

Climate Information Services End-User Assessment

Burkina Faso, July 2025



Yacine Fall, Kostyantyn Bazhenov, NORCAP, 2025

Contents

Executive summary	3
Introduction.....	7
Objectives of the assessment.....	8
Methodology	8
Description of the areas assessed.....	9
Findings	9
Livelihoods in the two farmer communities	9
Access to climate information	14
Receiving and interpreting weather forecasts.....	21
Gender differences in access to climate information.....	22
Co-production of Climate Information.....	23
Conclusions and recommendations	26

Executive summary

Background, context, and methodology

Burkina Faso faces increasing climate variability that threatens agricultural livelihoods and food security. The country has established national frameworks – including a National Adaptation Plan (PNA), a National Climate Security Strategy, and a National Framework for Climate Services (NFCS) –to address these risks. The Agence Nationale de la Météorologie du Burkina Faso (ANAM-BF) is mandated to deliver climate information services (CIS) to vulnerable communities.

This end-user assessment examines how climate information is accessed, used, and co-produced by farming communities in two sites –Arbollé and Koudougou –combining focus group discussions, key informant interviews, and a quantitative survey of 88 farmers. The sample was 84% male and 16% female, making gender-disaggregated findings indicative rather than statistically conclusive –though these are reinforced by the female-only focus groups.

Both communities rely primarily on subsistence agriculture –mainly sorghum, millet, maize, and pulses –supplemented by livestock and small-scale market activities. Koudougou is better connected to markets: over half of its farmers produce for sale, compared to only 18% in Arbollé. Community organisation is high: approximately 75% of respondents in Arbollé and 62% in Koudougou belong to at least one cooperative or savings group. Women participate in community groups at higher rates than men. Commercial credit and insurance are largely absent from both areas.

Key findings

1. Access to climate information

Virtually all farmers receive some form of weather or climate information. The most important channels are:

- Community radio –the highest-rated channel overall: locally targeted, in local languages, accessible to all, including women. Some gaps and uneven coverage exist.
- WhatsApp groups –a rapidly growing channel for both delivering information and receiving feedback, used by meteorological offices, extension agents, and farmer weather observers. Limited by low smartphone ownership (under 50%).
- Extension agents –highly trusted intermediaries who relay forecasts in community meetings and group settings.
- Meteorological department (ANAM-BF) –recognised as the primary authoritative source, distributing information directly and through intermediaries.
- SMS –important for reaching farmers without smartphones, including women.

- National radio and television –useful for broad reach but lack local-language precision.
- Social networks and weather apps –currently secondary, but growing in importance among younger, more connected users.

2. Quality and Timeliness of Forecasts

Farmers report notable improvements in climate information quality: 97% observed positive changes in the past two years. The meteorological department is trusted as a reliable source by nearly 90% of respondents. However, several quality gaps remain:

- Spatial resolution: forecasts often do not reflect conditions at village level, generating distrust when predicted rain fails to arrive locally (57% of farmers recall at least one inaccurate forecast).
- Timeliness of seasonal forecasts: ideally needed by late April or early May, they are often not received until June –too late for some planting decisions. Nevertheless, 81% of farmers reported receiving seasonal forecasts before the season started.

3. Use of Climate Information in Farming Decisions

Climate information is widely applied: 98% of farmers said it helps them take agricultural decisions, and 84% report modifying their practices in the past two years based on forecasts. Actions include adjusting planting times and seed varieties, preparing for drought and floods, protecting livestock and assets, and managing farm inputs and harvest timing.

4. Traditional vs. Science-Based Forecasting

Traditional forecasting methods (based on animal behaviour, plant signals, and atmospheric observations) remain widespread and are never fully dismissed. However, science-based meteorological forecasts are trusted significantly more: 90% of respondents find them reliable, compared to 16% for traditional signs. When the two methods align, farmers act with confidence. When they conflict, a slightly larger group defers to meteorological forecasts, while some farmers –particularly those using conservative strategies –continue to rely on traditional knowledge. Most farmers combine both approaches.

5. Gender Disparities in Access to Climate Information

Women face systematically worse access to climate information than men:

- Women on average access 2.6 sources of climate information, compared to 3.0 for men.
- Women rarely own smartphones and typically have no funds for internet access, excluding them from WhatsApp-based information.
- Higher rates of illiteracy among women limit access to text-based channels.
- Almost 50% of women receive climate information indirectly, through a family member rather than directly.
- Women depend disproportionately on community radio and in-person meetings –channels where they in fact participate at higher rates than men.

6. Co-production and Feedback

Meaningful co-production of climate knowledge between farmers and the meteorological service is very limited. The main exception is the system of farmer weather observers, who use basic rain gauges to report measurements to ANAM-BF via WhatsApp and serve as local intermediaries for forecasts and alerts. Only 27% of farmers have ever provided feedback on CIS, primarily through community meetings (63%) and WhatsApp (33%). Farmers prefer to give feedback by phone – 39% would favour a toll-free number –but the existing toll-free service (Numero Vert) is little used, and its feedback function is unclear. Only 47% of farmers say they fully understand the forecasts, despite 40% having received some training, pointing to a significant gap in forecast literacy.

Conclusions and Recommendations

The assessment confirms that meteorological forecasts are reaching farmers and are being put to practical use. However, gaps remain in timeliness, spatial precision, women's access, and farmer participation in co-production. The following actions are recommended:

1 Access to Climate Information

- Strengthen community radio as the top priority channel, ensuring regular, locally-language, village-level weather broadcasts at predictable times.
- Expand WhatsApp groups managed by extension agents and ANAM-BF to reach more farmers, including those not in existing cooperatives or value-chain groups.
- Build ANAM-BF's internet presence through social media (Facebook, Twitter, YouTube), a dedicated website, and a weather app, in preparation for growing smartphone and internet penetration.
- Increase use of SMS and voice messaging as interim channels to reach farmers, especially women without smartphone access.
- Disseminate seasonal forecasts on time (by end of April), well before planting decisions are made.
- Ensure that forecasts are consistently accompanied by actionable agricultural advisory in local languages.

2 Gender Inclusion

- Design targeted climate information outreach for women (e.g. women-only community meetings), to reduce reliance on secondhand information via family members.
- Ensure training on interpreting forecasts is accessible to women and conducted in local languages.

3 Co-production and Feedback

- Make community meetings with extension agents more systematic, inclusive, and well-timed, especially ahead of the agricultural season.

- Prioritise WhatsApp groups as a two-way communication channel between farmers and meteorological services, and ensure all communities have functioning groups.
- Only maintain the toll-free number (Numero Vert) if it can be sustained and if farmers can use it for feedback on past forecasts, not only for receiving information.
- Expand the farmer weather observer network to strengthen local data collection and two-way communication.
- Engage traditional knowledge holders in the co-production of climate information to build bridges between local and scientific forecasting.

Introduction

Burkina Faso has established several strategic and policy frameworks to mitigate consequences of climate change, including the National Adaptation Plan (PNA)¹ and a National Climate Security Strategy, and a National Framework for Climate Services (NFCS)². These documents focus on reducing vulnerability and strengthening the country's resilience to the impacts of climate change. The National Framework for Climate Services (NFCS) in Burkina Faso aims to provide relevant climate services and products to sensitive sectors (agriculture, water, health, etc.) for better risk anticipation.

