than eight participants, form small working groups of maximum eight participants per group. If time allows, you can compare the results of the exercises done by the different groups and look for similarities and differences across groups. This may help further refine the value chain mapping and develop a common understanding among participants.
- If possible, ask participants to use coloured paper cards (see example, Figure 1 above) to map activities on the wall of the meeting room.

Output

- A description of the selected value chain's purpose, objectives, and core activities.

PHASE A | Understand the business context

STEP 2: MAP THE LOCATION OF KEY ACTIVITIES IN THE AREA WHERE THE BUSINESS OPERATES

Purpose

- To understand the geographical context of the selected value chain.

Process

- Ask the cooperative members to draw a map that delineates the geographical scope of their cooperative in relation to the selected value chain (e.g., within one village, across different villages).
- Ask participants to indicate on the map where the **key activities** of the cooperative take place in relation to the selected value chain (described in Step 1). Probe the cooperative members to be as specific as possible by asking them questions such as: Where are the homes of the members of the cooperatives located? Are they concentrated in an area or dispersed? Where do they cultivate and store their product? Are the fields where the product is grown concentrated in a specific area or dispersed? Where is the product being processed? Where is/are the market(s) located? Where are the buyers coming from? (etc.)
- Then, ask participants to draw some arrows to show how the product moves from one place to another as it goes through different stages of production.
- Finally, ask participants if they have noticed any **changes in the location of key activities** over the past years or decades. If yes, ask them to describe the changes that have occurred and their perceptions of the reason(s) for these changes. Take detailed notes of the discussion.

Output

- A map showing where the cooperative operates and the **geographical flow** of the selected agricultural product.

Figure 2. Map showing the geographic flow (black arrows) of maize.
Once the maize is harvested, it is dried near the cultivated fields and then stocked in the storage house. Buyers include the local school and the nearby market. The rest of the maize is being processed at the grain mill. (Photo: Matt McCandless)

PHASE A | Understand the business context

STEP 3: MAP THE TIMING OF KEY ACTIVITIES THROUGHOUT THE YEAR (OPTIONAL, IF TIME PERMITS)

Purpose

- To understand the temporal context of the selected value chain (when key activities for the selected value chain take place and any changes of timing that have occurred in recent years).

Process

- Ask cooperative members to describe when the seasons (e.g., short rainy season, short dry season, long rainy season) and the main activities related to the selected value chain (identified in Step 1) take place during the year. This information can be summarized by the participants in a table on a flipchart in the form of a "seasonal calendar" (see example below). Ask participants to list in the first column the main seasons and the key activities related to the selected value chain and to identify the specific month(s) of the year when each season and activity currently takes place.
- Then, use the seasonal calendar as a basis to identify potential periods of stress during the year (e.g., times of high demand but low supply or vice versa; shortest growing season) and any changes related to the timing of seasons and related agro-activities experienced in recent years. You may ask questions such as:
  - At what time of the year is supply highest and lowest? When does harvesting normally occur during the year?
  - At what time of the year is demand highest and lowest? When does it normally occur during the year?
  - When do the most critical times of the year occur (e.g., mismatch between demand and supply)?
  - Have you noticed any changes in the timing of key seasons and/or activities? In the timing of the supply and/or demand peaks? What might be the reasons for those changes (e.g., climate, market)?

Take detailed notes of the discussion.

Output

- A seasonal calendar, such as the example below.

Table 4. Example of a seasonal calendar showing the timing of the main seasons and the key activities of a value chain during the year

Main seasons & activities	Jan.	Feb.	March	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Long rainy season	X	X							X	X	X	X
Dry season				X	X	X	X	X				
Short rainy season								X	X	X		
Planting				X						X	X	
Harvesting		X	X				X	X				
Storing												
Selling												

PHASE A | Understand the business context

STEP 4: IDENTIFY THE INPUTS, OUTPUTS, AND EXTERNAL SERVICES MOST IMPORTANT TO THE SELECTED CHAIN

Purpose

- To prioritize the resources (inputs, outputs and external services) most necessary to the cooperative at each stage of the selected value chain.

Process

- Ask participants to list the different **inputs*** (see **Tips** below) that are most important for their business at each stage of the selected value chain and to rank them using a score from 0 ("not required") to 3 ("very important") using Table A.4 (provided in Annex 2). Participants should identify no more than four key inputs under each category to keep the information manageable.
- Ask participants to analyze the results: 1) by ranking the type of inputs from the most important to the least important across all levels of the value chain using the "total score" column, and 2) by listing the inputs identified as "very important" for each stage of the value chain.
- Ask participants to identify any other key **outputs*** and **external services*** (those that have not already been identified in Table A.4). Develop similar tables accordingly.

