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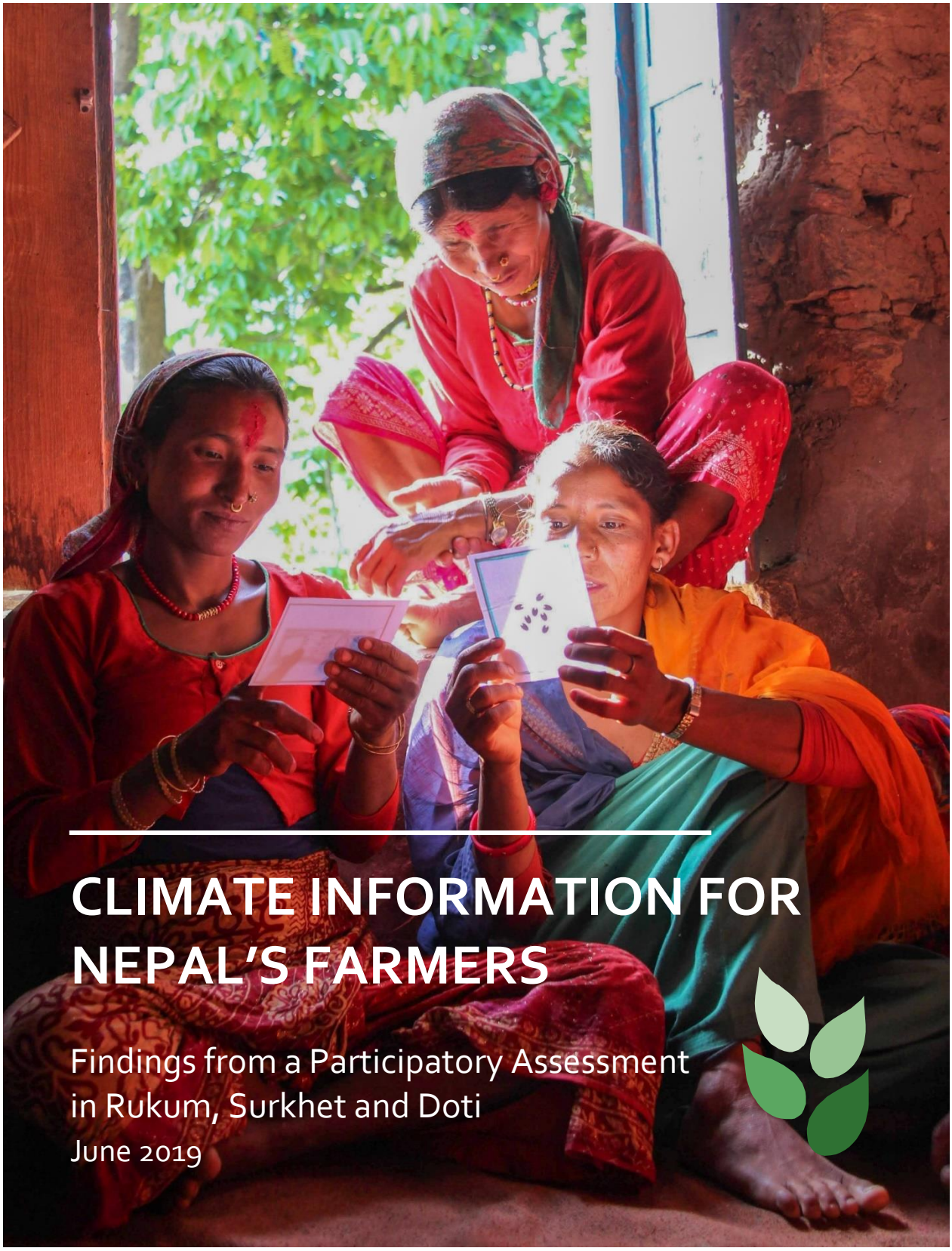

CLIMATE INFORMATION FOR NEPAL'S FARMERS

Findings from a Participatory Assessment in Rukum, Surkhet and Doti

June 2019

About SCALE

SCALE (Strengthening Capacity in Agriculture, Livelihoods, and Environment) is an initiative funded by USAID's Office of Food for Peace (FFP) and implemented by Mercy Corps in collaboration with Save the Children. SCALE aims to enhance the impact, sustainability and scalability of FFP-funded agriculture, natural resource management, and off-farm livelihood activities in emergency and development contexts.

About PAHAL

PAHAL (Promoting Agriculture, Health and Alternative Livelihoods) is a five-year program funded by the USAID's Office of Food for Peace (FFP) within the USAID/Nepal's Community Resilience Program. PAHAL aims to achieve food security among vulnerable populations in 14 districts in the middle and high hills of Mid and Far Western Nepal.

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Executive Summary

Background

The Mercy Corps-led Promoting Agriculture, Health and Alternative Livelihoods (PAHAL) program is a five-year Development Food Security Activity (DFSA) funded by the USAID Office of Food for Peace (FFP). Based in the middle and high hills of Far- and Mid-West Nepal, households in this area face a multitude of climatic shocks and stresses, including violent storms, floods, landslides and droughts that threaten households' food security and livelihoods.

In response to these challenges, the Nepal government is implementing the World Bank-funded Agriculture Management Information System (AMIS) project, with the objective of providing information to farmers on agriculture-related risks so they can take steps to reduce losses and increase productivity. AMIS consists of four components: 1) the establishment of an AMIS online portal, mobile application and call center; 2) the development of agro-climate and agro-weather advisory bulletins and monitoring systems; 3) the dissemination of AMIS information via SMS texts and other media; and 4) capacity strengthening for stakeholders and farming communities.

In 2018, the PAHAL program initiated a pilot to test the efficacy of one element of the AMIS project, the SMS text system, in three of its operational districts outside the AMIS implementation area: Surkhet, Doti and Rukum. Through this pilot, PAHAL registered approximately 115 lead farmers to receive AMIS SMS texts during the agricultural season from June through August. The intention was for the lead farmers to communicate this information to their respective farmer groups, who would then use it to prepare for and better adapt to various shocks and stresses. While the PAHAL team did not contribute to the production of the text messages, they were eager to learn whether this government service would be effective when paired with other PAHAL agricultural initiatives.

Assessment

In 2019, the Strengthening Capacity in Agriculture, Livelihoods and Environment (SCALE)[1] award assessed this pilot together with PAHAL staff. During the preparation stage, the team broadened the scope of its assessment to include the wider climate information system (of which AMIS is one part) in the three districts. That is, the team decided not only to assess the efficacy of the AMIS SMS pilot, but also to consider the other sources of climate information that reach farmers, the related services and resources they need to take action, and the social, economic and political influences in the enabling environment.

This decision was made for two reasons. First, the team recognized that tracing the origin of a particular piece of information from AMIS to a specific lead farmer and onward to a farmer would be difficult and unreliable, especially given that seven months had passed since the end of the pilot. Second, the team believed that in taking a systems perspective, they would gain a fuller picture of the constraints and opportunities for improvement.

The key questions guiding this assessment were:

1) Is the climate information system – including the AMIS SMS pilot - working effectively in the PAHAL pilot area?
2) After receiving information from AMIS and other sources, how did farmers respond and what capacity building activities conducted by PAHAL were used?

[1] For more information on SCALE, please visit: www.fsnnetwork.org/scale

3) How did farmers use climate and weather information besides determining harvesting and planting times?
4) What technical capacities, resources and services are needed for farmers to successfully access and apply weather information to agricultural practices?

The approach for this assessment was adapted from the Participatory Climate Information Services Systems Development Methodology developed under the USAID-funded CISRI project. The assessment team carried out a total of twelve village-level workshops and three municipality workshops, engaging over 100 farmers and 50 stakeholders in a range of participatory exercises and discussions. Farmers discussed the critical shocks and stresses they experienced over the past year; the ways in which they accessed and used climate and weather information from a variety of sources; and the resources and services they required to take action. Municipality-level participants reflected on the challenges and opportunities in the system and proposed an action plan for improving the information system.