The core mandate of the Agence Nationale de la Météorologie du Burkina Faso (ANAM-BF)³ (further on, ANAM) includes the provision of climate information, aimed at ensuring economic productivity, mitigation of the effects of extreme weather events, such as droughts and floods, which pose severe threats to ecosystems, livelihoods, and economic stability. The climate information services address both short-term and longer-term tasks: managing immediate weather-related risks and informing seasonal choices to maximize productivity of agriculture and other industries, informing agricultural practices, supporting technological innovation in agriculture and industry, and guiding the strategies of market actors. As an immediate way of informing farmers, climate information services allow them individually to choose decisions and strategies that minimize risks and maximize individual and communal benefits. This task is very crucial in the conditions where climate variability is increasing, and the utility of time-tested (traditional) and conservative strategies quickly erodes.

Yet the effectiveness of climate services depends on how well they reach the users, how the messages from different sources are combined to influence action and how thoroughly they are utilized by the intended beneficiaries – in particular – by vulnerable communities that are most exposed to climate variability, farmers, and women. To understand this, and to help the national institutions to address these challenges, we have prepared this end-user assessment: it explores the accessibility, usability, and co-production of climate information. It investigates the key questions of climate information – and provides answers that should help guide the decisions of the national meteorological service.

¹ National Adaptation Plan (in French) : [PNA Version version francaise finale BF.pdf](#)

² See the description of the mandate of the Burkina Faso ANAM-BF [Microsoft Word - Annex 4. PLAN CNSC Burkina synthese generale v11-05-2016.docx](#)

³ [Agence Nationale de la Météorologie du Burkina Faso \(ANAM-BF\)](#)

Objectives of the assessment

The purpose of the end-user assessment is to understand how the climate information is (co)-produced, accessed, and used. Specifically, the objectives are:

1. Analyze the level of access of end-users to climate information.
2. Assess current distribution channels and understand which channels are more reliable, trustworthy, user-friendly and accessible.
3. Understand the current participation of end-users in the co-production of climate services.
4. Understand the differences in access across communities and groups of people: in particular, in the way women access and use climate services.

This understanding will allow the National Met Services (ANAM), to produce and distribute climate information to better calibrate their offering, addressing the gaps that the assessment will point out, and building on the existing achievements.

Methodology

The end-user assessment combines qualitative methods (interviews and focus group discussions) and a quantitative survey. It is important to note that the survey by itself does not carry a strong statistical power: with around 88 responses across two communities, and the confidence interval of 95%, the margin of error is at least 10% for all questions⁴. It has even less power when discussing gender differences, since the male participants outnumber female with 84% male and only 16% female respondents.

However, the combination of the survey with the focus group discussions – where 2 out of four groups were female only – still allows us to establish a fairly accurate profile of the climate information services available in communities, not only with regards access and use of climate information by the farmers in general, but also pinpoint the key gender differences in access of climate information services (CIS). With this, we believe that the assessment can provide a good guidance for improving the CIS offering.

Table 1 Interviews, Focus group discussions and surveys

Study method	Number	Total number of participants
Arbollé		
FGD with farmers	2 groups (1 mixed group, 1 female only)	35
Survey of farmers	48 interviews	40

⁴ This means that every reported value should be understood as being situated within 10% interval ($\pm 10\%$ of the value) with 95% probability.

KII	1	1
Koudougou		
FGD with farmers	2 (1 mixed, 1 female only)	37
Survey of farmers	40 interviews	40
KII	1	1

Description of the areas assessed

The assessment was conducted in two sites: Koudougou and Arboillé.

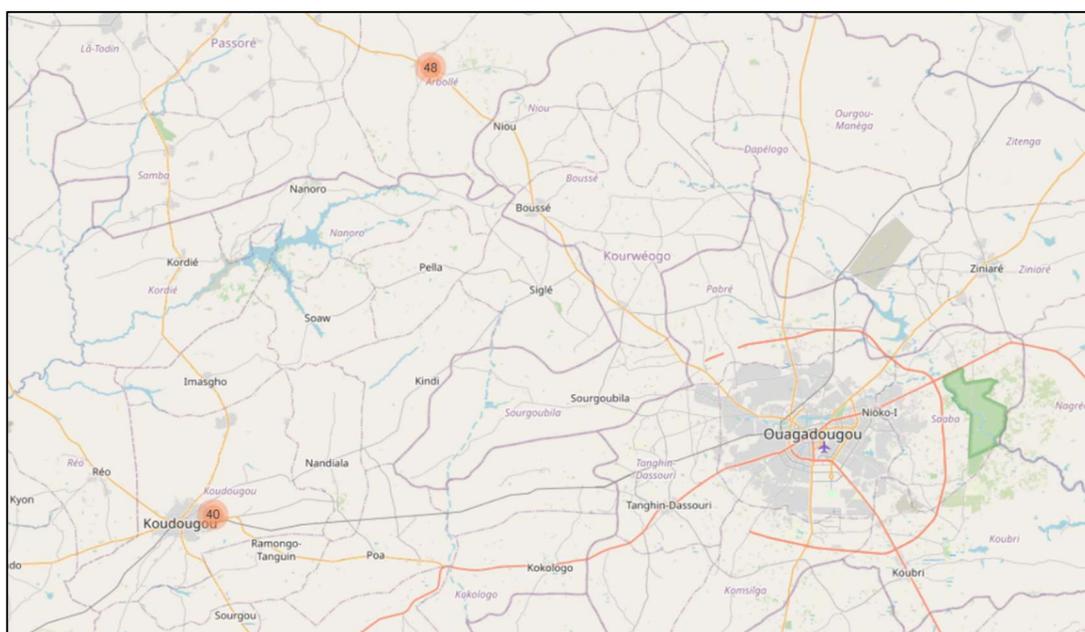


Figure 1 The assessments sites are in Koudougou and Arboillé, marked with orange dots, to the West and Northwest of the capital

In Koudougou, 40 people were surveyed, and two focus groups were conducted (with 37 total participants), and in Arboillé, 48 people were surveyed and 2 focus groups with 35 participants were conducted (see table 1, and figure 1 to locate the communities).

Findings

Livelihoods in the two farmer communities

Both areas are fairly similar in their economic profiles: in both areas local farming communities engage mainly in subsistence agriculture that is complemented with additional market-based agricultural efforts.

The agricultural production in both areas is fairly similar: in both areas farmers focus on the production of starches (with sorgho being the main staple, followed by maize and rice), and vegetable protein (pulses). In both areas farmers also cultivate animals, most commonly – poultry, followed by goats and sheep (see table 2 and figure 2).

Table 2 Key plants grown in each of the communities

Arbollé	Koudougou
Cereals (Grains) 1. White sorghum (<i>Sorghum bicolor</i>)	Cereals (Grains) 1. White sorghum (<i>Sorghum bicolor</i>)
Legumes (Pulses) 2. Peanut (<i>Arachis hypogaea</i>) 3. Bambara groundnut (<i>Vigna subterranea</i>)	2. Pearl millet (<i>Pennisetum glaucum</i>) 3. Maize (corn) (<i>Zea mays</i>) Legumes (Pulses) 4. Peanut (<i>Arachis hypogaea</i>) 5. Bambara groundnut (<i>Vigna subterranea</i>)
Vegetables 4. Sorrel – likely Roselle (<i>Hibiscus sabdariffa</i>)	6. Cowpea (<i>Vigna unguiculata</i>) 7. Beans (general term – possibly <i>Phaseolus</i> or <i>Vigna</i> spp.) Vegetables 8. Okra (<i>Abelmoschus esculentus</i>) 9. Sorrel – likely Roselle (<i>Hibiscus sabdariffa</i>)
Oilseeds 5. Sesame (<i>Sesamum indicum</i>)	Oilseeds 10. Sesame (<i>Sesamum indicum</i>)

Koudougou is better connected to the markets than Arbollé (it lies in the catchment area of a larger town) and demonstrates a greater diversity in production. In Koudougou more than ½ of the farmers produce for the market, whereas in Arbollé only 18% of farmers are connected to markets, while the rest are engaged in subsistence farming only (See figure 3). Consequently, in Koudougou more of the production value chains are related to the demands of a semi-urban market: there is an important industry focusing on poultry and vegetables (figure 3).

