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A New Dialogue : Putting People at the Heart of Global Development

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Communicating seasonal forecasts to farmers in Kaffrine, Senegal for better agricultural management

Our project explaining seasonal forecasting to farmers in central Senegal built common ground between scientific forecasting and traditional knowledge. It helped farmers understand and use seasonal forecasts to improve crop strategies, and let farmers explain to meteorologists what seasonal climate information they most needed, in turn improving the forecasts' usefulness.

Overview

Sahel is a place where climate is highly variable across many timescales. For example, the 1950s were very wet and farmers easily lived off their harvest. But a dry period followed in the 1970s, reaching its extreme in 1984. This affected most farmers, especially those living in Senegal's 'peanut basin'. Now we are experiencing a return to a wetter period but with new challenges: extreme wet and dry spells within seasons. In the Sahel region, more than 80 per cent of the population live off agriculture and pastoralism – and both of these depend on rainfall. This dependency affects food security, particularly when resources are scarce. And as climate change brings less predictable rainfall patterns, so it is more difficult for farmers' practices and knowledge systems to keep up with the rapid changes.

The next scientific report of the Intergovernmental Panel on Climate Change uses new scenarios of future emissions. In the new scenario RCP4.5 (a moderate scenario), the Beijing Climate Center's global circulation model projects a decrease in rainfall and an increase in temperature over the Kaffrine region in central Senegal in the 2020s. The likely increase in temperatures will create more evaporation, meaning more demand for water and more stress for the plants. Taking these scientific projections alongside local experiences of trends in climate, there is clearly a need for adaptation.

Interventions and impacts

Seasonal climate forecasts, communicated in accessible and meaningful ways to farmers, should provide invaluable knowledge for local agricultural decisions and livelihoods.

In Senegal, we are providing these through a multidisciplinary team of: farmers (unions and individual farmers); local extension workers; climatologists from the National Meteorological Agency; development workers from the Red Cross and from World Vision; agricultural advisers from the national agency for agricultural and rural advice (ANCAR); agronomists from the Ministry of Agriculture; an agroeconomist from the Senegalese Agricultural Research Institute (ISRA); and staff from the Climate Change Agriculture and Food Security (CCAFS) West Africa programme (which is run by the CGIAR Consortium).

The aim is to translate and communicate the seasonal forecast, and an indication of its probability, in easily understandable language, giving farmers the capacity to make informed farm management decisions. This is coupled with discussions on farmers' traditional forecast practices, providing space to share the different types of knowledge and so increase everyone's ability to make informed choices and good decisions.

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In the district of Kaffrine in central Senegal, agriculture is the primary economic activity. Although climate has varied a lot in the past 50 years, farmers don't use seasonal forecast information to cope with climate variability. We knew that to achieve our goal of a long-term partnership we would have to first build trust with the farming community. Scientific climate forecasts need to come together with farmers' own local knowledge of, and vocabulary for coping with, the climate. Inevitably there would be a language barrier as well as other communication challenges.

We started first by learning more about farmers' indigenous knowledge. We asked farmers to explain to us how they live with climate variability. Farmers have many ways of foretelling the climate, ranging from immediate rainy weather events to the behaviour of the season to come. For example, they recognise the approaching season by the wind changing direction, the appearance of stars shaped as an elephant, and by hot nights. Farmers predict a good rainy season from unusual appearances of snakes and frogs, a shooting star coming from a particular direction, or heavy rains preceded by strong wind and dark clouds from a particular direction. The end of the rainy season is announced by the appearance of dew and a higher sky.

Our approach was to listen and not to challenge, as this knowledge is a kind of legacy and heritage from farmers' forebearers. The signs are a mixture of coincidental events (such as shooting stars) and actual facts. For example, in West Africa the rainy season is related to the establishing monsoon – a warm and humid southwesterly wind that takes the place of the northerly dry and hot winds. Animals feel this change, including snakes and frogs.

J. Hansen (CCAFS)

As our overall objective was to find common ground and an 'entry point' to the community, we selected signs related to science to introduce our seasonal forecast approach. For example the wind direction change farmers describe is related to the monsoon, and we added that we have a satellite which allows us to monitor the monsoon all year round and as far away as the Gulf of Guinea. So forecasts can tell when it is likely to develop. We also use farmers' common sense understanding. People go to the beach during hot days even though both land and ocean are heated by the same sun. So there is something special about the ocean: it changes very slowly in response to air temperatures, and therefore influences the climate months after these changes occur. In fact, 'ocean heat memory' is the basis for seasonal forecasts.

We gradually introduced seasonal forecasting to farmers, always relating this new information to their existing knowledge. Farmers are familiar with weather forecasts on TV and were able to differentiate seasonal variation (climate) and day-to-day change (weather).