Figure 3. Focus group discussion with the results of an input matrix on top left of the wall.
(Photo: Matt McCandless)

Tips

Probe participants to explore a range of different inputs:

- **Natural inputs:** Environmental assets such as land, soil, water, forests, and associated ecosystem services (e.g., nutrient cycling, erosion protection) useful for the business.
- **Physical inputs:** Infrastructure (such as roads, storage) and productive capital (tools, machines) for transport, buildings, water management, energy and communications.
- **Financial inputs:** The availability of cash or equivalent assets that enable the cooperative to conduct its business (for example, savings, loans, bank deposits, liquid assets such as livestock and jewellery, but also regular inflows of money such as earned income, pensions or other transfers from the state, and remittances).
- **Human inputs:** Skills, knowledge, ability to work and good health important to the pursuit of the business activities.
- **Social inputs:** The set of social relationships (i.e., networks; membership in more formalized groups; relationships of trust, reciprocity and exchange) from which people draw in pursuit of their business activities.
- **Political inputs:** Access to decision-making processes, power relations.

Outputs

- Input/output/external services matrices with total scores showing which inputs/outputs/external services are most important to the cooperative and at what stage of the selected value chain.

PHASE B | Understand the climate context

STEP 5: SUMMARIZE INFORMATION ON OBSERVED AND PROJECTED CLIMATE CHANGE IN THE AREA WHERE THE SELECTED COOPERATIVE OPERATES

Purpose

- To understand the climate context in Rwanda with a specific focus on the region where the selected cooperative operates.

Process

- Before the training, review key sources of information on **climate change*** in Rwanda. (See **Tips** below)
- Provide a clear definition of key terms and make sure participants understand the difference between **weather*** and **climate*** and between **climate variability*** and **climate change.***
- Summarize and present to the members of the cooperative key information on:
  - **Current and past changes in climate conditions and extremes** that have occurred over the past decades in the business area preferably based on peer-reviewed sources, official government reports, and completed by consultations done at the local level.
  - **Future changes** in temperature, rainfall, extreme weather events and any other important phenomena based on scientific sources only.
- This information can be summarized on a flipchart using bullet points. If possible, ask participants to take a few minutes to summarize key results in Table B.5 presented in Annex 2 so that all members internalize the information.

Tips

- In Rwanda, the **Ministry of Lands and Environment (MINELA)** is responsible for designing the state policy related to environment protection, conservation and management, including climate change. The **Rwanda Environment Management Authority** housed in the MINELA is responsible for policy implementation and the **Rwanda Meteorological Services in the Ministry of Infrastructure** is responsible for forecasts and warnings of weather, climate, water and related environmental elements.
- Key **national documents** on climate change include: the National Adaptation Programme of Action (2006), the National Strategy on Climate Change and Low Carbon Development (2011) and the Second National Communication to the United Nations Framework Convention on Climate Change (2012) (see References section).
- For general information on climate change in Africa (including regional East African information), refer to the Intergovernmental Panel on Climate Change (IPCC) especially Boko et al. (2007) and Christensen et al. (2007) (see References section).

PHASE B | Understand the climate context

STEP 6: MAP THE KEY CLIMATE AND NON-CLIMATE HAZARDS AFFECTING THE SELECTED VALUE CHAIN

Purpose

- To understand the main hazards (including the current and future potential climate hazards) that affect the selected value chain.

Process

- Depending on the number of participants, form working groups according to the key stages of the selected value chain (e.g., production, processing, and marketing). Ask the participants to briefly identify the key **hazards*** to the value chain being examined at each level of the chain. You can ask the cooperative members to overlay key hazards on the map developed in Step 2. Depending on the number of participants, you may have one hazard map for each stage of the value chain or one hazard map showing the location of the main hazards at all the different stages of the value chain.

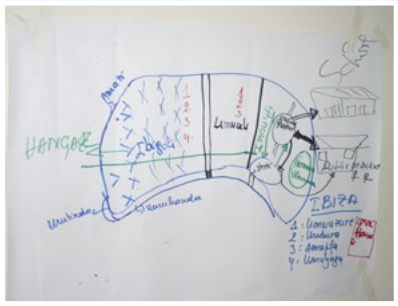

Figure 4. Example of a climate hazard map at the production level of the maize value chain.

