



Developing climate services for livestock production in smallholder farming systems

Learning from three years of agrometeorological research and innovation in Zambia

Introduction

Livestock play an essential role in smallholder farming, contributing food and income to rural populations and vital inputs to farming systems. Very few farmers in Zambia currently have access to essential information on what the climate of their area looks like. Climate conditions, including timing and actual amounts of rainfall at a location, vary considerably from year to year as part of natural climate variability. Climate change creates an additional challenge with longer-term trends. Climate services are needed to support farmers in their planning and decision-making about livestock, and crops and pasture that feed livestock.

Purpose

The purpose of this learning brief is to outline the requirements for climate services for livestock management in smallholder systems and to provide recommendations on how these can be met. The findings are relevant for different regions in sub-Saharan Africa, even if they are mainly from work undertaken under the Climate Risk Insurance and Information in Zambia (CRIIZ) project, implemented by the Deutsche Gesellschaft for Internationale Zusammenarbeit (GIZ) on behalf of the Federal Ministry for Economic Cooperation and Development (BMZ).

The role of livestock

Livestock contribute important benefits to smallholder farming systems including:

- Income to smallholder farmers and households from sales of livestock and livestock products.
- Food and nutrition to households from consumption of livestock and livestock products.
- Livestock provide assets that can be sold when cash is needed for emergencies or to invest in other enterprises. Livestock can offer ways for farmers to increase their income and assets relatively quickly.

- Manure and waste are important sources of nutrients and organic matter for crop production.
- Cattle provide essential draught power for the cultivation of crops.
- In some locations, women have control over management decisions and resources of some forms of livestock (for example poultry) to benefit themselves and their families.

Smallholder farmers' livestock contribute to the national economy. According to the Ministry of Agriculture of Zambia (2020),¹ smallholder farmers own about 80% of the country's livestock. This includes cattle, goats, sheep, pigs, and poultry.

Climate effects on livestock

Increased temperature

Livestock perform best within a temperature range (specific to each type of livestock). Climate change can increase how often temperatures exceed this range. Low temperatures also reduce performance.

Pests and diseases

The occurrence and severity of livestock pests and diseases are strongly influenced by temperature, rainfall, humidity and related factors like water quality.

Rainfall amounts and timing

Rainfall directly impacts performance and welfare of livestock kept outdoors and extreme events (e.g., droughts and floods) affect survival.

Availability of feed

Both quality and quantity of feed available and the price of these are influenced by weather conditions.

Favorable rainfall amounts and timing on farms enable good pasture and forage production. The timing of weather conditions influences feed availability and animal productivity (for example varying milk production during the year).

Productivity, reproduction & survival

All these climate and climate-related factors listed above affect the performance of animals, including rates of growth, efficiency of production, reproductivity and actual survival.

Farmers' demands for climate information for livestock production

Small-scale farmers are demanding climate information to help their planning and decision-making and that need is currently not being met. A very wide range of decisions they make are influenced by weather and climate. For example, Figure 1 summarises those identified by a survey of dairy farmers in Southern province of Zambia. Farmers included 15 different decisions ranging from Kraal rotation to supplementary feeding.

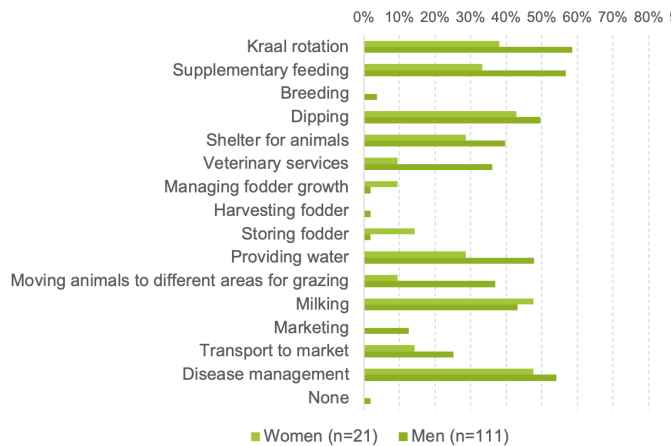


Figure 1: Decisions influenced by climate and weather (Clarkson et al. 2021)²

When asked what weather and climate information they desired, the same farmers identified more than 17 different types of information. Approximately 70% of farmers wanted information on extreme high temperatures and a large proportion also wanted information on low temperatures (figure 2). Information demanded regarding rainfall mainly concerns the start of the rain season, the amount of rainfall in it and distribution through the season, as well as the occurrence of extreme events.

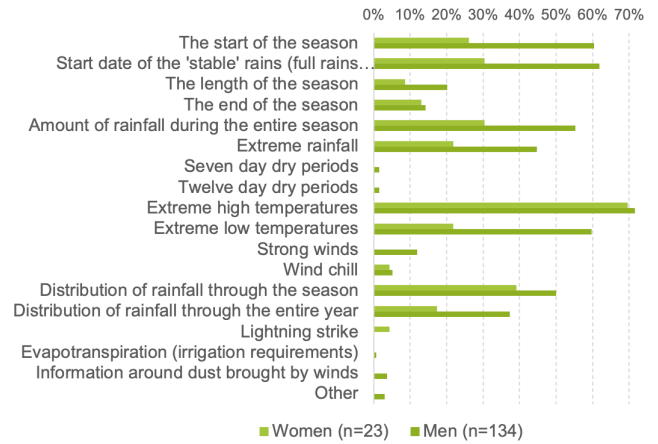


Figure 2: Climate information requested by dairy farmers in Southern Province (source: Clarkson et al. 2021)²

