# Combining indigenous knowledge with meteorological expertise

**In order to address the challenges climate change is posing, we have to make use of the traditional knowledge of local communities. Nowadays, this requirement is hardly ever missing in international agreements. Nevertheless, it is seldom implemented in practice. However, there are exceptions, as the examples of the Borana people from Ethiopia and the Acora communities in the Peruvian Andes show.**

**By Ana Maria Vela, Maruja Gallardo, Abarufa Jatani, Duba Tedecha, Meron Wubishet and Jane Carter**

Boru Malicha, a traditional forecaster in Ethiopia. Traditional forecasters include in their predictions not only the expected rainfall, but also the likelihood of disease outbreaks and of conflicts.

Photo: Jane Carter

Indigenous Peoples living in semi-arid parts of the world are amongst those with particular reason to be concerned about the impacts of climate change. For them, it has always been a challenge to manage water resources and maximise the use of scarce rainfall, and they have learned ways to do so. Yet in some cases, the indigenous knowledge acquired by peoples over centuries of experience and observation is being overtaken by unpredictable and intensifying new climatic patterns. What can be done to ameliorate such situations? This article explores two initiatives with indigenous people in Ethiopia and Peru that seek to combine their detailed local knowledge with meteorological expertise. As a result, accurate, readily accepted predictions of weather in key seasons are possible; responses can then be planned accordingly. The Ethiopian project works with the Borana pastoralist people of Borana region in the southern part of the country. The Peruvian project works with the indigenous Aymara-speaking and Quechua-speaking peoples of the Acora district in the Andes – peoples who trace their origins to before the Incas.

## The Borana people

The Borana people are traditional pastoralists who have been living in the area that they currently occupy, most of which falls within the boundaries of present-day southern Ethiopia (Oromia region), since at least the 13th century. The area is characterised by open savannah grassland dotted with scattered thorny trees and scrubby vegetation; raising livestock, predominantly cattle, is an occupation well suited to such conditions. With an average annual precipitation of 500 to 700 mm, and rain falling in two main rainy seasons, water resources are limited. In response, the Borana developed a traditional system of pasture and water resource management that treats both as common property, subject to clearly defined rules determining access to and use of predefined dry-season and wet-season rangelands. Timed livestock movements ensured that, overall, pastures maintained good grasslands, thorny bushes were kept in check, and animals remained nourished throughout the year. Meanwhile, a system of shallow ponds (*haroo*) and deep wells (*elas*) served both domestic needs and for watering animals, with the former being used first, during the dry seasons, and the deep wells later, when other sources had dried up. While occurring from time to time, droughts were manageable.

The traditional management system of the Borana has been enforced over the years by respected elected elders, all men. However, circumstances are changing. One factor is the intervention of the Ethiopian government, which has its own administrative system and has brought development interventions such as borewells and ideas for agriculture in enclosed areas, and has encouraged sedentary settlements. Another factor is the growing population of people and animals. A third and crucial factor is the changing climate. Temperatures are mounting, rainfall is increasingly erratic and unpredictable, and droughts are becoming more common.

*"We are a pastoralist community, and drought is a part of our life. In my lifetime, we used to experience drought once in every gada [eight years]. But now it is repeating within the gada period. We would usually have three to four years of good rains to fully recuperate, and in the earlier droughts, the calves and heifers survived, so we saved the core breeding stock. But currently, even the young and strong animals are starting to die, threatening herd regeneration. And that is unprecedented."*

Aba Kubsa Kuroftu (aged 51),
pastoralist, Gayo kebele, Borana

## Indigenous Acora communities

Shaped by the Andean high-altitude environment with an average altitude of some 3,800 metres above sea-level, the indigenous Acora communities specialise in tradition-

al crops such as potatoes, quinoa, and other Andean grains, along with pastoralism based on sheep, cattle and camelids. Their agricultural practices reflect a commitment to tradition but also their adaptation to the diverse ecosystems within the Acora, which is divided into four zones: Lake, Middle, High and Cordillera (mountain).

In the highest zones, the breeding of South American camelids predominates, making water resource management and pasture coverage crucial. The grazing of alpacas and llamas rotates according to the dry and rainy seasons; to higher ground during the latter, and to lower areas, especially wetlands, during the dry season. Additionally, grazing is rotated between different areas, the restoration of the native grasses being ensured by the creation of enclosed fields using fences of mesh, stone or wood. Communities are aware that these native grasses, unlike cultivated ones, contain higher nutrients. Once the grasses are restored, they are propagated in other areas.