(Photo: Matt McCandless)

- Based on the hazards map, discuss the following questions with them:
  - Where do climate hazards stand in comparison to other hazards identified in terms of level of importance and impact? Note any differences in the perceptions of climate hazards within and between groups (e.g., between men and women).
  - What is the current **frequency*** and **intensity*** of climate hazards?
  - What are the key changes that influence the cooperative the most, including changes related to climate hazards (change in occurrence, frequency, intensity)?
  - Which activities and associated **inputs***, **outputs*** and **external services*** are most exposed to climate hazards (i.e., located in areas that are prone to climate hazards)?
  - Are the different stages of the value chain impacted by the same types of hazards? What are the similarities and/or differences across the chain?
  - How might climate change affect the location, duration, timing, frequency and intensity of extreme weather events based on the information gathered under Step 5? (e.g., storms are likely to occur less often but to become more intense in a specific area)
- Note results on a flip chart using bullet points and, if possible, ask participants to summarize key results in Table B.6 presented in Annex 2. (Completing this task will help participants internalize the results of the discussion).

Output

- A hazard map of (or combining) each level of the selected value chain.

PHASE C | Evaluate the implications for the cooperative

STEP 7: IDENTIFY THE BUSINESS'S MOST CLIMATE-SENSITIVE INPUTS, OUTPUTS AND EXTERNAL SERVICES

Purpose

- To assess the degree to which the key business inputs, outputs and external services are affected by climate hazards.

Process

- Clarify to the participants that in this manual, **climate impact*** refers to the consequences of climate hazards on the chain being examined in the context of climate variability and change. Impacts may be negative (e.g., loss of income) or positive (e.g., increased yield and extension services). Climate hazards can influence business competitiveness through their impacts on agro-products supply and demand.
- Reiterate that an agricultural cooperative should always assess the impacts of climate hazards on the supply of agricultural products, including on **inputs,*** **outputs,*** and **external services,*** as well as on buyers and their demand for agro-products (e.g., climate hazards can disrupt food consumption by influencing the income of buyers and food prices). (See Table 1, Module 1)
- Ask participants to fill in Table C.7 in Annex 2. In the first column, ask them to list the main **inputs*** identified in Step 4 required at each level of the selected value chain. In the first row, ask them to write down the main current and future potential **climate hazards*** identified in Step 6. Then, ask the participants to score the impacts of each climate hazard on the inputs using a scale from -3 ("significant negative impacts") to 1 ("positive impacts"). Ask participants to add a justification of their ranking in brackets whenever necessary.

Figure 5. Focus group discussions with the members of a maize cooperative in Eastern Rwanda.
(Photo: Matt McCandless)

- Ask participants to reflect on how the results may change in the context of future climate change.
- Ask participants to review the list of outputs and external services (identified in Step 4). If these aspects have not already been taken into account, ask participants to repeat a similar exercise for the main outputs and for the external services that are most important to the selected value chain.

Output

- A list of the most climate-sensitive inputs, outputs and external services most relevant to the selected value chain.

PHASE C | Evaluate the implications for the cooperative

STEP 8: EXPLORE CLIMATE IMPACTS AT EACH STAGE OF THE SELECTED VALUE CHAIN

Purposes

- To understand the impacts of current and potential future climate hazards on the selected value chain.

Process

- First, ask participants to identify at each level of the selected value chain the following using Table C.8 (first three columns only) in Annex 2:
  - **Direct impacts:** The immediate effects, positive and/or negative, of a **climate hazard*** on the cooperative's **inputs,*** **outputs*** and **external services*** in relation to the selected value chain. Examples of the direct impacts of drought along a coffee value chain could include: reduced yield and quality of coffee (production level); disruption of market access; and delays in delivery (marketing level).
  - **Indirect impacts:** The positive and/or negative consequences of the direct impacts on the cooperative. Examples of indirect impacts include reduced income, damaged reputation, lost costumers (all levels of the chain), and increased downtime (processing level).
  - **Other causes of impacts:** Identify the other factors that contribute to the severity of direct and indirect impacts (e.g., soil erosion contributing to crop loss). These are important to note because other non-climatic trends and changes (e.g., poverty, environmental degradation) may exacerbate the negative impacts of climate hazards on the selected value chain. These other factors may have already been identified in previous steps (see hazard map, Step 6, and list of non-climatic factors, Table B.6). Examples of other causes of impacts along the coffee value chain include aging coffee trees and soil degradation (production level).
- Second, and once they have completed the first three columns of Table C.8, ask the members of the cooperative to discuss the results, asking questions such as:
  - Do different climate hazards (e.g., flood and drought) have similar or different impacts along the value chain? What are the impacts of a combination of climate hazards on the selected chain?
  - Who is impacted the most at what level of the value chain and by which climate hazard or combination of climate hazards?
  - How do impacts at one level of the value chain influence (or not) the rest of the value chain (e.g., cumulative effects, time lag effects; creation of new risks)?
  - Are the negative impacts of climate hazards experienced only at a specific stage of the value chain? Are some stages unaffected by climate hazards? Do some stages benefit from the impact of the identified climate hazards?