Main achievement and challenges

It was clear to us after our first contact that, through links to some of their indigenous knowledge and our forecasts, farmers started accepting our new forecasting system. One could clearly see it in their faces, their laughter and the questions they asked. They wanted to know more and could not wait to see the first actual forecast. One challenge though was the probabilistic aspect of the seasonal forecast: how to explain probability and its interpretation when making decisions?

We were lucky that this particular community believes firmly that only God can make things happen and that human beings are fallible. It was easy to explain to them our forecasting model: rain comes from clouds, clouds from water vapour, water vapour from ocean evaporation, evaporation is controlled by sea temperature. The higher the sea surface temperature, the more likely it is to bring rain; it is as simple as that. To throw in some uncertainties, we asked them: "If during some years some baobabs grow early leaves and others don't, what will that tell you for the upcoming season?" After a rumbling in the room,

Farmers discuss the probability of varying rainfall levels

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they started saying it depends how many baobabs grow leaves, which ones, and so on. It was enough for us that they understand that error is possible in their traditional approach. We added that this is true for us as well: some parts of the sea can warm while others cool, and it would be difficult for us to tell the forecast for sure, but the strength of warming will help us to decide with some confidence. Our forecast comes with some degree of probability.

We introduced the interpretation of probability by putting three black (dry forecast) rocks and one red (wet forecast) rock in one bag and asking them will they likely draw a red (wet) or black (dry) rock. Then we shifted the probability and put two of each.

We also mentioned all the different technical ways of presenting the forecast information: the interval of likely values, the tercile probability categories, the probability that a threshold temperature or rainfall will be exceeded (probability of exceedance), and ensemble forecasts (that try to account for known uncertainties). After a long discussion between farmers and the local extension workers who helped them to interpret the forecast, farmers decided the best way to present the forecast is the probability of exceedance, which seems for them more useable in terms of choosing the right crop variety.

Another challenge was tailoring our forecast for farmers' specific needs. Our main question is: what makes farmers choose a particular agricultural strategy? We formed four working groups and gave farmers a hypothetical forecast. We asked them, based on a high confidence in the forecast, what would they do differently in terms of agricultural strategies? We gave the four groups two dry and two wet forecasts. It turns out farmers were able to make good strategic crop choices and even challenged us on the difference between a good rainy season and a good cropping season. Rainfall total is important, but not enough, they said. They took things further, asking for more helpful information, which for them is the date when the rainy season is forecast to start. They told us this onset date is the most relevant piece of information in their decision system – so now the National Meteorological Agency can use farmers' preferences to tailor future seasonal forecast information for farmers right across Senegal.

Another challenge is the way we will get the forecast to farmers. We had an open discussion with the whole group and they recognised that rural radio is one way, but that the signal is weak when they are on their farms. Also, there are differences in how men and women get climate information – women often through personal contacts rather than formal channels. Overall, farmers wanted to have the information both from rural radio and through the agricultural extension agent who is permanently in contact with them. We chose the agricultural extension worker as our contact point and afterwards trained the rural radio journalist on climate forecasting.

Lessons

The main transferable lesson is the considerable scope for local knowledge and scientific knowledge to come together synergistically – both informing one other.

Farmers were able to develop adaptive strategies from climate information and choose a good strategy for dry and wet seasons.

A first evaluation of our partnership in the 2011 rainy season revealed that farmers who were given the seasonal forecast, (which was 'wet to normal' compared to the 'very wet' previous season), were able to plan better than farmers who did not receive any forecast and so simply adopted the previous year's strategy. In 2012 we gave them – as they specifically requested – a forecast of the onset of the rainy season, which helped them to be better prepared, and saved their harvest from the first rain.

The lesson is that the process of local knowledge learning from science, and science learning from local knowledge, is iterative. It is important to invest time in building trust and a mutually respectful learning.

Last, climate knowledge is not the only thing that matters to farmers. We had a discussion on our limits and the need to expand the collaborative working group to include fertiliser producers, seed suppliers and insurance providers.

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Traditional forecasting takes clues from the natural surroundings, like this village baobab tree

Further reading

■ Ndiaye O. *et al.* 2012. Using probabilistic seasonal forecasting to improve farmers' decision in Kaffrine, Senegal. In: Banaitiene, N. (ed.) *Risk Management, Current Issues and Challenges*, p497-504, Chap 21 DOI:10.5772/2568. ■ Meadu, V. 25 July 2011. *Putting climate forecasts into farmers' hands.* CCAFS blogs. See http://ccafs.cgiar.org/blog/putting-climate-forecasts-farmers-hands ■ Zougmoré, R and Ndiaye, O. 27 February 2012. *Following up on last year's climate forecast workshop - what happened next?* CCAFS blogs. See http://ccafs.cgiar.org/blog/following-last-year%E2%80%99s-climate-forecast-workshop-%E2%80%93-what-happened-next

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