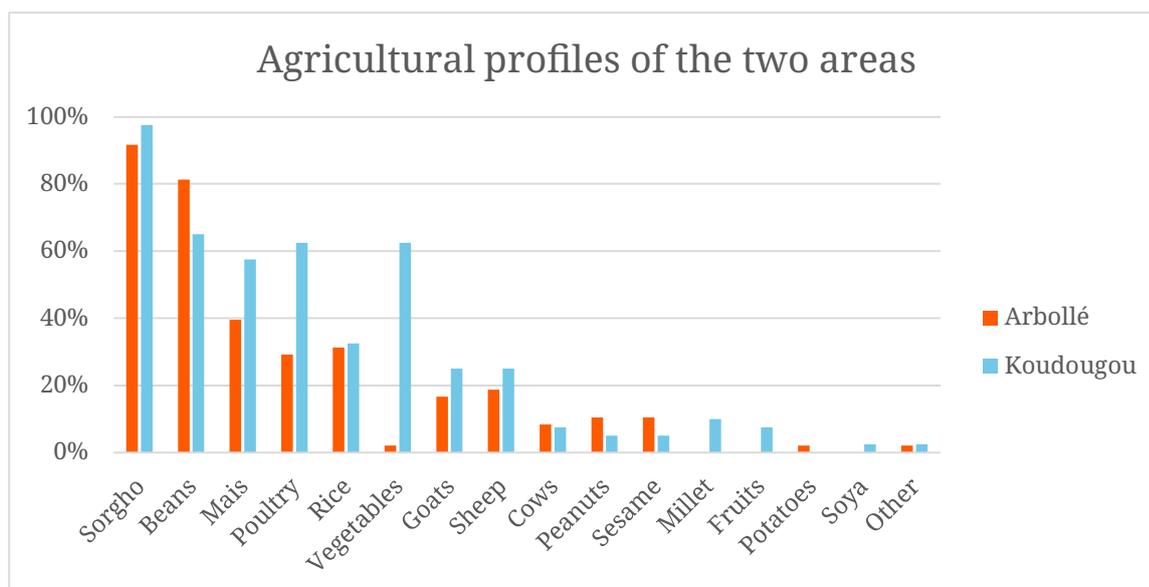


Figure 2 Production preferences of farmers in the two areas (percentage of producers among the surveyed sample) (n=88)

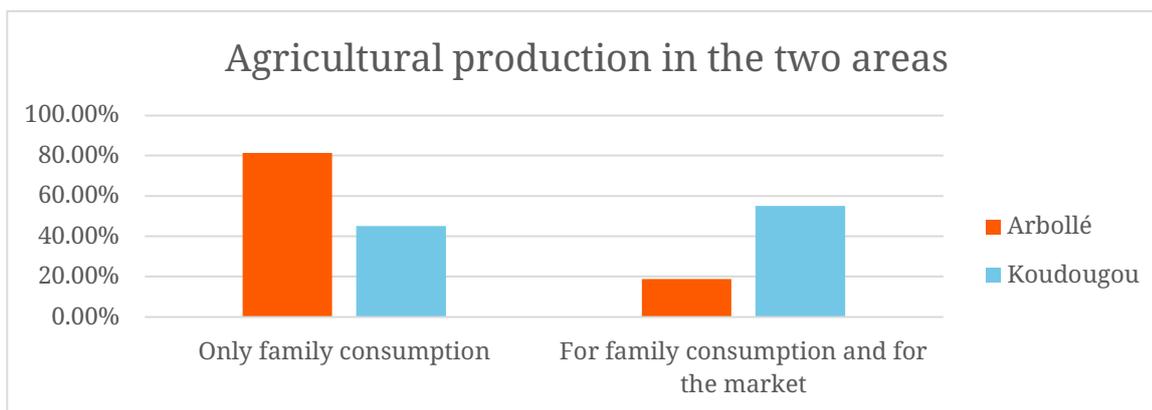


Figure 3 Production for the market vs. production for family consumption (n=88)

Farmers' membership in groups and collectives.

The level of organization of farmers in both areas appear to be high: among the people that were surveyed and interviewed in focus groups around 75 in Arbollé and 62% in Koudougou⁵ are members of at least one organized group, cooperative or collective. However, we cannot extrapolate these values on the whole of the population of the communities, because the survey was not fully randomized -- it could be that some groups or collectives had been over- or under-represented among the surveyed.

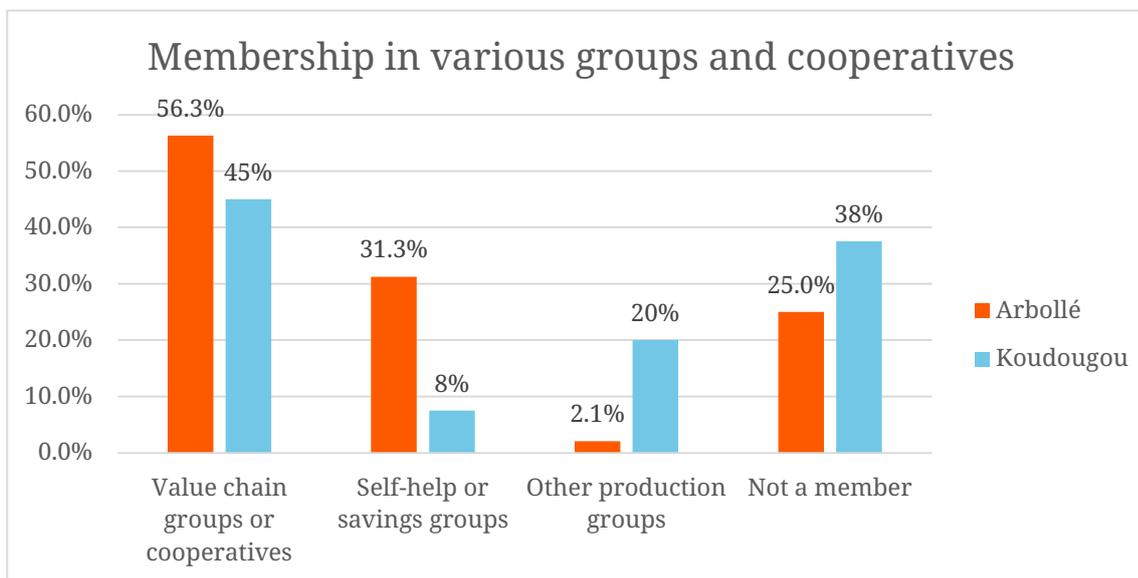


Figure 4 Percentage of respondents that declare membership in community groups (n=88)

⁵ Interestingly, in Koudougou the group participation is slightly smaller, which probably reflects higher productivity of agricultural enterprises due to close connection to markets.

The focus group discussions reveal a more nuanced picture of group participation. There appear to be three key types of organized groups:

1. cooperatives focusing on agricultural production – value chains (cereals or pulses: millet, maize, peas; in one village there was a community field that is cultivated jointly),
2. groups organized around production of higher value-added products for external markets – shea butter, soap, or soubala (condiment),
3. savings and microcredit groups.

The participation varies significantly between men and women: women more often belong to community groups (according to the participants of one focus group) The survey points in the same direction: only 14% of the women are not part of any group – in contrast to 30% of male respondents.

Community groups provide access to credit in both communities: microcredits are available and quite common in both communities: about a third of respondents are members of groups that provide credit to members (an another 5% used to be in such groups but are no longer members). At the same time there is practically no external (commercial) microcredit institutional presence in either community. Commercial insurance is not available either.