Output

- A list of **climate impacts*** and other non-climatic factors influencing climate impacts at each stage of the selected value chain.

PHASE C Evaluate the implications for the cooperative

STEP 9: EXPLORE CLIMATE RESPONSES AT EACH STAGE OF THE SELECTED VALUE CHAIN

Purposes

- Prioritize existing and/or alternative responses to minimize the negative impacts of climate hazards and maximize any opportunities along the selected chain.

Process

- Ask participants to complete Table C.8 in Annex 2 by focusing on current and alternative **responses*** to climate hazards at each level of the selected value chain:
  - **Current responses:** Ask the members of the cooperative to describe how they currently respond to each combination of direct and indirect impacts of climate hazards (described in Step 8). Examples of existing responses along the maize value chain include diversification of activities into livestock, savings (production level), and contract farming. Probe participants to explore a range of responses. For example, ask participants to think about short-term (immediate) and long-term (oriented towards longer-term business security) responses; anticipatory (i.e., before the impacts of climate hazards become evident) and reactive (i.e., after initial impacts of climate hazards become evident) responses. Examples of different types of responses include: bearing losses; spreading the burden of losses across different actors or systems; changing location; continuing the activities but in a modified manner; stopping the activities and modifying the threat itself.
  - **Sustainability:** Describe whether the cooperative members consider the current responses sustainable or not, for how long and for whom within the cooperative. A response is not sustainable if it leaves some members of the cooperative or the entire cooperative worse off in the long term; that is if it undermines the business's objectives identified in Step 1. For example, it is unsustainable to develop irrigation in a place where water scarcity is increasing.
  - **Alternative responses:** In case some response strategies are identified as unsustainable, ask participants to select potential alternative strategies. Ask participants to prioritize alternative strategies that maximize multiple co-benefits and especially those that:
    1. Support both **climate adaptation*** and **mitigation.*** For example, agroforestry can contribute to both mitigation (through carbon sequestration) and adaptation (because shade tree species can minimize the negative impacts of heavy rainfall events and drought on crops grown underneath them).
    2. Take into account future potential climatic conditions (see Step 5).
    3. Provide multiple co-benefits all along the value chain (instead of just at one specific level).
- **Required resources:** Ask participants to identify what resources (i.e., financial, human, social, natural, political, technological) they need to implement current or alternative strategies. Finally, ask them to prioritize current and alternative responses based on their feasibility.

Output

- A list of priority responses to climate hazards along the selected value chain.

PHASE C | Evaluate the implications for the cooperative

STEP 10: MAKE RECOMMENDATIONS FOR MAINSTREAMING CLIMATE CONSIDERATIONS INTO THE SELECTED VALUE CHAIN

Purpose

- Compile and analyze the results from all previous steps.

Process

- Ask participants to finalize and compile all the results from the group discussions and to analyze, present and reflect on the results in groups based on the following steps:
  1. Hang the hazard map(s) (Step 6) on the wall and ask participants to describe what the map says in terms of the value chain **exposure*** to climate hazards. Ask participants to summarize their findings in one sentence and write it down on a flipchart.
  2. Identify in Step 7 which inputs/outputs/external services of the selected value chain are the most **sensitive*** to the climate hazards. Ask participants to summarize their findings in one sentence and write it down on a flipchart.
  3. Hang Table C.8 on the wall and rank the responses by order of importance in terms of degree of feasibility and multiple co-benefits (e.g., adaptation and mitigation benefits, short-term and long-term benefits, economic and social benefits).

Figure 6. A participant presents the results of a group discussion on climate impacts and responses along the maize value chain in Eastern Rwanda.
(Photo: Julie Dekens)

  4. Ask participants to provide a set of key recommendations (maximum three) to the cooperative members to help them integrate climate adaptation into the selected value chain(s) (i.e., to support **climate mainstreaming***)? **Ask participants to write down their recommendations on a flipchart. Ask participants to justify their recommendations based on results from the previous steps. This is extremely important, as each group has to convince the rest of the audience about the relevance of their arguments.**

Outputs

- A set of recommendations for mainstreaming climate considerations into the selected value chain commonly agreed among the participating members of the cooperative and which can be integrated into the cooperative's business plan.