Luzmila Mendoza plants seed in her land, after making furrows in the soil and turning it over, which are traditional practices deeply rooted in Andean family farming.

Photo: Claudia Pancaya

In the middle and lakeside areas, crops resistant to poor weather conditions, such as cañihua (*Chenopodium pallicadicaule*, an Andean grain), are often cultivated. Preferred crops like potatoes and quinoa are only planted when communities observe positive bioindicators. For example, the very yellow flowering of the karihua or q'ariwa (*Senecio clivicolus*) signifies a good planting year. Without such flowering, communities generally decide not to sow and to wait for a better year. In the four zones of the district, livelihood changes are evident. A 13-year period of insufficient rainfall has severely impacted agriculture, reducing water availability for livestock breeding. The National Service of Meteorology and Hydrology of Peru (SENAMHI as per its Spanish name) forecast below-average rainfall until March 2024, with extended dry periods and rising temperatures in the southern region. Temperatures since early October last year have ranged from 20 °C to 24 °C, against a previous average of around 15 °C.

## Traditional ways of forecasting the weather

Amongst both the Borana and the Acora indigenous communities, there has always been a need to adapt to prevailing weather conditions; accordingly, means of forecasting have been developed. These represent an important part of the traditional belief system of both the Borana and the Acora peoples and are generally based on detailed observations made at a local level.

Amongst the Borana, there are certain men who are recognised to have specialist knowledge in weather forecasting. They generally specialise in one of three different techniques, although some use all three. One technique focuses on astrological indications in the night sky, another entails observing the patterns of animal behaviour, including different bird songs, whilst a third technique is based on an examination of the entrails of slaughtered animals. Some particularly senior elders also try to relate forecasts for the coming season with past events. Whatever their method, the forecasters generally reach agreement – with specific predictions for each of the five traditional agro-ecological areas recognised by the Borana. Traditional forecasters include in their predictions not only the expected rainfall, but also the likelihood of disease outbreaks and of conflicts. They thus provide a rounded picture of the immediate future through their eyes.

Indigenous communities in the Acora region also have ways of anticipating the weather, which they integrate into agricultural or livestock-related decisions. For instance, if the liquichu (or lequecho (*Vanellus resplendes*, a typical bird of the Andean region in Peru) places its eggs on the furrows of land accompanied by small stones and grass seeds, this is taken to mean that it will be a rainy year. Farmers decide accordingly about where to plant. In years of expected poor rainfall, they sow in the lowlands; if heavy rainfall is expected, they choose to cultivate along the slopes. Amongst the Acora communities, there is also the *Yatichiri*, "the one who knows and teaches, educates or instructs". Typically, such a person is a community member who has recognised first-hand knowledge of farming in the local agroclimatic conditions. The *Yatichiri* traverse their community, teaching and providing advice, which is often based on ancestral practices. One example is the excavation of small *qochas* (earthen ponds) to expand wetlands, preparing for years with pronounced droughts.

Especially in the high-altitude areas where there is little or no radio or social media coverage, indigenous techniques have prevailed until very recently. Yet collective and individual knowledge of past weather patterns is no longer enough to make accurate forecasts for the future, as commented by Aldo Coila, a community member active in the PGA (see page 30):

*"We have knowledge of ancestral wisdom. For instance, if the fox cries in the months of September or October, it signifies a good year. Another example is the season when sancayos [Corryocactus brevistylus] bloom, used for deciding cropping patterns. We look at all these things to make predictions," he says. However, he adds that times have changed: "In the past, when the sancayo bloomed, we made a second planting, but now things have changed, and such indications are failing due to climate change. They fail, but not entirely."* (Alberto Ñiquen, 2021)

## Bringing traditional and scientific knowledge together

Both the Borana and Acora communities clearly recognise a changing climate and a need to supplement their own knowledge system with that of modern science. There is also benefit to modern science in listening to people who know their territory well.