Community participation and engagement.

Communication inside the community – both in meetings with technical and extension agents, and spontaneous peer-to-peer exchange – plays a key role in the distribution of climate information and agricultural advisory. Community gatherings (which include both information and decision-making gatherings, and religious services) allow for two-way communication and feedback, they are a place to discuss both traditional weather signs and science-based forecasts and deliberate on agricultural practices and choices.

In both communities the majority of people attend at least half of all community meetings (94% in Arbolle, 80% in Koudougou), and religious assemblies (85% in Arbolle and 65% in Koudougou). Women tend to be more active participants in both: (86% men vs. 93% women attend at least half – or more of the community meetings and 70% of men vs. 100% of women attend at least half of or more of religious ceremonies.

Technical and extension agents use community meetings for sharing information, especially when this is combined with other activities (e.g. training or seed distributions occasions are also used to share forecasts and agricultural advice).

Access to communication equipment

Most households in both communities have access to several communication assets. FM radios and a simple phone that can receive text messages are universally widespread (see figure 5). Other equipment is distributed unevenly: smartphones with

internet access are owned by approximately half of the households, shortwave radios by about 40%, and TV sets by 30% of households. Smartphones are the key piece of equipment to access internet-based services, and the actual access may be lower than reported, since many of the smartphone owners do not have means to pay for internet access⁶. Computer ownership is low, less than 10% of households have one.

In addition, about 70% of the households have access to bicycles, and 60% of men have a motor vehicle (most often – a motorcycle. We look at transportation equipment in the same line as communication equipment, as transportation is necessary for attending community meetings and group gatherings.

These numbers do not reflect, however, that the access is very uneven within households. For instance, women have very low access to smartphones with internet – it is the men in the household that manage those. Similarly, women practically have no access to motor vehicles – only to bicycles.

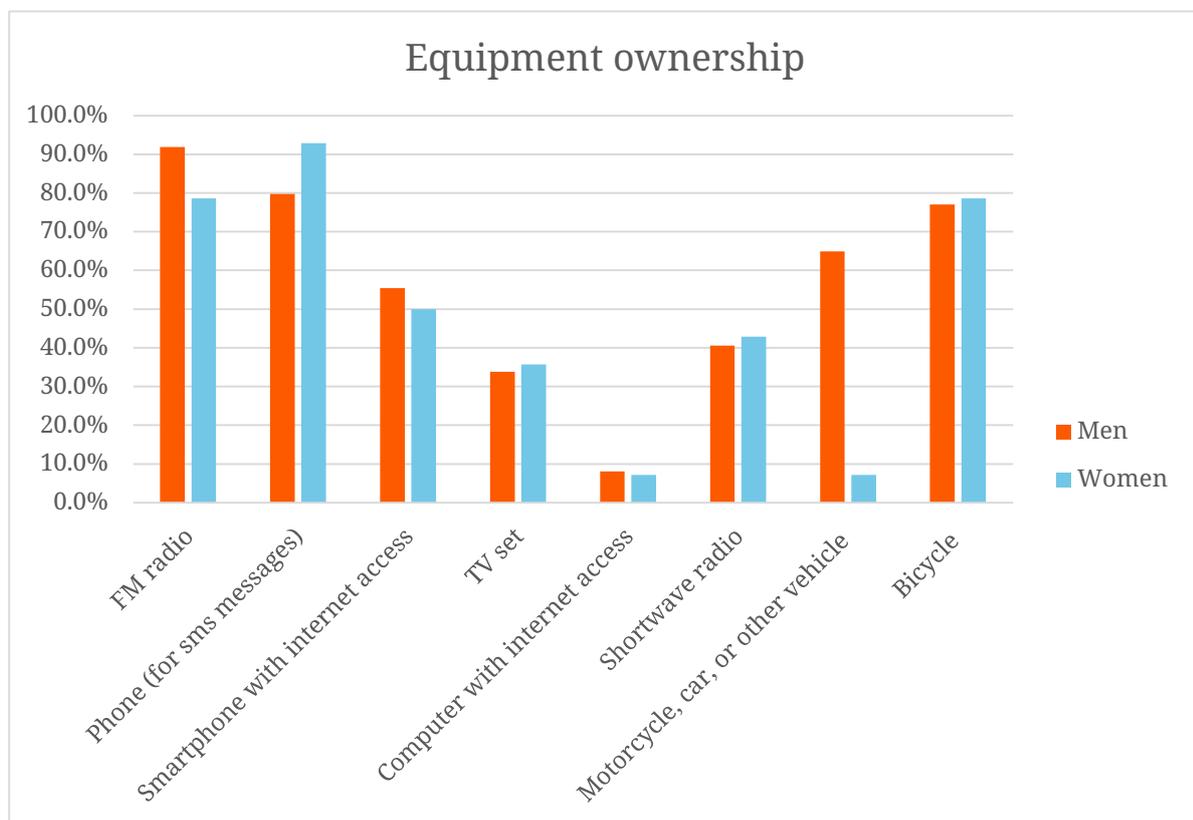


Figure 5 Household access to different communication and transportation equipment (n=88)

⁶ The number of internet users in Burkina Faso is assessed at 22.4% of population – which is still low. However, the growth is impressive: last year (October 2025 to October 2026) the number of users increased by 8.7%.

Source: [Digital 2026: Burkina Faso — DataReportal – Global Digital Insights](#)

Access to climate information

In both communities practically all the farmers have access to weather and climate information (however it appears that women systematically have more difficulty accessing the information compared with men – see more on the gender differences below). The sources of climate and weather information that were most commonly mentioned in the focus group discussion were:

- Radio warnings about extreme events, and weather forecasts on the community radio.
- WhatsApp group establish by the Met Office and within existing savings groups or cooperatives.
- Seasonal forecast and rain forecast on TV and on the radio (both national and community radio).
- Group communication and peer-to-peer exchange in community and group meetings.
- In some areas - daily and weekly forecasts are received via a toll-free phone number (Numéro Vert).

The survey supports these findings and provides detail on each channel (see figure 6): the most common channels for weather and climate information are radio (especially,