Module 3.
The Maisha Bora Cooperative Case Study

A trial of this manual was run for the Maisha Bora cooperative during a three-day workshop in May 2013, with different groups examining the production (including drying), processing (grinding), and storage stages of the cooperative's maize value chain. The exercise was carried out at the site of the cooperative, with members present to answer questions and provide insights. This module details the findings of this case study.

Business Context

Maisha Bora is a cooperative centered in the Gatsibo district of the Eastern Province of Rwanda. As of May 2013, the cooperative has 122 members (68 women and 54 men) and was registered in 2011 as a cooperative with the Rwanda Cooperative Agency. Before 2011, farmers were organized informally as an association. The cooperative's mandate is to be open and accessible to people with HIV/AIDS (i.e., the cooperative cannot refuse sick people) and the majority of members are HIV/AIDS positive. The vision for the cooperative is for all members to become economically and socially self-reliant. Its members farm on eight hectares of communal land as well as on private household plots ranging in size from 0.5 to 2 hectares. Agriculture on the communal land is governed by the local government, and cooperative members only grow the crops authorized by the district for each parcel of land.

Major activities for this cooperative include the production, drying and processing of maize and soybeans, as well as the management of livestock (goats and others). Although no business plan for Maisha Bora was available, cooperative members explained the workings of the business to workshop participants. The cooperative owns plastic sheets for drying all maize communally, grinding machines, and a decorticator (a machine for stripping plant husks etc.). A storage house is rented during times of harvest for storing and drying the crops. Maize production in 2012 was 25 tonnes. The grinding machine is also used by non-cooperative members, which provides additional income to the cooperative.

The cooperative also pools and markets grain, an activity that has had a major benefit to members. Originally, the cooperative would sell to itinerant traders at low market rates and the maize would be processed at a factory in Kigali. Following the hiring of a business consultant, the marketing strategy shifted to seeking longer-term supply contracts that would reduce price fluctuation.

The key inputs to the business as identified by workshop participants include fertilizers (available at subsidized price), water, the decorticator, land and soil. The outputs of the business are maize and various plant byproducts used for fodder and fuel. Some of the key challenges faced are the lack of available land resources, illness of members due to HIV/AIDS affecting their ability to work, and inconsistent production due to climate variability and change.

Climate Context

The cooperative is located in the Eastern Province of Rwanda in the "cool sub-humid" agro-ecological zone category.[1,2] This signifies mean temperatures in the range of 15 to 20 degrees Celsius and a growing period of 180 to 270 days in length. The Gatsibo district is characterized by high temperatures in the mid- to high-20s degrees Celsius and low temperatures in

1 See http://harvestchoice.org/products/map/912,1802 for Agro-ecological zonation maps for Africa.

2 See http://www.fao.org/nr/gaez/en/ for more information on Agro-ecological zonation.

the mid-teens. Precipitation peaks twice per year in the months of April and November or December. The period from May to September is the driest. Total annual precipitation is around 900 millimetres.[3]

Due to its hilly terrain, drainage in the area is rapid, often causing floods following heavy rainfall events. This area is also prone to droughts. The Maisha Bora cooperative members describe their climate context as existing in three states of equal frequency: too much sunshine, leading to dry conditions and lower crop returns; too much moisture leading to floods and crop damage; and an optimum mix of rainfall and solar radiation when crop yields are highest.

Droughts and floods are the main climate hazards faced in the region, and poor adaptation to these events is considered a key climate **vulnerability.*** There is concern that the increasing frequency and intensity of such events due to climate change could exacerbate this vulnerability. These concerns are validated by climate change projections (generated by IISD using the MarkSim weather file generator[4] based on existing climate records supplied by Rwanda's National Meteorological Agency) suggesting higher temperatures and increased rainfall by 2025 and 2050.

While increased temperatures can lead to higher rates of evapotranspiration and intensify droughts, a more significant concern is the projected increase in precipitation in Eastern Rwanda. Climate change predictions for Gatsibo predict greater rain in the already wet months of December, February, April, May and December. Based on the climate change projections, the most sensitive inputs are likely to be water, land and anything requiring transport by roads that may become damaged by flooding.