Designing and providing effective climate services

In order to design and provide effective climate services, the following need to be considered;

Timing of planning and decision-making

Different kinds of decisions have different time frames. Some decisions require consideration and planning a long time (for example, several months) ahead of when they will be used, e.g., choice of livestock, choice of breeds, and choice of feeds supply (extensive/intensive). Other decisions can be made closer to the production period, e.g., adjustments to the scale of enterprises and numbers of livestock to be kept, how much feed may need to be purchased. Finally, some decisions are typically made during production such as when to move cattle to new pastures, and when to provide extra water or shade. These lead times are summarised in Figure 3 as 'Long before', 'Just before' and 'During' the season or production period.

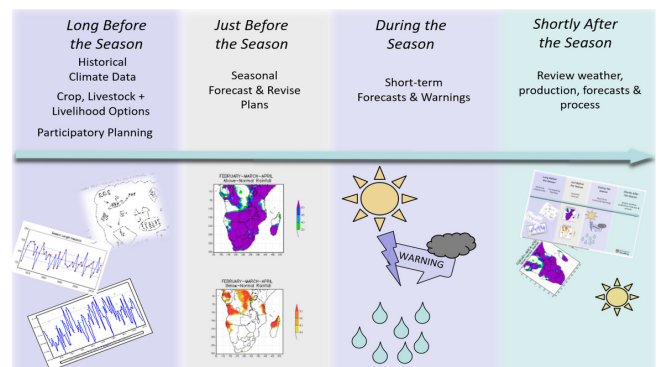


Figure 3: Timing of climate information and activities

To help farmers with the different decisions climate services need to:

- Be available when farmers are making the decisions; and
- Give information or decision support tools that are relevant for the decisions.

Historical climate information

What is the climate and how is it changing? The majority of farmers in Zambia and across the region currently do not have access to key information on the climate of their location. Climate conditions, such as the timing and amounts of rainfall at a location, vary considerably from year to year through natural climate variability. Climate change creates an additional challenge with longer-term trends. Access to historical information for their locations enables farmers 'Long before the season/ product period' to see what the normal conditions are and help to identify practices (for example choice of livestock breeds and management methods) that are best suited to them. In addition, such historical information enables farmers to see in what ways the climate is changing and to identify suitable adaptation practices.

Seasonal forecasts

Seasonal forecasts offer additional information that farmers can use to adjust their plans before the season'. Making large investments or important decisions that rely heavily on the accuracy of the seasonal forecast is not advisable as currently many seasonal forecasts do not report on their probability.

High probabilities in a seasonal forecast may indicate a greater likelihood. Seasonal forecasts are useful for identifying and taking 'no or limited regret' actions that have low costs, such as ensuring drainage is clear and roofing on livestock housing is water-proof ahead of a season predicted to have 'above normal' rainfall, or planning how to access and conserve sufficient water for livestock if the season is predicted to have 'below normal' rainfall.

Short-term forecasts for immediate decisions

These forecasts help with decisions 'during' seasons and production periods such as whether to harvest a forage crop (before rain arrives) and when to provide additional shade and water (because high temperatures are forecasted).

Decision-making tools for farmers to help farmers to plan and compare different options

Effective climate services can include tools that farmers use themselves to plan, consider and decide on actions, and monitor and keep track of actions and progress. These can include budgeting, feed composition calculations, and seasonal or production calendars for livestock enterprises.

Engaging with and supporting smallholder farmers

The above elements of climate services can be made available by a range of communication and engagement mechanisms including radio, television, SMS messaging, government extension staff, as well as farmer organisations. Each has its advantages and limitations. For example, extension staff can provide training, explanation and interaction in meetings which are favoured by farmers, particularly for planning ahead and for complex issues. However, radio and SMS can communicate short-term forecasts and warnings widely and rapidly. Climate services need to be deliberately designed to integrate different elements and to use a carefully identified combination of complimentary methods of communication and engagement. One approach that has had considerable success and provides a framework and methodology to achieve this is the Participatory Integrated Climate Services for Agriculture (PICSA)³ approach which has been used in over 25 countries. Whilst it already supports smallholder farmers with crop and livestock production as well as other livelihoods, there is scope to increase its use in supporting livestock decision-making and planning.



Key points and recommendations

- Livestock play a range of essential roles in smallholder farming including supplying income, nutrition, crop nutrients and means of saving and providing cash for emergencies.
 - Livestock performance and survival are directly impacted by temperature, rainfall amounts and timing, and indirectly impacted by pests, diseases and availability of feed and forage.
 - A wide range of key decisions in livestock systems are influenced by weather and climate and there is strong demand from farmers for improved climate services.
 - Farmers need historical climate information to plan well ahead of production cycles. Seasonal forecasts communicated transparently to help adjust plans.
- short-term forecasts and warnings help to inform immediate actions, and decision-making tools that they can use themselves.
 - Climate services can best provide these elements by using an integrated combination of: extension services and staff, radio, television, and mobile phones, and by consciously taking into account the advantages and limitations that they each offer.
 - Integrated climate services approaches like PICSA provide effective ways to support smallholder farmers and there is scope to increase their focus on and use in livestock decision-making and planning.



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3. <https://research.reading.ac.uk/picsa/>

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