Key Findings

The climate and weather information needs of farmers were not effectively met by the climate services currently available, which included the AMIS SMS system. There was no indication that during the months of the AMIS pilot, information on weather and agro-climatic conditions was more available to farmers than in previous years. The key reasons for this fell into two categories: 1) farmers' lack of consistent access to information, and 2) the kind of information most needed by farmers to manage shocks and stresses is not currently provided by the Department of Hydrology and Meteorology (DHM). The assessment identified opportunities to improve PAHAL's roll-out of the AMIS SMS pilot, as well as technological and communication-related challenges that limited the production and dissemination of climate information not only in the pilot area, but throughout the country.

Lack of Consistent Information

Farmers identified an average of 12 sources of climate and weather information per village. The most trusted sources of information – the PAHAL team, government extension agents and lead farmers – delivered information infrequently, while neighbors and spouses exchanged information regularly but were not viewed as trustworthy. As anticipated, farmers were unable to attribute any particular information to the AMIS system. However, lead farmers were unclear on the pilot's intention and noted challenges receiving, interpreting and sharing the messages with their groups; it is unlikely many of the AMIS SMS messages ultimately reached farmers.

Barriers to accessing climate information from other sources were noted at multiple points in the communication chain, and related to weak infrastructure and communication technology, physical remoteness, illiteracy, trust and a lack of knowledge around climate information. Some of these challenges could have been overcome by improvements to the roll-out of the PAHAL pilot; for instance, by including a stronger communication and awareness raising campaign around the pilot's intention and the value of climate information. In addition, outreach might have improved if PAHAL had registered additional people to receive AMIS texts rather than solely focusing on lead farmers.

Technology, Communication and Capacity Limitations

However, even if the above steps had been taken to improve the AMIS pilot, the effectiveness of AMIS – and the climate information system of which it is a part – would still be constrained by underlying challenges with the government's technology, capacity and communications. Currently, the technological capacity of the Department of Hydrology and Meteorology (DHM) is limited to three-day forecasts and lacks the ability to produce precise, localized data. The DHM is unable to predict many of the major shocks and stresses identified by farmers in this assessment, such as hailstorms, floods, crop pests and diseases. AMIS, and any other climate and weather information

sources that rely upon DHM data, are likewise constrained in their ability to meet farmers' needs not only in the pilot area, but throughout the country. Stakeholders also believed that internal government communications have constrained the dissemination and use of information. As the government is undergoing a restructuring process, roles and responsibilities have shifted and some offices have been replaced by new ones that are just getting up and running. These shifts have raised questions about how, and through whom, climate information should best be shared.

However, a number of changes are underway. The DHM has invested in new radar technologies and intends to build its capacity over the next few years to provide more precise, longer term forecasts and to expand the reach of AMIS to the entire country. At the same time, the restructuring process is shifting greater responsibilities to municipality-level stakeholders and expanding the presence of local resources and support services for farmers, such as Agriculture Knowledge Centers. These developments present a prime opportunity to clarify roles and responsibilities and formalize a climate information communication chain, so that remote farmers can truly benefit from the DHM's advancements.

Recommendations

The findings from this assessment point to four key areas that must be enhanced to improve the accessibility and utility of the climate information system in the pilot area and throughout Nepal:

- **Enhance Redundancy**: The AMIS pilot fell short, in part, because only lead farmers were registered to receive AMIS texts. The number of trusted channels through which information might flow to remote communities should be increased, and could include agrovets, heads of farmer cooperatives, local radio stations, government extension agents and Agriculture Knowledge Centers. Greater collaboration among government and NGO-led programs is also necessary to achieve redundancy.
- **Raise Awareness**: NGO and government partners must work together on a coordinated effort to strengthen capacity and raise awareness of the importance and value of agro-climatic information. This is a need for all stakeholders along the communication chain, from farmers to local leaders and community organizers, and must go hand-in-hand with efforts to enhance redundancy.
- **Deepen Government Partnership:** Programs like PAHAL can be essential government partners in climate information interpretation and dissemination. At the national level, they can play a greater role in supporting the development of agroclimatic advisories. At the municipality level, they can support capacity strengthening of Rural Municipalities and Agriculture Knowledge Centers and facilitate conversation on information flows. They can also engage with government extension agents to build technical capacities at the village level, particularly in remote communities.

Integrate with Other Program Activities: Climate and weather events have the potential to impact multiple facets of communities' lives. Participants in this assessment linked cooler and wetter conditions to crop pests and disease outbreaks, as well as human and livestock illnesses. They drew connections between climatic shocks and the need for financial savings and food stockpiles. Programming should reflect these interconnections by ensuring climate information is not only integrated in farmer groups, but also in savings groups, women's cooperatives, health campaigns, and livestock associations. Households participating in these initiatives need to be prepared for agroclimatic impacts across sectors and aware of how they can leverage their various group resources (savings, vaccinations, social connections) in a holistic manner that protects their food security despite the risks.

Background and Context

Introduction to PAHAL

The Mercy Corps-led Promoting Agriculture, Health and Alternative Livelihoods (PAHAL) program is a five-year food security initiative funded by USAID's Office of Food for Peace (FFP) and based in the middle and high hills of Far- and Mid-West Nepal. For vulnerable communities in these areas, achieving and sustaining food security is a persistent challenge.

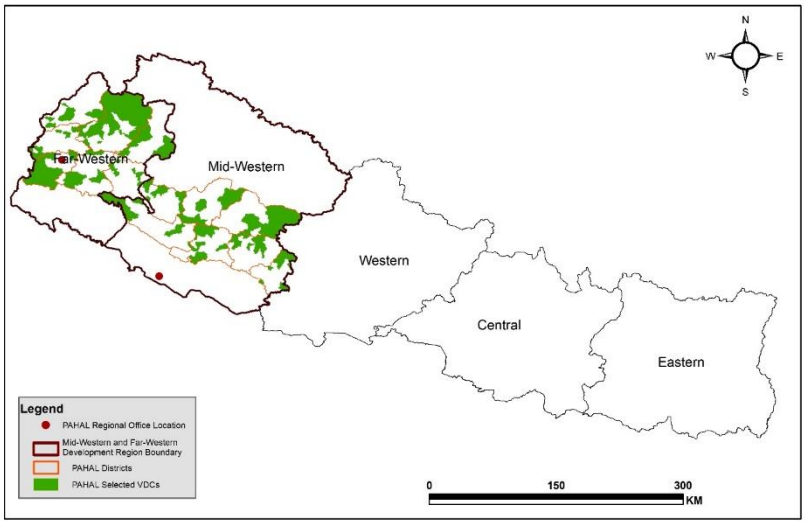


Figure 1: PAHAL Intervention Areas. Source: nepal.mercycorps.org

Households face a complex array of development constraints, ranging from weak infrastructure and markets, to gender- and caste-based inequities, poor nutrition practices and limited government services. These constraints are further compounded by a multitude of climatic shocks and stresses, including violent storms, floods, landslides and droughts. While PAHAL communities depend on agriculture for their lives and livelihoods, farmers face increasingly dire conditions. A lack of quality land, poor soil fertility, crop pests and destructive farming practices are undermining the productivity of the environments upon which they depend. These conditions threaten to trap families in cycles of poverty and hunger.[2]

Over the last five years of implementation, PAHAL has taken a multi-dimensional, systems approach to building the resilience capacities communities need to thrive in the face of risks and hazards. PAHAL's agricultural interventions are interwoven with its work on market linkages, financial access, good governance, social inclusion, and natural resources management. The program's efforts include diversifying the production of vegetables and cereals; increasing market system participation; and promoting the adoption of improved, climate-responsive practices that can increase yields, incomes, and food security.

Sustaining food security also requires communities to access knowledge that can inform risk-mitigating strategies. Over the lifetime of the project, PAHAL has connected communities to early warning systems and promoted the development of Local Disaster Management Committees (LDMC) so families can better prepare for and protect against risks to their farms and households.[3] In 2018, PAHAL built on these efforts by linking farmers to an on-farm decision support tool known as the Agriculture Management Information System (AMIS).