Implications for the Cooperative

A number of climate impacts were identified at the various stages of the chain, but the greatest concern at all levels was flooding. Floods are directly responsible for destroying crops, as the hillsides above the cooperative fields are not protected from erosion, causing water and sediment to surge down the slopes, eroding fields and crops. In addition to affecting the quantity of food, floods can lower the quality of those grains that are produced. When crop output is reduced by floods, cooperative members have less food for their own household consumption, and also have reduced income due to lower revenue from crop sales. Floods can also destroy cooperative infrastructure such as storage sheds and locations used for drying grains. Public infrastructure such as roads and bridges are also impacted by floods, affecting the transport of goods and people.

Other climate hazards identified by cooperative members included droughts and hailstorms that reduce crop output. Other concerns raised by cooperative members included: the degradation of crops in the storage and processing stages; loss of crop quality through degradation and spoilage due to inadequate storage areas; and unskilled equipment operators not ensuring that machinery is well maintained, leading to improper processing. Based on previous experiences, the above impacts can reduce maize yields to 10 tonnes, less than half of the production (around 25 tonnes) of grain in a good year (i.e., 3 tonnes per hectare).

Participants identified various responses to minimize the negative impacts of climate hazards, particularly flooding, on the activities of the Maisha Bora Cooperative as described below:

- **Natural resources management:** Participants concluded that there is a need to manage water in upstream areas at the top of hills, from which floodwaters come (such as through integrated water management at the watershed level). These headwaters are often in neighbouring districts and under separate administrations, requiring cooperation in how solutions are managed, implemented and financed. Other key responses focused on natural resources management included: terracing, reforestation of upland slopes, improved management of wetlands in upstream areas, and eliminating the clearing and burning of bush.

- **Technological responses:** Another set of proposed responses focused on more technological

3 Based on existing climate records supplied by Rwanda's National Meteorological Agency.

4 http://gismap.ciat.cgiar.org/MarkSimGCM/

aspects such as: better maintenance of existing drainage infrastructure and machinery; construction of buildings better able to withstand floods; and reinforcement of existing buildings such as storage sheds and machine shops.

- **Capacity building:** Other solutions that were proposed for reducing vulnerability to climate hazards, particularly floods and drought, focused on capacity building through training and knowledge sharing. Ideas shared included: providing better training for equipment operators; exchange visits with other cooperatives to share information on practices; and discussion and dialogue with people in neighbouring areas to manage vulnerabilities more comprehensively.

- **Livelihood changes:** These solutions included: finding off-farm work to supplement income and relocating some activities to lands less prone to flooding.

Overall, the exercise of assessing climate risk for the Maisha Bora cooperative by focusing on the maize value chain helped it to identify climate risks from a holistic perspective (i.e., beyond just production issues). The issue of financing adaptation options remains a challenge. Many of the proposed solutions will require investment, and the cooperative has limited ability to leverage the required funds. The results could further serve as a basis to incorporate climate adaptation into the cooperative business plan and associated project proposals. By understanding and addressing these risks, the cooperative is better place to proactively manage them, rather than dealing with the damage done after they occur. The results also highlight the need to manage tradeoffs. Managing risk often means balancing priorities, for example, between short-term productivity gains at the expense of future productivity. Understanding these risks can reveal where investment is needed—whether in the form of money, human resources, and opportunity cost—to proactively prevent climate hazards from adversely affecting the cooperative's viability in the face of climate variability and change.

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Annex 1: Key concepts
(in the context of this manual)

Agricultural cooperative	A type of business owned and managed by the members that should contribute to income generation through improving value addition of agricultural products (i.e., livestock, fish, crops, fruits and/or vegetables).
Climate	**Long-term averages (across decades, usually 30 years)** of climate variables such as temperature, precipitation, humidity, wind, cloud type and amount, and solar radiation.
Climate adaptation	A **process** of adjusting to current and future potential climatic changes (i.e., **addressing the impacts of climate change).** In this manual, climate adaptation is closely related to climate risk management.
Climate change	**Long-term changes** in the climate that persist for decades or longer arising from natural causes or human activity. Human-induced climate change is attributed to greenhouses gas (GHG) emissions that absorb and emit radiation.
Climate hazard (or hydro-meteorological hazard)	A potentially damaging event or phenomenon of a climatic nature. Examples include extreme weather events (e.g., floods, droughts, thunderstorm, and hailstorm); changes in location, timing, frequency, intensity of extreme weather events; and gradual changes such as rising temperature and changing rainfall patterns.
Climate impact	The realization of a climate risk.
Climate mainstreaming	The integration of measures that address climate variability and change into the agricultural cooperative's activities to ensure long-term sustainability of investments and reduce the sensitivity of business activities to actual and expected climatic changes.
Climate mitigation	Activities designed **to address the causes of climate change** by reducing the sources of greenhouse gases (GHG) emissions in the atmosphere and/or by enhancing the sinks (removal) of GHG from the atmosphere.
Climate variability	**Short-term changes** in the climate beyond that of individual weather events. For example, extreme weather events such as heavy rains or droughts that do not necessarily represent a trend.
Climate risk	The **probability** of harmful consequences or expected loss (e.g., death, reduced economic productivity, environmental damage) resulting from interactions between climate hazards, exposure to these hazards and vulnerable conditions.
Climate risk management	The use of climate information in decision making to minimize potential harm or losses associated with climate variability and change. In this manual, climate risk management is closely related to climate adaptation.
Cooperative	An autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly-owned and democratically-controlled enterprise, according to internationally recognized co-operative values and principles.