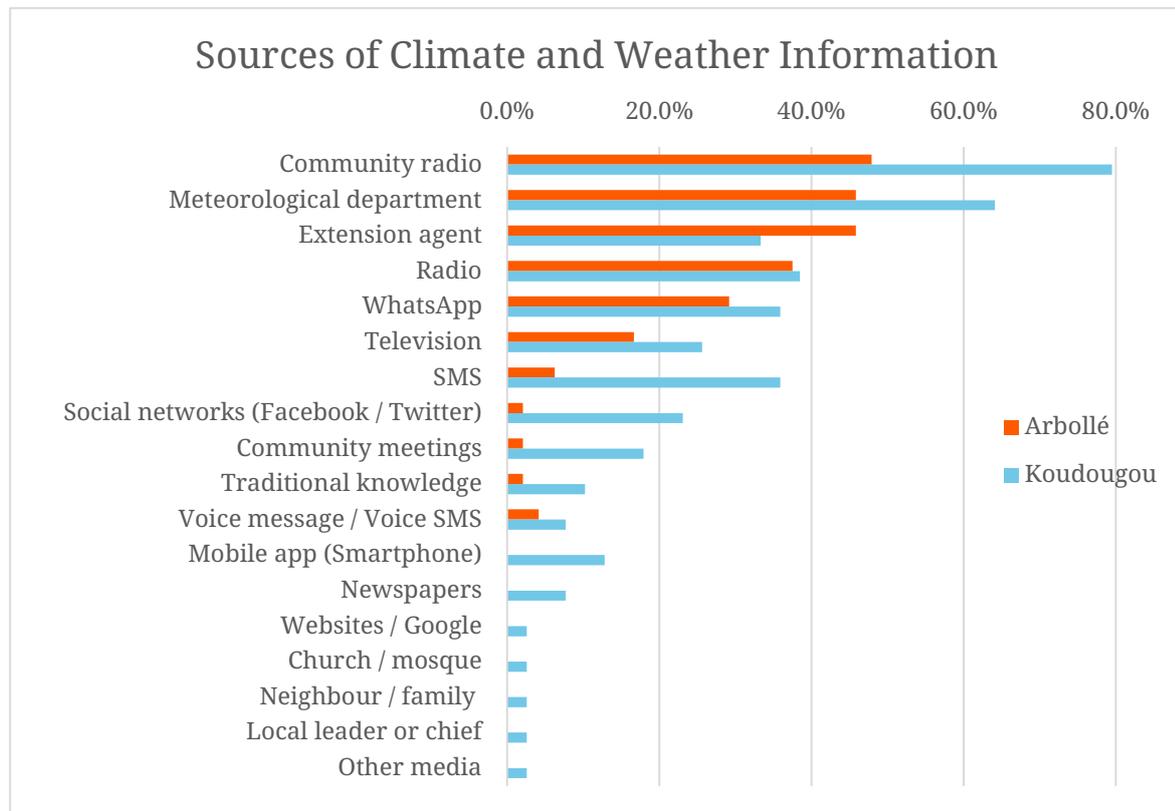


Figure 6 Key sources of climate and weather information in the two areas (n=88)

the local stations), the meteorological department directly or indirectly⁷, the extension agents, and WhatsApp for group communication.

Peer-to-peer communication is not often mentioned by respondents, but this may be due to the ubiquity of these exchanges (which likely makes it hard for respondents to recognize it as a separate communication channel – they are “not worth mentioning”).

1. Traditional media as channels for climate Information.

Traditional media (radio, newspapers, television) remain the key channels for distributing weather information. Among those, community radio is the most important one, since it can offer a fairly high-resolution forecast (down to village/commune level), targeted for specific localities, accompanied with relevant agricultural advisory, and in local languages. It also provides a regular service in weather information and offers geographically targeted alerts and forecasts. Community radio is also a medium that enjoys the most egalitarian access, for men, women, youth, and elderly population. National radio and television are significantly lower in importance since they are not as precise as the local community radio and usually don't come in local tongues. Newspapers, on the other hand, are in practice insignificant as source of weather information.



Figure 7 Focus group discussion

⁷ In the survey the channels and the sources of information are joined together. For instance, Meteorological department is listed as one of the possible channels of the climate information. In practice, the meteorological department can be an original source for other channels (such as radio, TV, etc.), and a source directly in WhatsApp chats and group meetings. So, for instance, when the information is shared in the WhatsApp group by the meteorological officer, some people could cite this as coming from the met department, while others would mention WhatsApp as the source. This must be taken into account when interpreting the chart.

2. Online media

Social networks and websites are not a significant source of information for the majority of farmers as of now, most likely because of lower coverage of smartphone ownership and poor connection to the internet. However, access to the online media is growing, and these media are predominantly used by younger population, which means that their importance will only increase.

Online media include social media (such as Facebook, Twitter, or YouTube), news websites and specialized weather sites, as well as any specialized weather apps. We noted that access to online media is higher in Koudougou than in Arboillé (see figure 6), probably because in general the people in Koudougou are better connected to the internet. In Koudougou, in addition, the use of a specialized weather app was reported – unlike in Arboillé.

Table 3 Summary of findings on the current use, trust, and importance of each of the channels, with description and recommendation

Channel for climate information	Current importance	Trust	User preference	Overall assessment	Barriers of access and reach	Description	Recommendation
Community radio	★★★★★	★★★★★	★★★★★	★★★★★	Preferred channels for women, as they usually have poor access to other sources and services on smartphones. Some of the respondents noted that there are gaps and uneven coverage in community radio broadcasting of CIS.	Key channel for all members of community and will remain so. It is especially important for women.	Supporting community radio should be the top priority for climate communication. It should ensure that the information is shared in local languages, is precise enough so that it informs of the particularities of the forecast in all the catchment area, and that it is presented regularly, at predictable time.
National radio	★★★★	★★★★	★★★★	★★★★	Radio enjoys egalitarian access and is preferred by women.	National radio is less important than community radio because it does not offer the same resolution as the community one and does not come in local languages.	NMHS should maintain cooperation with national radio and TV as it is a privileged channel for nation-wide communication and weather information.
Television	★★★★	★★★★	★★	★★★	Equal access for men and women, but poorer coverage overall	Less important than radio	Similar to radio but is not the priority source of climate information since it has poorer access and does not offer a good resolution for the forecast.
Print media: newspapers	★	★	★	★	Poor access and low importance overall	Not a significant source of information for farmers	Not expected to become a significant channel for CIS

Social networks (Facebook, Twitter, Youtube)	★★★★	★★	★★★	★★★	Women have significantly poorer access to any information that is distributed via smartphones - compared to men	Currently the importance of social networks is limited by low smartphone ownership and internet access, but it is one of the preferred channels for younger audiences	The importance of the social networks is expected to grow It is recommended that the met services establish and maintain presence in key social networks.
Websites	★	★	★★	★★	Women have significantly worse access to any information that is distributed via smartphones - compared to men	Currently not an important channel now.	In the future their importance might increase, so NMHS should maintain a presence on the internet
WhatsApp as a channel for group communication	★★★★★	★★★★	★★★★★	★★★★★	Women have significantly worse access to any information that is distributed via smartphones - compared to men	Is one of the key channels for sharing climate information to groups. It is also used for feedback. It is used by observers ⁸ to report to the meteorological department.	This is the main and low-cost channel for sharing information in groups, in maintained by the met office, extension agents – who should set up WhatsApp groups in all locations.
Mobile apps	★★	★★	★★★	★★	Women have significantly worse access to any information that is distributed via smartphones - compared to men	Currently somewhat important channel, but its importance will increase with the improvement of internet access	NMHS should consider managing a weather app, but it is less of a priority investment area compared to radio and social networks due to cost
SMS	★★★★	★★★	★★★★	★★★★	This is a very important source of information for women since they are more likely to own a simple phone, rather than a smartphone	Currently used to complement WhatsApp for those that have a phone but no internet access	It could be used until the access to internet improves, where it will be substituted by WhatsApp or a weather app
Voice message / voice SMS	★★★★	★★★★	★★★★★	★★★★	This channel is more accessible to women	Currently not used very often, but preferred by many farmers	It could be used until the access to internet improves, where it will be substituted by WhatsApp or a weather app. It is especially important for informing women
Toll-free number	★★	★★★★	★★★	★★★	Practically equal access: but may be more accessible to women since they are more likely to have simple phones (not smartphones)	Used in some locations if it was set up by an NGO project	It is a very costly system with the only additional benefit that it is more accessible to women. Should only be considered if it can be sustained.

⁸ The observers are community members that keep basic meteorological tools (such as rain gauge) and report the readings to the meteorological department on the regular basis. This communication channel allows them to receive all the updates on weather directly from the met. office.