In the case of the Borana, traditional forecasters and experts from the Zonal Meteorological Department are coming together in bi-annual meetings that take a Participatory Scenario Planning (PSP) approach. This is supported through the Swiss Agency for Development Cooperation (SDC) and funded by the Regional Livestock Programme (RLP), which is managed by Helvetas in collaboration with Welthungerhilfe and the non-governmental Ethiopian Institute of Peace and Action for Development. The PSP meetings are held before the expected long and short rainy seasons, and result in the detailing of a "most likely scenario" that is jointly agreed. That is, it combines traditional and meteorological knowledge. The scenario is then relayed to the communities, allowing them to plan accordingly. All key development actors in the Borana zone (13 woredas or districts) are invited to the PSP, to ensure that information is widely shared. Remarkably, in all the PSP meetings held to date, there has been broad agreement between the predictions of the traditional forecasters and the government meteorologists. For example, after many years of very poor rainfall and extensive drought, both traditional forecasters and meteorologists predicted that the 2023 Hageya season (September – November) would be wet, with above average rainfall across the entire Borana zone. This is indeed what happened. The way in which the PSP predictions are used to formulate advisory messages is provided in the Table.

**Examples of advisory messages produced through the PSP in Ethiopia**

| Below average rainfall, leading to drought | Normal rainfall | Heavy, above average rainfall |
|---|---|---|
| • Careful management of pasture and water resources, reserving as much as possible for the dry months after the poor rainy season.<br>• Likely concentration of livestock in certain areas due to limited grass growth.<br>• Likelihood of livestock diseases arising from concentration of livestock and poor fodder availability.<br>• Crop cultivation only recommended for short season crops such as beans.<br>• Careful follow-up to initiate early warning of drought and any necessary humanitarian response. | • Pasture likely to be adequate for good livestock health; widespread livestock mobility over the entire Borana pastures.<br>• Fodder production expected to be adequate for dairy production.<br>• Crop cultivation recommended for a variety of crops, including vegetables, maize and teff.<br>• Floods possible in specific named areas. | • Flood-vulnerable settlements should be relocated away from low lying areas.<br>• Mobilisation of the community to harvest run-off; shallow pond construction and maintenance.<br>• Protection of deep wells from structural damage.<br>• Intensified farming with early crop sowing of early maturing species.<br>• Early delivery of farm inputs by concerned bodies.<br>• Road protection from run-off as far as possible. |

Amongst the indigenous Acora communities, similar initiatives have taken place, with the National Meteorology and Hydrology Service (SENAMHI) of the Peruvian Environment Ministry (MINAM) playing a key role in recognising and documenting indigenous knowledge linked to weather phenomena. In addition, an Agroclimatic Management Platform (PGA for its Spanish name) has been formed in Acora district. Established in 2022 and now in a second phase, the PGA model seeks to strengthen agroclimatic governance to improve agricultural productivity and competitiveness. The PGA brings together organisations from different sectors, civil society, academia and other public-private actors in the territory. It serves to give a voice to small farmers, to generate climate and agroclimatic information, and to provide technical assistance on cropping and livestock breeding that builds on indigenous knowledge and meteorological forecasts. A monthly agroclimatic bulletin is co-produced combining weather forecasts and local observations by farmers. It also includes technical recommendations for the treatment of crops and breeding, based on local knowledge. This newsletter is shared in the PGA's own WhatsApp group and is constantly nourished by local monitoring of farmers and active participation and dissemination in the district. To date, there are three PGA in Peru; the number is expected to grow to twelve platforms in the country by 2030.

In the case of the PGA Acora, implementation has been carried out by the SENAMHI Zonal office in Puno, local agencies of the Ministry of Agrarian Development and Irrigation (MIDAGRI), the Regional Government of Puno and the Municipality of Acora. The articulation between various national and local stakeholders to develop this initiative was supported by the SDC regional project Andes Resilientes al Cambio Climático, facilitated by the Helvetas-Fundación Avina consortium.

## Summing up …

These brief insights into combining traditional indigenous knowledge and scientific data in two very different parts of the world have a number of points in common. The first is that indigenous methods of weather prediction are generally rooted in minute, careful observations of the environment, the fauna and fauna. This knowledge of the local biodiversity and how it is changing is important to record. The second point is that anchoring state-of-the art scientific predictions within a familiar knowledge system can render it particularly accessible to the people who need such information. A third, and less positive, observation is that the position of traditional knowledge holder is often taken by older men, with the opinions of women being often overlooked or undervalued. Yet this can be turned constructively: introducing new sources of knowledge can be turned into an opportunity to promote inclusion and wider participation in decision-making.

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