Exposure	The value chain exposure to climate hazards refers to the number of inputs, outputs and external services relevant to the value chain as well as the number of buyers of the product(s) produced by the cooperative that are present in climate hazard-prone areas.
External services	The external support from Government, NGOs, and/or the private sector that feed into the business). Examples of external support include: finance (e.g., loans, savings); extension (e.g., training on agricultural practices); farm inputs (e.g., subsidies for fertilizers); information, Communication and Technologies (e.g., price information accessible on cell phones, road networks); research and development (e.g., new pest resistant varieties); machinery and storage equipment (by private companies) and organic/fair trade certification.
Frequency	How often a climate hazard occurs in the area where the value chain operates (e.g., "once every year," "twice a decade").
Hazards	A potentially damaging condition, event or phenomenon for the cooperative and the selected value chain. Examples: HIV-AIDS, social unrest, political instability, corruption of local leaders, deforestation, price fluctuation.
Inputs	The resources required to run the cooperative from production to marketing.
Intensity	How strong the hazard is when it occurs in the area where the value chain operates (e.g., "floods typically reach the entire village and half the surrounding fields").
Responses	The range of strategies undertaken by the members of the cooperative (individually and collectively) to minimize the negative impacts of climate hazards on the selected value chain and/or to maximize any potential benefit.
Outputs	The products or services the cooperative offers.
Sensitivity	The value chain sensitivity to climate hazards refers to the degree to which the value chain (its inputs, outputs, external services and the buyers of the product(s) produced by the cooperative) are affected, either adversely or beneficially, by climate variability or change.
Value chain	The chain of activities which add value, from the production of a raw material to the processing and the consumption of the final product.
Vulnerability	The susceptibility of a value chain to the adverse effects of a climate hazard. The vulnerability of the value chain to climate hazards is a function of the value chain's sensitivity and adaptive capacity. Adaptive capacity refers to the ability of the cooperative to take advantage of opportunities or to cope with the consequences of potential damages.
Weather	**Day-to-day variation (24 to 72 hours)** of climate variables such as temperature, precipitation, humidity, wind, cloud type and amount, solar radiation. For example, "The weather in Gatsibo district today is mostly sunny with scattered clouds."

Annex 2: Reporting tables
(with examples of completed tables)

Reporting Table A.4:
Prioritization of key inputs at each level of the selected value chain

Core processes *versus* Main inputs	Production	Processing	Marketing	Consumption	TOTAL SCORE
Natural inputs					
Physical inputs					
Financial inputs					
Human inputs					
Social inputs					
Political inputs (at the level of the cooperative)					

Legend:

3 Very important
2 Important
1 Somewhat important
0 Not required

Example of a completed Table A.4

Core processes *versus* Main inputs	Production	Processing	Marketing	Consumption	TOTAL SCORE
Natural inputs					
Land	3	1	0	0	3
Water	3	2	0	0	5
Soil	3	0	0	0	3
Physical inputs					
Road	2	2	3	2	9
Grinding machines	0	3	2	0	5
Storage house	1	3	1	0	5
Bicycles	0	2	2	1	5
Electricity	0	3	1	0	4
Financial inputs					
Micro-credit	3	3	3	0	9
Savings	2	1	1	2	6
Human inputs					
Market information	2	1	3	3	9
Weather information	3	1	1	0	5
Agronomic practices	3	0	0	0	3
Social inputs					
Trust among cooperative members	3	3	3	0	9
Reputation of the cooperative	1	1	3	3	8
Political inputs (at the level of the cooperative)					
Well-connected cooperative leader	2	2	2	0	6
Participatory decision making process	1	2	3	0	6