Introduction to AMIS

AMIS is one component of the World Bank-funded Building Resilience to Climate Related Hazards (BRCH) project. BRCH is implemented in partnership with Nepal's Ministry of

[2] PAHAL Program – Strategic Resilience Assessment (STRESS) Report. Mercy Corps. 2016.

[3] Promoting Agriculture, Health and Alternative Livelihoods. Mercy Corps Nepal. nepal.mercycorps.org. 2019.

Agricultural Development (MoAD), the Department of Hydrology and Meteorology (DHM), and the Nepal Agricultural Research Center (NARC). It includes a number of initiatives aimed at improving the government's technical and institutional capacity to deliver accurate, timely forecasts and early warning systems. The primary objective of AMIS is to provide information to farmers on agriculture-related risks so they can take steps to reduce losses and increase productivity.

AMIS consists of four components:

1) Establishment of AMIS infrastructure, including an online portal, call center and mobile application;
2) Development of AMIS products, including agro-climate and agro-weather advisory bulletins, a crop/livestock monitoring system, an early warning system for droughts and floods, and digital crop maps;
3) Dissemination of AMIS information via SMS text messages, mobiles applications, mass media, bulletins, and leaflets; and
4) Capacity strengthening of government stakeholders and farming communities.

BRCH began in January of 2013 and will close on December 31, 2019, at which point the Nepal government plans to take over funding and implementation.

AMIS Snapshot

- World Bank funded (Jan 2013 – Dec 2019)
- Lead Partner: Ministry of Agricultural Development (MoAD)
- Department of Hydrology & Meteorology (DHM): Provides weather and climate forecasts
- Nepal Agriculture Research Council (NARC): Technical partner in development of agriculture monitoring products and decision tools
- Ministry of Population and Environment (MoPE): Overall coordinator of AMIS and all other PPCR projects, leads inter-Ministerial Project Steering Committee

PAHAL Pilot

In 2018, the PAHAL team initiated a pilot of one component of AMIS, the government-led AMIS SMS text system, in three of its program districts that were outside the AMIS implementation area: Surkhet, Doti and Rukum. While AMIS uses several dissemination channels, the PAHAL team chose SMS text because it is compatible with the simple mobile phones many farmers possess and they believed the messages would be easier to access and to understand than the more complex online portal or mobile application.

Through this pilot, PAHAL registered approximately 115 lead farmers to receive AMIS texts during the agricultural season from June through August. The intention was for the lead farmers to communicate this information to their respective farmer groups, who would then use it to prepare for and better adapt to various agroclimatic shocks and stresses. While the production of the text messages would remain the responsibility of the government alone, the PAHAL team believed these messages would complement their trainings on improved agricultural techniques, potentially enhancing adoption rates and effectiveness.

Assessment

Objectives

The initial objective of this assessment was to understand the perceived impact of AMIS on the actions of farmers in the pilot area. During the preparation stage, the team broadened the scope of its assessment to include the wider climate information system (of which AMIS is one part) in the three districts. That is, the team decided not only to assess the efficacy of the AMIS SMS pilot, but also to consider the other sources of climate information that reach farmers, the related services and resources they need to take action, and the social, economic and political influences in the enabling environment. This would help overcome the challenge of attributing specific information to a certain source, while giving the team a more comprehensive understanding of needs and opportunities. The key assessment questions guiding this assessment were:

1) Is the climate information system – including the AMIS SMS pilot - working effectively in the PAHAL pilot area?
2) After receiving information from AMIS and other sources, how did farmers respond and what capacity building activities conducted by PAHAL were used?
3) How did farmers use weather information besides determining harvesting and planting times?
4) What technical capacities, resources and services are needed for farmers to successfully access and apply weather information to agricultural practices?

Nepal rural agriculture landscape in Rukumkot. Photo: Kristin Lambert / Mercy Corps. Rukum, Nepal. 2019.

Why is climate and weather information important for farmers' resilience?

Climate and weather information is a critical resilience capacity for farmers facing a variable and changing climate. When farmers have access to timely, accurate forecasts and the supportive services and resources necessary to take action, they can better prepare for and mitigate risks to their food security and livelihoods.

Methodology

The approach for this assessment was adapted from the Participatory Climate Information Services Systems Development Methodology (available here)[4] which is based on a bottom-up process of empowerment and inclusive stakeholder engagement. It aims to build understanding and relationships across a climate information system – from meteorological service providers to farmer end users – with the goal of catalyzing locally-led improvements that more effectively meet farmers' needs. The methodology consists of five stages, which were adapted to PAHAL's needs as described below.

[4] The Participatory Climate Information Services Systems Development (PCISSD) approach was developed under the USAID-funded Climate Information Services Research Initiative (CISRI), led by Mercy Corps. More details available athttp://climatelinks.org/resources/PCISSD-guide

Stage 1: Framing the System

The core assessment team consisted of the PAHAL Agriculture Manager, four members of the PAHAL Regional Agriculture team, and a Mercy Corps Agriculture Advisor from the Food for Peace-funded SCALE Award.[5] With the help of local program coordinators, the team selected assessment sites based on their accessibility, positive history of engagement with PAHAL, and the presence of local government representatives interested in AMIS (see Table 1). To allow for extrapolation of the results, the chosen sites are representative of the pilot areas within their districts in terms of terrain, crop systems, agricultural techniques, socio-economic make-up and exposure to agro-climatic shocks and stresses.

Table 1. Assessment Sites

District	Town(s)
East Rukum	Rukumkot
Surkhet	Neta Majuwa
Doti (KI Singh RM, Basudevi VDC)	Jhigabasti Dalla Charikot

This stage also included desk research on the AMIS system and conversations with national and local-level stakeholders to inform them of the assessment process and gauge their interest in participating in it. The team spoke with representatives from government and research institutions, local cooperatives and Local Disaster Management Committees (LDMCs), as well as mayors and community group leaders. This initial outreach – and the strong relationships PAHAL has fostered over the life of the project – helped ensure stakeholders' engagement in the stages that followed.

Stage 2: Preliminary Mapping

In this stage, the SCALE Agriculture Advisor led remote and in-person trainings for the assessment team on the methodology and process. They refined the tools for the PAHAL context and practiced facilitating the data collection exercises. This included drafting a preliminary climate information systems map (following the model shown in Fig.2, p.5) that reflected the team's initial understanding of the relationships between actors and identified critical knowledge gaps; this was adapted and expanded upon through stakeholder discussions in Stage 4. With inputs from PAHAL's senior leadership, the team finalized their research plan and confirmed stakeholders' participation.

Stage 3: Empowerment

The empowerment stage involved strengthening the ability of actors at all levels to contribute meaningfully to multi-stakeholder discussions on climate information. This stage differs in every context according to participants' needs, objectives and existing knowledge base. In this assessment, PAHAL was interested in participants' 1) awareness of the role and value of climate information; 2) ability to articulate their information challenges and needs; and 3) capacity to advocate for changes that would improve the system. Prior to this assessment, PAHAL had conducted several awareness raising events that introduced community members to terms and topics related to climate information. The team decided to conduct Stage 3 in parallel with the Stage 4 workshops, and to use workshop discussions as a means of assessing which messages stuck and which would need further reinforcement.

[5] The Food for Peace-funded Strengthening Capacity in Agriculture, Livelihoods and Environment (SCALE) Award is a five-year program that supports capacity strengthening and knowledge sharing across FFP's global portfolio of food security programs. More at: www.fsnnetwork.org/scale

Stage 4: Stakeholder Mapping

Stage 4 consisted of a series of tiered participatory workshops in which facilitators first gathered the perspectives of farmer end users on a climate information system (farmer-level workshops), and then pulled in decision-makers to reflect on, validate and respond to the users' challenges, needs and opportunities (municipality-level reflection and action planning workshops). Over a two-week period in April 2019, the PAHAL assessment team held four village-level farmer workshops and one municipality-level workshop in each of the three pilot districts, engaging over 100 farmers and 50 stakeholders. The team also provided updates to, and gathered inputs from, regional and national stakeholders including members of the DHM, MoAD and the AMIS office.