Meteorological department	★★★★★	★★★★★	★★★★★	★★★★★	Depending on the channel men are likely to have better access to the meteorological department directly	The meteorological department distributes the information both directly (i. e. through bulletins in Whatsapp groups) and through other media, serving as a source of data for other media.	Meteorological department should improve communication through intermediaries: extension channels and farmer observers.
Extension agent	★★★★	★★★★★	★★★★★	★★★★★	Equal access in meetings, but better access for men through WhatsApp groups	Key agents for distribution of CIS	Should be a privileged channel for distribution of CIS, using WhatsApp groups and community meetings
Community (group) meetings	★★★★	★★★	★★★★	★★★★	Women attend meetings more regularly than men	One of the key channels to distribute CIS - especially to women, and collect feedback. Curiously, it is not a preferred way of receiving CIS for many	Should continue to be used by extension agents but may lose importance as other media develop. Consider also specific group meetings for women
Church meetings	★	★	★	★	Women are more likely to attend meetings	Not a significant source of climate information for farmers	Could complement community meetings, but not privileged
Government officials	★	★	★★	★	n/a	not a significant channel	Should be included in co-production of CIS
Neighbours or family	★	★	★	★	Women more often receive information from neighbours or family	Significant source of CIS for women, but not a reliable	CIS focused on women should reduce women's dependence on neighbours or family members
Local leaders	★	★	★	★	n/a	not a significant channel	Should be included in co-production of CIS
Traditional forecasting	★★★	★★★	★	★★★	Equal access	Influential source of climate information, all are aware and many trust traditional signs and indices.	Should be engaged in co-production of CIS

3. Communication in community meetings and in farmers' groups

Community and group communication on weather and climate remains a key avenue for informing communities. When mediated by extension agents, community meetings allow connecting forecasts with agro-advisory and have the advantage of the possibility of interaction and feedback (table 3). Community gatherings are the most appropriate for discussing seasonal forecasts, in connection with the discussion of the advisory for the next season.

Many farmers prefer group meetings as a way of getting informed on climate and weather, but currently they don't see it as a key channel. From the focus group discussions, it appears that community meetings with extension agents are not systematic: most commonly informing on CIS happens in the context of other work

tasks performed by the extension agents, such as trainings or distributions of seeds. Occasionally, religious gatherings (in mosques) are also used to discuss the forecast. To improve the utility of the meetings, it would be recommended to:

- Make them more systematic and predictable,
- Ensure that they are inclusive – both for people that are not part of specific value chains or trainings groups, but all the members of the community.
- It is also important to ensure the participation for women: for instance, it may be beneficial to hold women-only meetings.

A more important means of group communication and information has developed using WhatsApp groups or (less common) SMS messages in groups. WhatsApp specifically is used by some farmers that are appointed as weather observers (see footnote 4 on p.12 above) and equipped with rain gauges, to report their readings back to the local meteorological offices. These farmers receive direct communication (forecasts, alerts) from the meteorological office and are expected to share it further.

WhatsApp is clearly preferred by farmers, but it is limited by the low rates of smartphone ownership; low literacy levels (these barriers affect women disproportionately: their smartphone ownership and literacy rates are even lower than those of men).

Finally, climate information is shared through peer-to-peer communication, but it is difficult to assess the intensity of this communication due to its ubiquity (it is rarely mentioned by the respondents).

4. Traditional knowledge vs science-based forecasts

The reliability of the forecasts distributed by the Meteorological department is seen as high: almost 90% of respondents observe that they find the information reliable (see figure 9), compared to 16% for traditional signs. The farmers interviewed in focus groups seen these methods as less reliable; however, at the same time they are never ignored.

We have noted that the farmers clearly have no expectation that the traditional methods should deliver exact forecasts. Even though traditional methods are usually rooted in objective criteria (such as change in humidity), they are not seen as precise as the science-based forecasts prepared by the meteorological institutions.

Some farmers mention that the traditional methods and the meteorological departments forecasts often contradict each other. The farmers appear divided as to which forecast should be taken into account: traditional forecasts are used by farmers that choose conservative strategies: perhaps they believe that traditional methods are perceived as safer, and better understood by the farmers.

On the other hand, a large portion of farmers believe that meteorological forecasts provide more detailed, timely, and actionable information, including early (24h) alerts and are coupled with agricultural advice. As a result, an increasing number of people now combine both traditional and modern methods to guide their decisions.

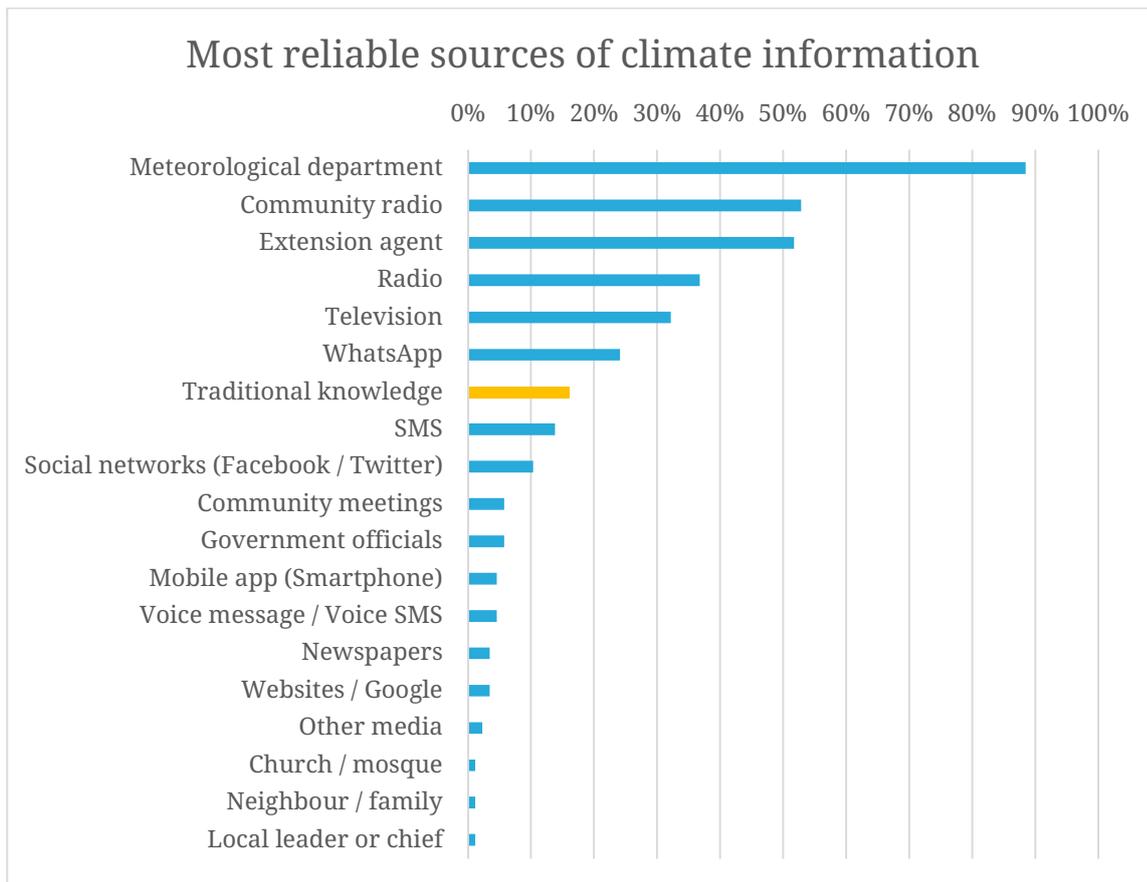


Figure 8 Climate information provided by the meteorological department enjoys significantly more trust than traditional knowledge (n=87)

Consequently, when both traditional and science-based methods coincide in their predictions, the farmers confidently rely on this data. But when there is a contradiction, they must make a choice which method to trust – and it appears from the discussions and the survey that a slightly larger group trusts the meteorological forecast, while a smaller group still relies on traditional methods.

Methods of traditional forecasting

Traditional forecasting relies on attentive observation of natural signs: animal and insect behaviour, plant growth, and environmental conditions. These methods are used widely for agricultural decision-making. Traditional signs are not random, they are based on objective changes in moisture, wind patterns, are caused by weather change, and their predictions are very often reliable. However, with the change of climate, traditional methods become less reliable, as observed by respondents.