Legend:

3 Very important
2 Important
1 Somewhat important
0 Not required

Reporting Table B.5:

Summary of information on observed and projected climate change in the area where the selected cooperative operates

Trends in climate variables	Observed climate (past and present)	Future potential climate
Temperatures		
Precipitation patterns (amount, timing)		
Extreme weather events		

Reporting Table B.6:

Main climate and non-climate hazards affecting the selected value chain

Climate hazards	Current climate hazards	Frequency (how often a hazard occurs)	Intensity (how "strong" the hazard is when it occurs)	Future evolution under climate change (Step 5)
Non-climate hazards	Human health hazards; socio-cultural hazards	Political hazards	Environmental hazards	Economic & financial hazards

Example of a completed Table B.6

Main climate hazards	Current climate hazards	Frequency (how often a hazard occurs)	Intensity (how "strong" the hazard is when it occurs)	Future evolution under climate change
	• Drought (all stages of the value chain)	• Once every two years	• At least three weeks without rainfall and unusually warm temperatures	• More prolonged and frequent droughts
	• Flood (all stages of the value chain)	• Once every year	• Floods all the fields surrounding the main river	• More intense (floods could reach the village) and frequent floods
	• Seasonal change (all stages of the value chain)	• Every year or so since the past few years	• Prediction of cultivation seasons is more and more difficult	• Likely to continue
Non-climate hazards	**Human health hazards; socio-cultural hazards**	**Political hazards**	**Environmental hazards**	**Economic & financial hazards**
	• HIV-AIDS • Limited involvement of women beyond production	• Corruption of political leaders	• Deforestation • Soil degradation	• Lack of access to micro-credits and crop insurance

Reporting Table C.7:

Impacts of climate hazards on the main business inputs at each stage of the selected value chain

Main inputs (Step 4)	Current climate hazards (Step 6)			Total Score
Production				
Processing				
Marketing				
Consumption				

Legend:

1 Positive impact
0 No impact
-1 Minor negative impact
-2 Moderate negative impact
-3 Significant negative impact
X Mixed impacts (both positive and negative)
? I don't know

Example of a completed Table C.7

Main inputs (Step 4)	Current climate hazards (Step 6)			Total score
Production	**Drought**	**Flood**	**Seasonal change**	
Water	-3	-1 (increased salinization)	?	-4
Land	-3	-2 (increased land degradation)	?	-5
Soil	-3	-2 (increased soil erosion)	?	-5
Micro-credit	-3 (increased demand but reduced access to micro-credits)	-3 (increased demand but reduced access to micro-credits)	-3 (increased demand but reduced access to micro-credits)	-9
Weather info	0	-2 (reduced access due to network disruptions)	0	-2
Agronomic practices	-3 (current practices are inappropriate)	-3 (current practices are inappropriate)	-3 (current practices are inappropriate)	-9
Trust among coop members	-2 (increase of thefts)	-2	-2	-6
Processing	**Drought**	**Flood**	**Seasonal change**	
Grinding machines	0	-2 (Deterioration of equipment)	0	-2
Storage house	0	-2 (Deterioration)	0	-2
Electricity	-3	-1	0	-4
Micro-credit	-3	-3	-3	-9
Trust among coop members	-2 (increase of thefts)	-2	-2	-6
Marketing	**Drought**	**Floods**	**Seasonal change**	
Road	0	-3	0	-3
Micro-credit	-2	-2	-2	-6
Market info	0	-2	0	-2
Trust among coop members	-2 (increase of thefts)	-2	-2	-6
Reputation	-3	-3	-2	-8
Participatory decision-making process	0	0	0	0
Consumption	**Drought**	**Flood**	**Seasonal change**	
Market info	0	-3	0	-3
Reputation of the coop	-3	-3	-2	-8

Legend:

- **1** Positive impact
- **0** No impact
- **-1** Minor negative impact
- **-2** Moderate negative impact
- **-3** Significant negative impact
- **X** Mixed impacts (both positive and negative)
- **?** I don't know

Reporting Table C.8:

Impacts of climate hazards at each stage of the selected agricultural value chain and current and alternative responses

Current & future potential climate hazards	Impacts			Responses			
	Direct impact	Indirect impact	Other causes of impacts	Current responses	Is it working? For whom? For how long?	Alternative responses	Required Resources
Production							
E.g., droughts							
Transformation							
Marketing							
Demand							

Notes

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