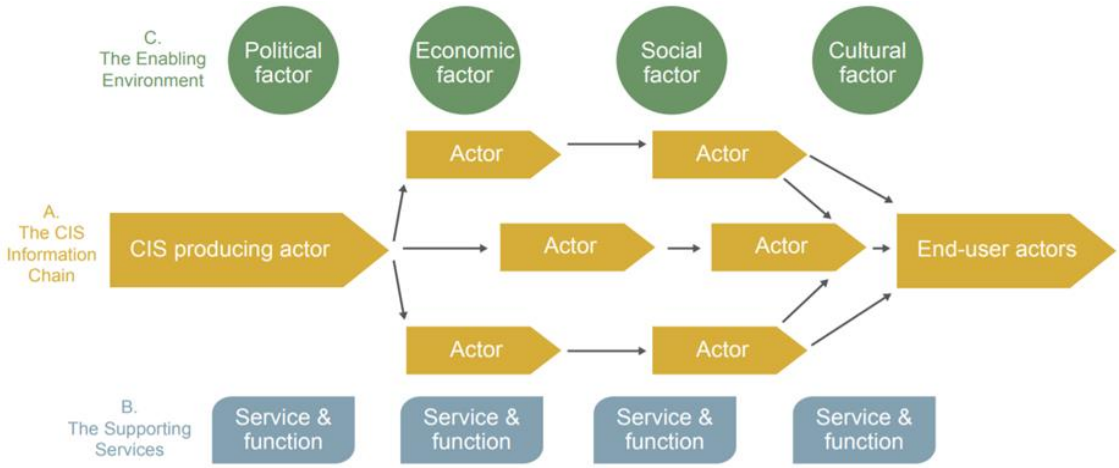


Figure 2: Climate Information Systems Mapping Model. Source: PCISSD Methodology, 2019.

Farmer-level Workshops

Each of the 12 village-level workshops (4 per district) consisted of 8-10 farmers, with separate discussions for men and women. Participants represented several farmer groups which were supported by different lead farmers. Facilitators guided farmers through a series of three activities:

1) The development of a **seasonal calendar** depicting key agricultural activities, shocks and stresses throughout the calendar year;
2) The drafting of a **systems map** displaying the flow of climate information between actors, factors in the enabling environment that impacted that flow and key resources and inputs needed to facilitate it (Fig.2);
3) And an **action mapping exercise** that visualized the capacities, resources and knowledge that influenced farmers' decisions to adopt certain agricultural techniques.

Municipality-level Reflection and Action Planning Workshop

Following the farmer-level workshops, the team analyzed the findings and summarized the constraints and opportunities. They then convened lead farmers, local-level government officials, mayors, DHM representatives, agriculture and livestock officers, agrovets, and the heads of farmer cooperatives and community groups for a workshop in each district consisting of the following activities:

1) Reflection and validation of the farmer-level findings and challenges;
2) Drafting of an ideal climate information system map that would address these challenges;
3) Identification of the skills, resources, challenges and opportunities related to implementing the ideal system; and
4) Development of an action plan for the short-, medium- and long-term.

Stage 5: Ongoing Learning and Adaptation

Stage 5 ensures that learning and adaptation is integrated throughout the whole assessment. From the initial trainings to the refinement of the tools and process, the assessment was adapted to ensure it would respond to PAHAL's needs. The team held post-workshop reflections sessions to assess how the discussions went; to reflect on the quality of the data gathered; and to tweak their agendas, timing and explanations as needed moving forward.

A community in Doti, one of the districts that participated in the AMIS pilot and assessment.
Photo: Kristin Lambert / Mercy Corps. 2019.

A Systems Perspective

While AMIS was initially the principal focus of this assessment, these exercises encouraged facilitators to look beyond the flow of information from AMIS alone for two reasons. The first is the challenge of attribution and recall. Tracing the origin of a particular piece of information from AMIS to a specific lead farmer and onward to a farmer (who could not know the original source of that information) would be difficult and unreliable, particularly given that nearly seven months had passed between the pilot and this assessment.

The second reason is grounded in the methodology, which is based upon the premise that to understand how an information chain is functioning, it must be assessed within a systems perspective. This requires looking at the full context within which a climate information system operates: the multiple sources of information that reach end users, the influences of social, political and economic factors, and the resources and services that enable access and use. Taking a systems perspective can reveal new connections, uncover influences from other information sources, and give a fuller picture of constraints and opportunities for improvement.

Findings

Information and data collected during the farmer-level focus group discussions was reviewed and compiled to create a summary of results, highlighting the major trends and key findings.

Seasonal Calendar (Farmer-Level)

The Seasonal Calendar exercise encouraged farmers to describe and visualize how seasonal changes shaped their agricultural tasks over the 2018 year. Each calendar depicted annual patterns for the following items:

- Rainfall
- Seasons Cereal and vegetable production (harvesting, weeding, sowing)
- Household food availability
- Household trends in income and expenditure
- Household health
- Crop pests and diseases
- Weather and climate-related hazards
- Livestock illnesses
- Household migration

Seasonal calendars followed similar patterns across all twelve farmer groups, with no major differences between those produced by men and women. Most participants grew rice, wheat, maize and potatoes the previous year, as well as a mix of summer and winter vegetables. The participants generally labeled the summer season from mid-May to mid-October, and the winter season for the remainder of the year. Most of the villages experienced the heaviest rain in June, July and August and had the driest period from October to December.

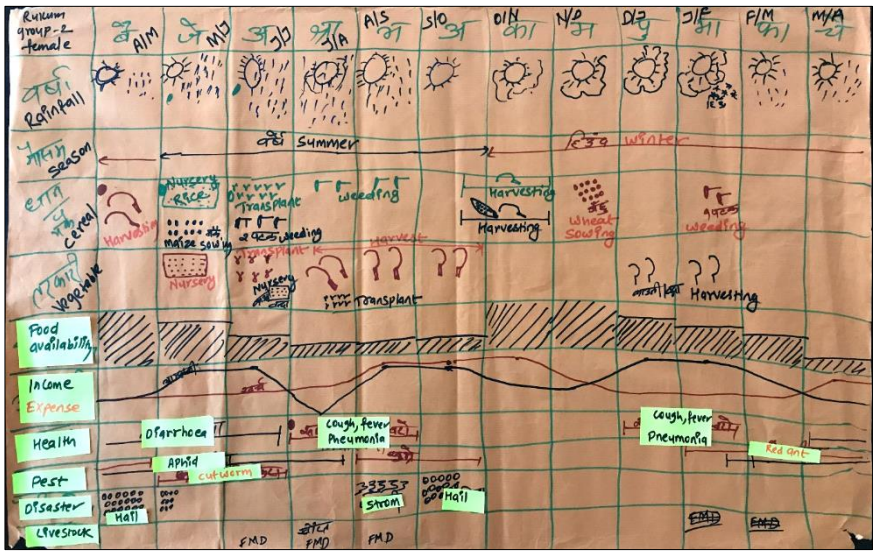


Figure 3: Seasonal Calendar, Rukum Women's Group #2. Photo: Kristin Lambert / Mercy Corps. 2019. AADD

Participants from every group lost production as a result of climate and weather-related incidents. Hailstorms and strong winds were the most damaging of these across all the assessment sites. Snowstorms, flooding and heavy rain also caused significant crop loss. In Rukum, farmers believed their households would have less food the following year because heavy snowfall and hailstorms damaged their winter vegetables and wheat. In Doti, farmers decided to leave some of their land fallow because of insufficient rain during the wheat sowing time; in Surkhet, the same conditions led farmers there to plant rice over a month later than anticipated.