1. Animal and insect behaviour

a) bird nesting patterns

When birds do not build their nests high in trees, it is interpreted as a sign warning of strong winds. When birds that usually live in lowland areas build their nests at the tops of trees, it is taken as a sign of heavy rainfall.

If such birds build their nests lower in the trees, it suggests that rainfall will be limited. This method is commonly observed and trusted by communities.

b) insect behaviour

Certain insects are observed to relocate their eggs from one location to another, which is regarded as an indication that rain is imminent. This is one of the most frequently cited and trusted indicators.

c) termite activity

The construction of termite mounds is seen as a sign that there will be abundant rainfall. This is one of the more commonly referenced traditional signs.

d) earthworms

The emergence of earthworms from the soil surface is considered a sign that rain is approaching.

2. Plant and Tree Indicators

a) leaf abundance

When certain trees produce many leaves, it is considered a prediction of upcoming drought or a dry season. This method is frequently used and considered reliable by many farmers.

If all branches of a tree are covered evenly with leaves, it indicates that rainfall will be uniform and abundant, whereas if a tree grows unevenly (i.e., one side developing more than the other), it is taken to mean that the rainfall will be irregular.

d) seasonal leaf changes

The appearance of new leaves on trees signals the beginning of the rainy season. The falling of leaves marks the end of the season.

3. Atmospheric, soil, and environmental signs

a) The absence of morning dew in the early morning is believed to indicate that it will rain later in the day. This is a common daily observation.

b) Morning Heat Without Wind. If mornings are very hot and there is no wind, it is taken as a sign that it will rain later in the day. This is frequently used for short-term, same-day forecasting.

c) Wind Direction. The presence of strong winds from the east, especially during the rainy season (associated with the monsoon), is interpreted in some locations as an indication of incoming heavy rains.

Receiving and interpreting weather forecasts

All the farmers that participated in the study receive forecasts that are prepared by the meteorological office. It is recognized as the main source of climate information, distributed through various channels. It is seen as an important (figure 6) and a reliable (figure 8) source of information.

Types of information about forecasts

The farmers in both communities mention that they regularly receive daily (56%), weekly (47%) forecasts, and every 10 days (33%). A small number of farmers reported receiving seasonal forecasts (only 12%) – but this is due to the fact that the survey did not coincide with the season start – as it is clear from other responses that the farmers are regularly receiving seasonal forecasts before the season.

Quality of climate information

When discussing the quality of the forecasts with the farmer end-users, the quality is not only a measure of the skill, or accuracy of the forecast, but a composite measure that includes the perception of accuracy, timeliness, precision, ease of access, and how well the messages are understood. In general, the farmers have noticed a steady improvement of the quality: 97% have noticed positive improvement in the last 2 years! The most notable and common improvements are:

- General improvement of accessibility of climate information (greater number of channels)
- Becoming member of a WhatsApp group to receive forecasts and targeted information
- Better diffusion through community radio: improvement of quality and regularity
- Better understanding of the weather information and forecasts
- Higher ownership of smartphones and internet access
- Forecasts are seen as more accurate and reliable as they are more often proven true.

Timeliness of the forecasts

Timeliness of the climate and weather information depends on the type of forecasts and the channel. For daily, weekly and 10-day forecasts, the key channel for climate information is radio, and according to the focus group participants, radio mostly share the information on time. At the same time, those that rely on WhatsApp often receive the information late, often due to poor internet access.

Seasonal forecasts, on the other hand, are often delayed: they would be ideally needed by late April or early May but are often received as late and second half of June, when many of the agricultural decisions would have been taken. Most of the farmers (81%) said that they received **seasonal forecasts** before the start of the season, while 44% also received them already after the season start. Only a few respondents (2%) say that they received the forecast too late, and only 2% mention that they never received the seasonal forecast. Consequently, an earlier dissemination of seasonal forecast would be a recommended area for improvement.

Skill and accuracy of the forecasts

In the communes of Arbolle and Koudougou participants of the focus groups acknowledge that the forecasts are mostly accurate, but when communicated they are often not precise enough to reflect the conditions in each village of the area, and the forecast would appear incorrect in some areas. In sum, 57% of farmers could recall a situation where the weather forecast was not accurate – in most cases this was related to rain forecasts that failed to realize.

Consequently, the main obstacle to trusting the science-based meteorological forecast is that it does not have a high resolution: often the forecasts of rain do not touch some of the villages in the community, and that can generate distrust.

Gender differences in access to climate information.

Women have noticeably worse access to climate information compared to men, which is confirmed by both the survey and the focus groups, for two key reasons:

- Women have poorer access to communication equipment, they usually do not own smartphones, and even when they do - they do they have no money to pay for the internet connection.

- Women are more often illiterate and cannot read the text messages and are also excluded from trainings.

Women are thus forced to rely on the climate information on the radio and in community meetings. They also rely more on family members sharing peer-to-peer information in savings group meetings and in the markets. Almost 50% of the women that we interviewed said that they receive climate information from a family member, and not directly.

Overall, women on the average have access to 2.6 different sources of weather information, while men, on average, report that they can access 3 different sources.

Co-production of Climate Information.

Co-production and understanding of weather and climate information

There is little co-production that occurs between the farmers and the meteorological service in the communities we studied: apart from the feedback that the farmers may give through the extension agents, they have very little input into co-producing the climate knowledge.

The only exception to this is the institution of *weather observers*: they are farmers that have basic weather measurement equipment (manual rain gauges) and write down their observations in a journal, while also reporting them via WhatsApp to the local meteorological department. These farmers have a direct connection to the meteorological office and often act as intermediaries for weather information: they receive information from the meteorological department directly (forecasts, warnings about extreme weather events) and local farmers know that they can address the observers as go-betweens for feedback and climate information.

A common request that is coming from the farmers is to provide them with trainings that would explain how to use the meteorological data. We noticed that about 40% of farmers have received some form of training in understanding weather – and yet at the same time, only 47% claim that they fully understand the forecasts. The farmers are aware of the gaps in their knowledge, and one of their most common requests is to provide them with trainings on interpreting weather information and forecasts and their connection to agricultural decisions. It is important that these trainings are in local languages, and that they target women specifically (as well as men).

Feedback systems

In the conversations with farmers, as well as in the survey, the issue of the possibility of contacting the meteorological office with feedback was raised multiple times. The feedback is important for two reasons:

1. The farmers should have a possibility to receive explanations of the meaning of the forecast should they require it

2. Feedback from farmers is essential for the meteorological institutions to improve the service – both for the production and the distribution of the forecast.

About 27% of farmers have used an opportunity to provide feedback on the CIS – and 22% say they have received a response. In most cases this happened in the context of community meetings (63%) and religious gatherings (21%), followed by WhatsApp groups (33%), phone calls (25%) and SMS messages (20%).

However, the existing practice does not reflect farmers’ preferences: phone is the preferred way to provide feedback (39% would prefer a toll-free number, and 23% would be happy with any phone number), followed by WhatsApp (29%) and SMS (16%). Community meetings are less preferred avenue for feedback – only 21% mention those.

Thus, both the survey and discussions with the farmers confirm the importance of **group meetings** as the key channel for both delivering the weather information and providing feedback. The group meetings ensure interaction with the extension agent, and a possibility to discuss the meaning of the forecast. The meetings are best for discussing long-term forecasts – seasonal or sub-seasonal issues, and the accompanying recommendations on value chains decisions. A request from farmers is to ensure that the meetings are regular and attended by the agent. In locations where production or savings groups are missing, new groups should be formed.