Damage from crop diseases and pests was also significant, most notably from tuta leaf miners, potato blight, red ants, white grubs, and aphids. Many farmers lost some off-season vegetables, as well, due to moths and nematodes. Though less severe, livestock losses were also common. Farmers recalled incidences of pneumonia, foot and mouth disease and diphtheria in their cattle, as well as an unknown illness that caused the deaths of around 100 goats in Surkhet. In terms of household health, participants and their families experienced cases of viral fever, pneumonia, typhoid, and diarrhea, though these were not viewed as particularly severe.

The patterns of other household activities, such as migration, were similar across villages. Men left after the festival time for employment opportunities in Kathmandu, India or Dhangadhi, and returned before the start of the agricultural season. Household income flows tracked the agricultural season and were highest at harvesting time around April and November. Household expenditures also increased around this time due to the festival season. Participants said they did not typically store extra food or save money in anticipation of severe weather or a particularly lean agricultural season.

Climate and Weather Information Links

Many of the agricultural risks and losses experienced by farmers over the past year were perceived as directly or indirectly related to climate and weather conditions. The most damaging agricultural losses were caused by climatic events, which farmers thought to be increasingly harsh and frequent as a result of the climate crisis. Farmers also believed most of the crop pests and diseases, livestock diseases and human illnesses they experienced were linked to and exacerbated by periods of heavy rainfall, flooding or cold weather. In contrast, migration patterns, income levels and expenditure flows were not perceived as related to weather or climatic conditions.

Climate Information System Mapping

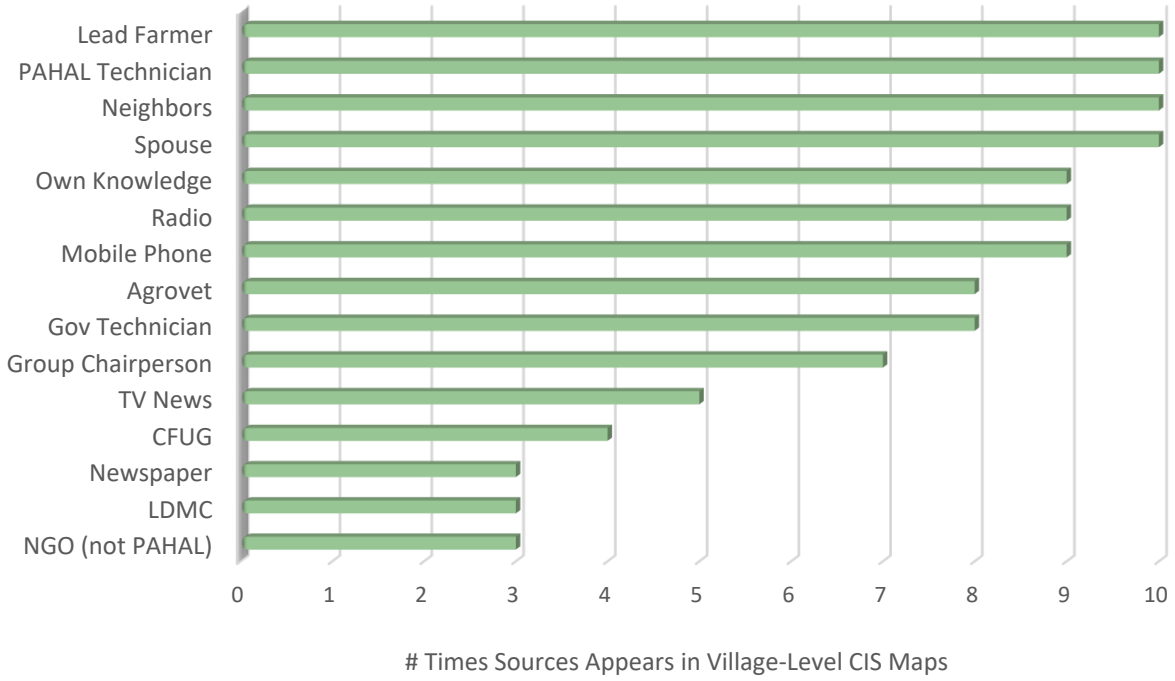
In the Climate Information System mapping exercise, participants described and visualized three key elements of a climate information system:

1) The **flow of information** between actors who produce climate information, the intermediaries who help communicate it and the ultimate users, including discussion on types of information received;
2) The **services and resources** that facilitate access, understanding and application of climate information;
3) Political, economic, social and cultural factors in the **enabling environment** that influence climate information dissemination, access and use in a positive or negative way.

Figure 4. Women farmers participating in an exercise that uses storytelling cards to identify the resources, capacities and knowledge communities need to act on climate and weather information.

Photo: Kristin Lambert / Mercy Corps. 2019

Figure 5: Sources of Climate Information. Diagram displays the most frequently mentioned sources of climate information, and the total number of times each source appeared across the ten CIS maps produced by farmer groups.



Information Sources and Flow

The ten maps produced by the farmer groups identified a total of 25 different sources of information, with an average of 12 sources per group.[6] There were no major differences between the number of sources identified by men and women. Figure 5 displays the information sources that appeared in at least three of the ten maps, and the number of times each source was mentioned. All ten farmer groups identified lead farmers, PAHAL technicians, neighbors, and spouses as key sources of information. Nine groups also noted their own knowledge, radio and mobile phone.

The information flows depicted on the maps typically extended to two or three sources away from the farmer (i.e.TV news to lead farmer to farmer, see Fig.6). Absent from the maps were the ministries and agencies that produce and disseminate climate and weather information, as these were not known to participants.

Participants also discussed the trustworthiness of various information sources. These discussions revealed an inverse relationship between the frequency of information received from a particular source and the trust participants placed in that source. The most trusted sources – including PAHAL, government extension workers, lead farmers, agrovets and radio – provided information irregularly. In contrast, spouses and neighbors exchanged information often, but were perceived as less reliable sources.

Types of Information

Participants typically received climate and weather-related information in PAHAL and government-led workshops and during visits from lead farmers. The advice varied, but often related to guidance on off-season vegetable production; trainings on improved climate-responsive techniques and pest management; and assistance with livestock vaccinations and treatments. Technicians would advise, for example, that winter tomato production requires a

[6] Due to weather conditions, the mapping activity was not completed in the second village in Surkhet.

plastic house to protect against cold snaps, and that certain vaccines would protect livestock against diseases that often occurred during the rainy season.

Some information varied by location. For instance, only farmers in Doti prepared a crop calendar the previous year because they received support from the USAID-funded Suaahara program that took place in their district. This was useful in informing some agricultural decisions but did not meet their needs for dynamic information as weather conditions changed. In Surkhet and Doti, farmers heard radio announcements that provided warnings and guidance about household illnesses, including the links between rainy periods, wastewater and disease. In all the sites, participants said rainfall information was available over the radio and/or TV but was limited to 3-day forecasts. Most often, farmers made agricultural decisions after conversing with and observing their neighbors. Decisions such as when to plant and what to plant were largely driven by self-knowledge. Hazards such as hailstorms arrived without warning, and most farmers said they had no prior warnings about crops pests and disease outbreaks; only the techniques for how to manage these problems after they arrived.

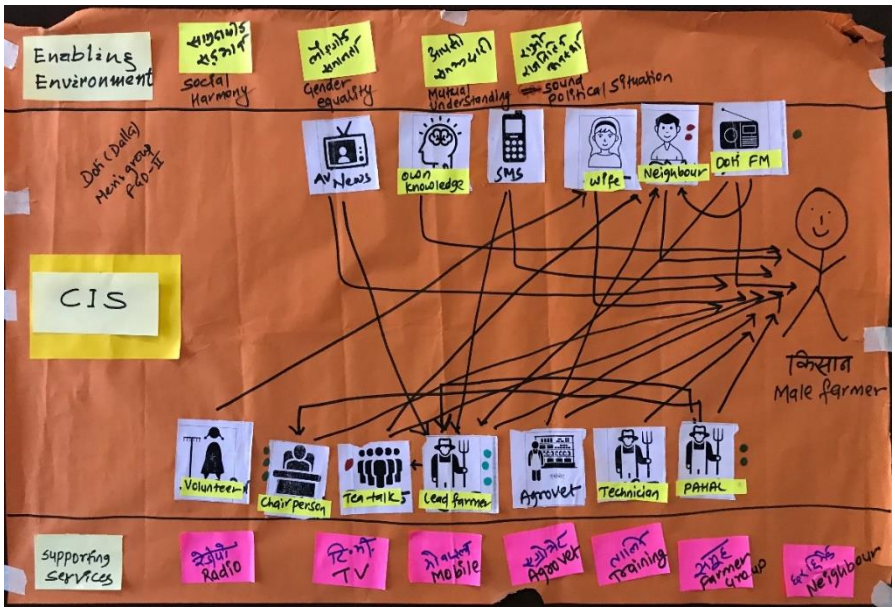


Figure 6: CIS Map, Doti (Dalla) Men's Group #2 . Photo: Kristin Lambert / Mercy Corps. 2019

Participants said they did not receive sufficient information to help them anticipate and prepare for the risks and hazards they identified in the seasonal calendar. The types of information most desired by farmers were seasonal forecasts, with advisories on how to prepare for the likely conditions; planting information for various crops; forecasts for major hailstorms, winds and heavy rains; and alerts about the likely occurrence and severity of crop pests and livestock diseases. With more advance information, farmers believed they could have taken precautionary measures to better protect their crops and livestock, such as planting and harvesting earlier, or stockpiling food or money before a particularly harsh season.

AMIS Reflections

As expected, most farmers were not specifically aware of the AMIS system or what information came from it. For this reason, the assessment team held additional interviews with lead farmers to identify AMIS-specific learning. These revealed some critical challenges concerning access, understanding and use of the system. Three lead farmers said they received AMIS messages, but were illiterate and thus unable to understand the messages or pass them along. Another lead farmer said her farmer group was suspicious of the messages because they were unsure who was sending them. They all had phones, so why was she the only one getting these messages? Others said the messages provided short-term forecasting information, which was somewhat useful, but lacked advice on how they should respond. Several lead farmers were unsure why the messages suddenly stopped. In one village, however, a lead farmer who had been part of the pilot downloaded and began using the AMIS app, which he said provided a fuller suite of advice.

Enabling Environment and Resource Challenges

Farmers noted a number of resource and environmental constraints that restricted the flow of information:

- **Weak Infrastructure:** Lack of electricity, unreliable mobile network, poor roads, limited TV and FM
- **Tough/remote geography:** Physical remoteness from resources such as Agriculture Knowledge Centers and markets. Poverty and financial barriers made travel even more difficult
- **Bias in information flow:** Insufficient number of lead farmers to cover their assigned areas, priority placed on the more easily accessible locations
- **Illiteracy:** Inhibits ability to understand text messages, books, newspapers, websites
- **Lack of Capacity:** Farmers need to know what information to seek out and how to interpret it; lead farmers and agrovets need the technical knowledge to advise them

Action Mapping

The Action Mapping exercise guided participants in identifying the skills, knowledge and resources that enabled or prevented them from adopting certain agricultural techniques. The PAHAL team chose to focus on five key techniques during this activity: use of improved seeds; jhol mol (homemade bio-pesticide); sprinklers or drip irrigation; plastic houses; and non- or reduced use of pesticides. The team selected these agriculture techniques because PAHAL carried out related trainings during the AMIS pilot and there was potential for AMIS agroclimatic information to influence their adoption.

Table 2. Action Mapping Exercise: Explanation of Agricultural Techniques Discussed

Technique	Icon	Explanation	Possible Link to AMIS
Improved Seeds		Seed varieties that offer higher yields, resistance to climatic challenges	Seasonal forecasting, warning of dry spells, drought, cold snaps
Jhol mol		Traditional, homemade bio-pesticide	Alerts of crop pest or disease outbreaks, rainy periods that attract pests
Non/Reduced Use of Pesticide		Chemicals for crop pest control (not recommended by PAHAL)	Alerts of crop pest or disease outbreaks, rainy periods that attract pests
Sprinkler or Drip Irrigation		Promotes water efficiency, supports off-season vegetables	Forecasts of dry spells, rainfall variability or drought
Plastic House		Protects off-season production; reduces temperature fluctuation	Forecasts of heavy storms, hail, high winds and cold snaps

Results of the Action Mapping are summarized in Table 3. Participants expressed a strong familiarity with all of the techniques, their applications and benefits. They attributed much of their knowledge and capacity to the trainings done by PAHAL and government workers, which had a clear influence on adoption rates. For instance, the vast majority of farmers chose not to apply chemical pesticides because PAHAL and lead farmers taught them about the damaging environmental impacts and recommended jhol mol as an alternative. In contrast, all of the farmers used improved seeds, which they learned about through PAHAL, government trainings, and another USAID-funded program called Suaahara.

Table 3. The capacities, resources, knowledge and constraints that informed adoption of agricultural techniques. Results from 109 farmer participants (Rukum: 36; Surkhet: 39; Doti: 34).

Technique	Adoption Rates			Capacity	Resources	Knowledge	Constraints
	Rukum	Surkhet	Doti				
Improved Seeds	100%	100%	100%	PAHAL, Lead Farmer (LF), Gov Training, Suaahara	Seeds, Money, Tools, Manure, Agrovet	Radio, Own Knowledge, PAHAL, Gov, Neighbors, LF	None noted
Jhol Mol	42%	0%	68%	PAHAL Training and Workshop	Livestock Urine, Drum, Tools	PAHAL, LF	Tedious for small-scale production, can borrow or use pheromone traps
Non/ Reduced Use of Pesticide	0%	10%	12%	PAHAL Training	Money, Agrovet, Personal Protective Equipment	PAHAL, LF, Own Knowledge	Farmer didn't apply because of negative impacts
Sprinkler or Drip Irrigation	74%	69%	19%	Agrovet, PAHAL Training, Demo Site, Home Visit	Money, Water, Agrovet, Cooperative Loan	PAHAL, Newspaper, Neighbors, Own Knowledge	Drip too expensive for some
Plastic House	50%	15%	26%	PAHAL and Gov Training, Workshop, Home Visits	Land, Money, Cooperative Loan, Tools, Agrovet, Seeds Manures	PAHAL, Gov, Neighbor, Radio, Own Knowledge	Lack of land, expensive, no markets, use nursery tunnels instead

The discussions also revealed the complementarity between PAHAL's agricultural support and other interventions. Farmers noted how they used loans from cooperatives to purchase some of the more expensive materials required for drip irrigation and plastic houses. Notably, climate information did not influence farmers' decisions to adopt any of the techniques. Even though farmers were aware of how the practices were beneficial given certain climatic conditions, information on climate and weather did not independently inform farmers' actions. This was likely due to the lack of available information as well as the presence of other barriers to adoption.

For the plastic house, for instance, farmers were aware of how to make them and why they were useful. However, plastic houses require a plot of flat land, labor and resource costs that are higher than many can afford. In the absence of accessible markets, most farmers only produced for their own consumption and felt an investment in a plastic house was not worthwhile. Farmers were likewise aware of how to prepare jhol mol and knew that it was effective against certain crop pests. However, many farmers were reluctant to use it because they felt the hassle and time would not pay off given their small levels of production.

Municipality-Level Workshops

The three municipality-level workshops in Surkhet, Doti and Rukum brought together a range of stakeholders to reflect on and validate the farmer-level findings, and to create an action plan for improving the climate information system, including AMIS. The stakeholders that participated in these workshops included: local government representatives, representatives from the DHM, lead farmers, agriculture and livestock officers, agrovets, members and heads of farmer cooperatives, LDMCs and Community Forest User Groups (CFUG).