WhatsApp groups are a good complement to the feedback system, as they allow the groups to keep in touch, and are best suitable for short-term alerts - but this function is undermined by the fact that the smartphone ownership does not reach 50%. As the smartphone ownership will increase, the importance of WhatsApp will continue to grow.

An additional tool for feedback is a toll-free phone number (Numéro Vert), already available in some communities. It allows farmers to reach proactively for information, and request a forecast – however, only a few of the farmers report using it. It is not clear whether if the toll-free number allows to receive feedback on past forecasts or request specific explanations.

Table 4 Channels for feedback on CIS

Preferred channels	Levels of feedback	Status of communication	Recommendations
Community meetings	From farmers to peers From farmers to extension officers	Adequate Community meetings with extension officers are currently the best tool for receiving climate information – and provide feedback in real time. Yet, it has limitations – it requires attendance from the part of farmers and presence of the extension officers. It also does not allow to respond quickly.	Enhance the presence of extension service at group meetings and organize more meetings in areas where those are sparse. It is especially critical that the meetings are timed properly – well in advance of the agricultural season, and in case the seasonal forecast is changed The meetings should be complemented by communication through WhatsApp or SMS.

WhatsApp Via observers	From farmers to local meteorological services From farmers to extension officers From weather observers to meteorological services and farmers	Adequate to poor Outside of community meetings Whatsapp is the best way to reach extension service and meteorological officers. There are few practical methods to reach the meteorological officers: the most common is to go through the observers who are in communication through WhatsApp	It is important that there are functional WhatsApp channels for communicating with farmers – even those that are not appointed as Observers. The importance of WhatsApp (or other similar apps) would only grow for all the farmers, as phone ownership grows.
Toll-free number SMS	From farmers to central met office	Poor The farmers are aware of the toll-free number but are not aware /not using it for feedback. Yet, this is a potentially very important channel, supported by the fact that most farmers have access to a phone	The toll-free number is a costly endeavour and should only be maintained if it can be maintained sustainably.

Climate information and farming decisions

Almost all the farmers find climate / weather information very useful, and 98% have said that the information helps them take agricultural decisions. The same 98% also believe that the information provided by the meteorological department has a positive impact on their lives and livelihoods

The vast majority of farmers (84%) also say that they have modified their practices due to the weather information they received in the past 2 years. The most common actions include:

- Making preparations for a drought,
- Preparing for flooding,
- Taking measures to avoid damages to family members, house and property: for instance, hiding the livestock from the storm, or bringing inside the shea butter when the rain is about to come,
- Changing the time of planting, the variety of the seed, or a planting a different culture altogether
- Planting in different plots,
- Varying the size of planting area,
- Varying the amount of fertilizer applied,
- Adjusting the amount of work to dedicate to agriculture,
- Changing the time of harvesting,

Quotes from participants of focus groups:

"Women use weather forecasts to plan household activities, hanging the clothes or cooking in open kitchens, and also when sending children to collect wood"

"One day the sky was cloudy, and I thought I should not go put the fertilizer in the field, but the météo said that the rain will be small, so I went to spread the fertilizer, and in fact it did not rain much"

Clearly, climate information helps farmers to prepare to weather shocks, and to use the information to increase productivity – and to protect families against natural disasters.

Observations on climate variability

When prompted, the farmers eagerly share observations on climate and weather variability that they had noticed in the past years (we asked for a 5-year recall), and those could be pointing towards the effect of changing climate (it is also necessary to note that these observations are highly subjective and could not be objectively verified):

- More common now are the periods of drought and dry spells. For instance, last year it was too hot, so the farmers did not have enough grains to make shea butter; some of the sheep were also lost.
- The rain season had become shorter: it used to last 5 months, now it is 3 months. The rains are distributed unevenly in space and time, and rains at the start of the season are more unpredictable.
- Delay of the rain season: the season started in June, now beginning of July, and often the amount of the rain is insufficient for planting.
- Stronger winds.
- Higher incidence of strong rains and flooding.
- Unpredictability in rain patterns: e.g. rains used to come from the East, now they can come from any direction. Wind directions in the beginning and end of season are also changed. The *monsoon* and the *harmattan* winds do not occur predictably as they used to.
- Overall, due to larger unpredictability, the farmers need to diversify more: producing shea butter, soumbala and soap, making of the mats, as well as maintain a vegetable garden, and engage in husbandry of sheep and pigs.

Conclusions and recommendations

The survey of the farmers and the focus groups discussions in both communities demonstrated that the meteorological forecasts are generally received, seen as reliable, are generally trusted, and are used to make agricultural decisions. There is also a noticeable improvement of the quality of the climate information over the past two years.

There are, however, still gaps related to timely access to the climate information, and specifically, access of women to CIS. These gaps are detected both on the supply side and on the demand side.

On the **supply side**, the deficiencies relate to the fact that the key channels for CIS distribution have a margin for improvement: for instance:

- Community meetings with extension agents often occur sporadically and are ad-hoc, whereas they should be arranged in a predictable manner.
- Climate information and forecasts distributed through radio or TV are not precise enough, and often are not in local languages,
- The potential of WhatsApp groups is not used fully; they should include more participants

- Seasonal forecasts are often shared too late to take decisions – they should come earlier.
- Climate information is not always accompanied with actionable advice, especially when share through traditional media.

On the **demand side**, there are clear gaps that relate to the ability to receive and make use of the climate information, that should be addressed by a comprehensive policy:

- Low smartphone coverage, coupled with high level of illiteracy, especially among women, makes the efficient CIS channels, like WhatsApp, inaccessible to many farmers, especially female farmers. Since smartphone ownership is growing, it would be expected for this gap to close eventually.
- Many farmers still lack the skills to fully understand the climate information and translate it to actions – this can be remedied through meetings with extension agents and specific targeted trainings.

There is also a significant gap in feedback and co-production of climate information: there are few possibilities for farmers to feedback on the CIS, and practically no outlets for participating in co-production of climate information. This gap reduces the utility of the meteorological science-based forecasts for choosing best agricultural strategies. Lack of meaningful co-production makes it difficult to integrate traditional and science-based forecasts, which results in some farmers falling back on traditional conservative strategies – which now work poorly because of changing climate.

Recommendations on access to climate information and advisory

A concerted action by the meteorological services, the media, agricultural extension, communities and farmers' groups would allow to address many of the gaps that were identified in this study. Among the low-cost actions that would improve the distribution and the reach of CIS are following:

1. Among the traditional media that are still very relevant for the distribution of CIS, the community radio is the most important channel. It is important to ensure that the weather service on the community radio is reliable, comprehensible (in local language), and comes at predictable intervals.
2. Internet-based media will be gaining greater importance with time, as the smartphone ownership and internet access increase, which means that the meteorological service should enhance internet presence through:
 - Social media presence (Facebook, Twitter, YouTube),
 - Dedicated websites,
 - A dedicated weather app.
3. Extension agents and meteorological offices should make better use the potential of WhatsApp to create groups where the CIS could be distributed to many recipients at once.
4. There should be a targeted effort to share the climate information to women and improving their access and comprehension of CIS.
5. See also recommendations on specific channels in table 3 above.

Recommendations on co-production of climate information and feedback

The participation of farmers in co-production is still very limited. There are some ways to improve – see recommendations in table 5. In sum:

6. Community meetings, if made more inclusive, and more systematic, are the priority channel for feedback, co-production of knowledge, and for distributing agricultural advisory, with the participation of extension agents.
7. WhatsApp groups with local meteorological departments are a convenient channel for 2-way communication and should be prioritized for feedback on CIS (see also recommendation 3).
8. See also recommendations on specific channels and types of feedback in table 4 above.