Government Restructuring and DHM Improvements

A critical issue of discussion throughout the workshop was how the climate information system and other farmer services would best function under the newly restructured Nepali government system. In the original AMIS dissemination plans, climate information was intended to reach farmers via three channels: lead farmers, LDMCs and the District Agriculture Development Office (DADO), which funneled the information to farmers through service centers. In the restructuring process, DADO was eliminated and replaced by Agricultural Knowledge Centers (AKCs), each of which will support two districts. As the AKCs are getting established and staffing up, farmers in the AMIS implementation area have been short one critical source of information. Participants agreed that capacity strengthening for the AKC office will be critical to ensuring it can effectively communicate and interpret climate information. In addition, it will be critical for the government to formalize how information should flow across the relevant ministries and agencies and to clarify actors' roles and responsibilities.

Participants also discussed some of the changes underway at DHM. At the time of the workshop, AMIS was covering 26 districts in Nepal, reaching 35,000 users via SMS texts, and broadcasting agrometeorological advisories in the 26 districts via radio. The government hopes to scale up AMIS to reach the entire country and has plans underway to deepen DHM's technical capacities. As was mentioned in the farmer workshops, DHM confirmed it is currently limited to providing 3-day forecasts. However, they recently installed three new radars which will cover the whole country and enable DHM to expand to 7-day forecasts. Over the next two years, DHM hopes to begin providing weekly and seasonal forecasts, with greater precision and longer-term forecasting for matters such as rainfall amounts, crop humidity, pests and diseases. AMIS plans to provide capacity strengthening to support this process, with a focus on training local extension agents and junior agricultural officers on to interpret and deliver information to farmers.

Figure 7. Ideal CIS Map, Municipality Workshop, Surkhet. Photo: Kristin Lambert / Mercy Corps. 2019.

Systems Mapping and Action Planning

During the workshop, participants drew their own CIS systems maps, expanding on those at the farmer-level and adding in elements that would improve its functioning in response to the farmers' feedback. Figure 7 shows the ideal systems map developed in Surkhet. At this workshop, a representative of DHM joined the conversation, leading to a more complete mapping that encompassed various producers and disseminators of climate information within the Nepal government. Key elements to note include:

- The addition of a Province Emergency Operation Center, a District Emergency Operation Center, a Regional Climate Office, and a ward-level Early Warning Task Force
- A major role for representatives within the Municipality and Rural Municipality (RM) as primary coordinators and intermediaries across the information chain
- Agricultural Knowledge Centers serving as an important hub for disseminating and interpreting climate and weather information directly to farmers at the village level
- An emphasis on increasing accessibly of the DHM website and through a roll free number

Participants then discussed opportunities to improve the CIS system in the short, medium and long term. Table 4 shows these activities and the lead agencies, with a tally showing which municipalities marked each action as a priority. Of note is the key responsibilities placed on the Rural Municipality as a critical coordination body. The plans emphasize 1) widening dissemination through radio, Farmer Field schools and farmer trainings; 2) institutionalizing climate information in strategic plans and documenting of the proper information flow; and 3) deepening knowledge and awareness of climate information across all stakeholders.

Table 4. Municipality Action Plans + Priorities					
Short Term (1-3 months)					
Activity	**Lead(s)**	**Surkhet**	**Doti**	**Rukum**	**Sum**
Prepare and share detailed report of the study	PAHAL	1	1	1	**3**
Broadcast climate and weather information with agricultural advisories through radio/FM	Rural Municipality (RM)	1	1	1	**3**
Hold regular farmer meetings to share AMIS and promote improved agricultural practices	Lead farmer (LF) and Agrovet	1	1	1	**3**
Raise awareness of climate information, and convene discussion on AMIS information flow	DHM	1			**1**
Prepare crop calendars based on forecasts	RM		1		**1**
Disseminate climate and weather-related information through Farmer Field schools	RM, Agriculture Section		1		**1**
Medium Term (3-6 months)					
Include program related to climate and agriculture information in strategic plans	RM, Ward Office, Gov-led Agriculture Sector Development Program	1		1	**2**
Convene a workshop with municipality-level stakeholders to discuss information flow	RM, Agriculture Section		1		**1**
Lead farmer training about information flow system and applied Ag activities	RM and stakeholders		1		**1**
Develop Climate Information Mobile Application	RM			1	**1**
Interaction program/awareness program	RM and Ward Office			1	**1**
Long Term (> 6 months)					
Policy and rules/regulation preparation and implementation for information flow	RM, DHM and relevant stakeholders		1	1	**2**
Establish province-level early warning task force and emergency operating center	RM in coordination with other stakeholders	1			**1**
Conduct study of climate change and recommend suitable types of vegetables and livestock	RM, in coordination with other stakeholders	1			**1**
Explore potential partnerships with private sector to enhance information flow and reach	Private sector partners with donor projects			1	**1**
Develop curriculum on climate information for use in primary schools, so children can educate parents	Local level stakeholders			1	**1**

Analysis

Is the climate information system – including the AMIS SMS pilot –working effectively in the PAHAL pilot area?

The climate information system, including the AMIS SMS system, is not working effectively in the pilot districts. There was no indication that during the months of the pilot, information on weather and agro-climatic conditions was more available to farmers than in previous years. The key reasons for this fall into two categories: 1) farmers' lack of consistent access to information, and 2) the kind of information most needed by farmers to manage shocks and stresses is not currently provided by DHM.

On the first point, barriers to accessing climate information were noted at multiple points in the communication chain, and related to weak infrastructure and insufficient communication technology, trust, lack of knowledge around climate information and illiteracy. Access challenges were also exacerbated by the physical remoteness and geography of the hill communities in the Mid- and Far-West, which limited lead farmers' ability to reach their villages and may have led to prioritization of more accessible locations. As anticipated, farmers were unable to attribute any particular information to the AMIS system. However, given that the lead farmers interviewed in this assessment were unclear on the pilot's intention and noted challenges receiving, interpreting and sharing the messages with their groups; it is unlikely many of the AMIS SMS messages ultimately reached farmers

Some of these challenges could have been overcome by improvements to the roll-out of the PAHAL pilot; for instance, by including a stronger communication and awareness raising campaign around the pilot's intention and the value of climate information. In addition, outreach might have improved if PAHAL had registered additional people to receive AMIS texts rather than solely focusing on lead farmers. In fact, in the areas where the government is implementing AMIS outside of this pilot, they have bundled AMIS services with a range of complementary training and awareness raising activities and distributed the messages via multiple channels. The efficacy of these additional efforts in the overall AMIS areas warrants further study so best practices can be replicated.

Yet, even with an improved rollout, the effectiveness of AMIS – and the climate information system of which it is a part – would still be constrained by underlying challenges with the government's technology, capacity and communications. Currently, the technological capacity of the DHM is limited to three-day forecasts and lacks the ability to produce precise, localized data. The DHM is unable to predict many of the major shocks and stresses identified by farmers in this assessment, such as hailstorms, floods, crop pests and diseases. AMIS, and any other climate and weather information sources that rely upon DHM data, are likewise constrained in their ability to meet farmers' needs not only in the pilot area, but throughout the country.

After receiving information from AMIS and other sources, what were farmers' responses and what capacity building activities conducted by PAHAL were used at that time?

This assessment did not find evidence of farmers' use of AMIS. However, farmers did speak of the way that agroclimatic information was woven throughout PAHAL's trainings, workshops and in visits from lead farmers. This information was not predictive (like forecasts) but rather was part of the discussion and guidance on climate-responsive agricultural techniques, such as the use of improved seeds and plastic houses in response to cold snaps or dry spells. In addition

to PAHAL-supported trainings, farmers also received training and guidance from government agricultural agents and government-funded agricultural programs, as well as the USAID-funded Suaahara program.

How did smallholder farmers use weather information besides determining harvesting and planting times?

This assessment found little evidence of the use of weather information by smallholder farmers. However, farmers made the association between certain weather and climatic conditions and the shocks and stresses their households experienced over the previous year. For instance, farmers connected rainy and cold periods to spikes in the occurrence of certain human and livestock illnesses, as well as the spread of certain pests. With more advance notice of changing weather conditions, farmers might be more prepared and motivated to take precautionary measures that would limit the impacts of these events. In addition to informing harvesting and planting times, farmers had a need for information about seasonal forecasts and the likelihood of extreme weather, which could inform whether farmers stockpile food and save money ahead of a bad season.

What technical capacities, resources and services are needed for farmers to successfully access and apply weather information to agricultural practices?

Weather information alone did not influence farmers' agricultural practices, due to the challenges in access and content stated above. However, discussions with farmers revealed the critical influence that trainings and capacity-strengthening can have on farmers' decisions about which techniques to adopt and where to invest their labor and money. Technical capacity and knowledge were necessary but not sufficient in itself to encourage adoption of improved agricultural practices. Farmers' access to markets, financial resources, land and agrovets also determined adoption rates, particularly of techniques that demand more time, labor and upfront costs. For instance, PAHAL's support to the development of cooperatives was instrumental in allowing some farmers to take out the loans that allowed them to cover the costs of plastic houses and drip irrigation.

Figure 8. Women farmers on a ledge overlooking the high hills of Western Nepal participate in a seasonal calendar exercise with assessment facilitators. Photo: Kristin Lambert / Mercy Corps. 2019.

Recommendations

The findings from the AMIS pilot assessment point to four key areas that must be enhanced to improve the accessibility and utility of climate information in the pilot area: Redundancy, Awareness, Partnership and Integration.

1. Enhance Redundancy

The AMIS pilot fell short of achieving its potential impact in part because SMS texts were only directed to lead farmers, who are overextended, have high turnover rates and are frequently unable to access their remote communities by road or by phone. In addition, some lead farmers have low literacy and struggled to understand and communicate the messages. Other sources of information, such as government extension agents, PAHAL staff and the radio gave useful but infrequent information that was insufficient for meeting the needs identified by community members. As a result of these multiple barriers, many of the AMIS texts – as well as other potential sources of climate information – did not reach the intended farmer recipients.

This situation could be improved by enhancing redundancy – that is, increasing the number of trusted channels through which information might flow to remote communities. By widening the delivery of climate information to additional sources, more farmers are likely to hear and benefit from the advisories, especially as they become increasingly accurate and precise with DHM's improved technology and capacity. Through this assessment, participants identified a number of these potential channels. Agrovets, in particular, were identified as a critical channel through which agro-climatic information and recommendations can be transferred. Most of the villages that participated in this assessment had access to at least one agrovet in their community, who could not only serve as a source of information, but also provide the resources farmers might need to take action. Other important nodes included the heads of farmer cooperatives, local radio stations, government extension agents and Agriculture Knowledge Centers.

Greater collaboration among government and NGO-led programs is also necessary to achieve redundancy within the climate information system. In this assessment, participants perceived that a lack of coordination across such programs has led to missed opportunities to share and reinforce agro-climatic forecasts and advisories. Given the challenges in regularly accessing some of the pilot communities, it is essential that all resource persons (from NGOs to government extension agents) be working from the same playbook and reiterating common messages through trainings, Farmer Field Schools, and other relevant activities.

It is recommended that working groups on climate information be formed within each municipality, consisting of both government and NGO partners. This could be coordinated through a new government Climate Office within the Rural Municipality, with strong links to DHM and the head AMIS office. This Office would ensure local level stakeholders meet regularly to discuss forecasts, standardize the agroclimatic messages and advisories they roll out in their communities, and work together on addressing common communication challenges.

2. Raise Awareness

NGO and government partners must also work together on a coordinated effort to strengthen capacity and raise awareness of the importance and value of agro-climatic information. This is a need for all stakeholders along the communication chain, from farmers to local leaders and community organizers, and must go hand-in-hand with efforts to enhance redundancy. In other words, NGOs and governments must ensure key community sources are not only

registered to receive climate information, but also that they are capable of interpreting it, and equipped to accurately disseminate it to others. For example, if agrovets become key points of information dissemination, they must also be aware of which supplies and inputs they should stock so that farmers can take appropriate action. If more radio stations begin to disseminate agroclimatic forecasts and advisories, those journalists must also be equipped with the terminology and basic understanding to effectively communicate those messages and the appropriate responses.

Many participants also said they do not know what information to ask for, and were unsure of issues like determining risk and probability when it came to forecasts. They wanted more information of the likelihood of certain events occurring, such as the outbreak of a crop pest or disease, and they wanted these messages to come with clear directions on how they can prepare for and mitigate negative impacts before a shock or stress occurs. As the capacity of the DHM grows to deliver more precise and longer-term forecasts that address these needs, the needs of farmers to understand, interpret and use those messages will also grow. This awareness raising and educational campaign will thus need to be ongoing, iterative and responsive to the evolving context.

3. Deepen Government Partnerships

The flow of climate information within the restructured government must be clarified and strengthened so that local government can play a stronger dissemination and advisory role. The Rural Municipalities, in particular, must assume greater responsibility for ensuring the communication of advisories from the DHM and AMIS to the farmer level, and preparing Agricultural Knowledge Centers to become robust resource centers for farmers. NGO programs like PAHAL can be essential partners in supporting this process with their convening abilities, technical expertise and insights on the needs and activities of their respective farmer communities.

A closer relationship with the government would also clarify what AMIS is providing and when. At the beginning of the AMIS pilot, many members of the PAHAL team lacked a clear understanding of precisely what information AMIS would provide to farmers, how frequently it would be delivered, and what advice would be paired with the forecasts. This led to missed opportunities to intentionally fold AMIS information into other program trainings and activities that would have helped farmers to understand what actions to take in, and what resources were required in response to different forecasts.

There are multiple ways PAHAL could partner with government stakeholders to enhance the efficiency and effectiveness of AMIS:

- **National level:** Attend and contribute to weekly meetings during which NARC and AMIS interpret DHM forecasts and develop advisories for communities. PAHAL could contribute technical agricultural advice; share feedback from community members on the utility and accuracy of previous messages; and ensure their program trainings are responsive to the forecasts and advisories. The PAHAL team also has a role to play as an intermediary between farmers and DHM and AMIS, helping them to prioritize the key challenges farmers face on the ground and the kind of information that would be of most use to farmers, as DHM's capacity to provide this information grows.
- **Municipality level:** Given the government restructuring and the DHM improvements underway, this is a critical time to focus on creating a robust information communication chain and identifying the most effective channels to reach farmers, particularly in remote areas .Programs like PAHAL could play a role in convening or facilitating conversations amongst different government

stakeholders on what an effective flow of information would look like from the national to the local level, and what changes are needed in the enabling environment to facilitate this (policies, regulations, etc.). There is also a need to work closely with the Rural Municipality to ensure staff have the capacity to assume greater responsibilities for disseminating and communicating climate information and coordinating with AKCs to provide robust support to farmers.

- **Government Extension Agents:** PAHAL can help to ensure that government extension agents are engaged in the same trainings and capacity strengthening events as PAHAL-supported technical staff and lead farmers, so that their approaches are aligned, and they are actively sharing and learning from one another's experiences.

4. Integrate with Other Program Activities

Climate and weather events have the potential to impact multiple facets of communities' lives. Participants in this assessment linked cooler and wetter conditions to crop pests and disease outbreaks, as well as human and livestock illnesses. They drew connections between climatic shocks and the need for financial savings and food stockpiles. Programming should reflect these interconnections by ensuring climate information is not only integrated in farmer groups, but also in savings groups, women's cooperatives, health campaigns, and livestock associations. Households participating in these initiatives need to be prepared for agroclimatic impacts across sectors and aware of how they can leverage their various group resources in a holistic manner that protects their food security despite the risks.

Integration with savings groups and markets is also particularly important. A lack of money was one reason that so few participants chose to invest in plastic houses. Through cooperatives, farmers could be saving toward this purchase, especially if the forecasts point to a particularly cold or damp season. The inaccessibility of markets, as well, was a key constraint to participants enhancing their production and adopting improved agricultural techniques. The promotion of market access, alongside improved techniques informed by climate and weather information, could make a meaningful contribution to household incomes and food security. Lastly, programs should take care to consider the whole array of local, government and donor-funded programs operating in the area to ensure complementarity between activities and to enhance opportunities to spread and reinforce agroclimatic advisories to remote farmers.