

Info Note

The value and benefits of using seasonal climate forecasts in agriculture: evidence from cowpea and sesame sectors in climate-smart villages of Burkina Faso

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Key messages.

- Farmers with access to seasonal and daily weather forecasting change their cropping strategies as well as their labour schedule.
- Climate-informed cowpea farmers have greater yields and gross margins.
- Gains were less significant for sesame production. Further data collection during 2015 season may clarify this difference.
- Farmers are ready to pay a significant amount for climate forecast information.
- Large-scale dissemination of climate information can be a climate-smart investment if done in a cautious and proper manner.

This infonote summarizes initial findings of a project entitled “Impact of communicating seasonal climate forecasts to cowpea and sesame farmers in Yatenga region, North Burkina Faso” undertaken during the 2014 main agricultural season by scientists from the CCAFS West Africa programme and the Institut de l’Environnement et de Recherches Agricoles (INERA), Burkina Faso.

Sesame is a cash crop promoted in recent years to respond to a growing global demand. Quite versatile and produced across the country, yields remain low with an average of 300-350kg/ha. National production was estimated at around 60,000 tons in 2012, mostly for export.

Cowpea is a key legume crop, mostly cultivated by smallholder farmers in intercropping with cereals (95%). Yields are low (around 300kg/ha) while it could reach 1,500kg/ha in monoculture. Just a minority (5%) of farmers use modern inputs (improved seeds, fertilizer) and market their grain for the regional market.

This project aims at assessing:

- The effect of climate information services on farm productivity and incomes for cowpea and sesame farmers in the Yatenga region;

- Farmers’ willingness to pay for such climate information services
- Lessons learned for potential scaling up of communicating climate forecasts services in the cowpea and sesame sector as a way to improve farmer climate resilience and productivity.

Such studies are also being carried out in climate-smart villages in Senegal (Kaffrine region).

Study context and methods

In Sahelian climatic zones like in Yatenga region in Northern Burkina Faso, farmers are well aware of climate variability. The date of onset and offset of the rainy season as well as the distribution of rainfall along the growing season, significantly impact on their crop yields, and consequently on family incomes and food security.



Figure 1: Cowpea harvest - Farmers in Yatenga region, in North Burkina have to cope with erratic rainfall patterns, varying greatly every year. ©USAID/Elisa Walton

The ability to understand, monitor and predict the climatic variability is crucial for rainfed farmers to avoid crop failure. Climate change is further jeopardizing the livelihoods of millions of smallholder families in the Sahel.

The CGIAR research program on Climate Change, Agriculture and Food Security (CCAFS) is working with farming communities from climate-smart villages in five countries of West Africa (Burkina Faso, Ghana, Mali, Niger and Senegal). Indeed, since 2011, CCAFS has been developing the concept of climate-smart villages, as a way to adapt their agriculture to climate change. A range of climate-smart innovations is tested by farmers through participatory action research. And on top of these innovations, communicating seasonal climate forecast information to farmers is a promising option. This is being tested by farmers in Kaffrine in Senegal and Yatenga in Burkina Faso to help farm decision-making, optimize the potential of good years and minimize the losses during poor years.

Recent research on climate information for farmers in the region showed that seasonal forecasts can help improve farmers' incomes and lower the risk of poor harvests (Roudier, 2012). Previous experience in South West Burkina suggests quite modest economic gains for farmers (Dabiré and al, 2011). However, the picture of the value of seasonal forecasts for agriculture is still incomplete as its impact on the farm and agricultural sector depends on many factors including farmers' risk attitudes, insurance, policy environment and scale of adoption (Meza and al, 2007).

This study based on cowpea and sesame, two strategic sectors for Burkina Faso agriculture, brings complementary insights on this issue. It involved 170 farmers from 17 villages including 11 experimental villages exposed to climate information and associated agro-advisories through workshops and radio shows; and 6 control villages not exposed to climate information.

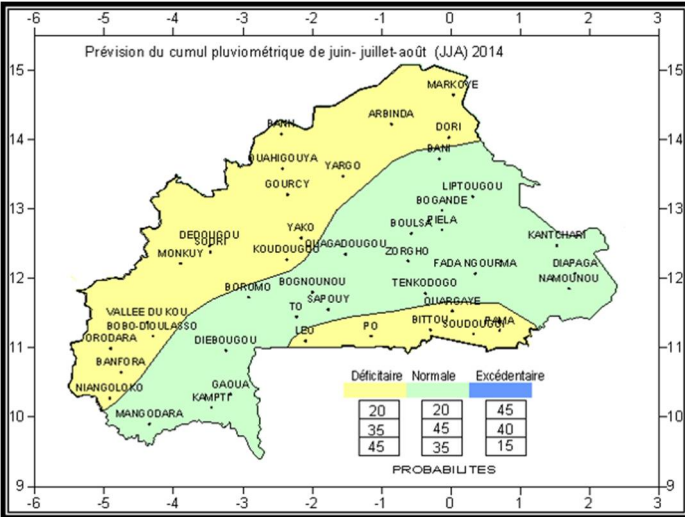


Figure 2: Example of climate information communicated to farmers: cumulative rainfall forecast for the period June-August 2014 © DGM/Baki Grégoire

Since 1998, the Climate Outlook Forum for West Africa known as PRESAO (*Prévisions Saisonnières pour l'Afrique de l'Ouest*) provides seasonal rainfall forecasts for the West African region including expected total rainfall for July-September and date of onset and offset of the rainy season. Using PRESAO's information and local meteorological data, a multidisciplinary team led by an agro-climatologist from INERA with experts from the *Direction Générale de la Météorologie (DGM)* of Burkina

Faso, local extension workers and agronomists, produced agro-met advisories specific for the Yatenga region.

Three types of climate information were communicated to farmers: downscaled seasonal forecasts, 10-day forecasts and daily climate information.

During a one-day workshop in June 2014, before the agricultural season, farmers were presented the seasonal forecasts and discussed about which adaptation strategies to implement. They also shared traditional forecasting practices they usually consider to adapt to inter-annual climate variability. Indeed, farmers in this region use various natural indicators from stars, trees, insects, birds, wind or temperature to predict how the coming rainy season will be (dry or humid, late or early). Ant migration from low lands to plateaus or a bounty production of shea trees are for instance good signs, whereas birds nesting in low branches of trees or fall of non-mature fruits are bad signs.

A second workshop took place in July to communicate updated climate forecasts for the period July-September.



Figure 3: Listening to the daily climate information radio show ©Francesco Fiondella

The 10-day forecasts as well as daily climate information were disseminated through radio shows. Each farmer from the experimental group (120 farmers) received a radio and a rural radio station (*La voix du paysan*) was contracted for climate information broadcasting. Farmers were also reached through the extension efforts from the cowpea and sesame value chain development initiative *Projet d'appui aux filières agricoles (PROFIL)*.

The impact of using seasonal forecasts on crop yields, farm inputs use, cost and profits was measured through an *ex-post* assessment method. The willingness of farmers to pay for such climate information was determined through a contingent valuation method (Terra, 2004).

Climate-informed farmers change their farming practices

Data show that farmers exposed to climate information change the way they manage their crops. A significant number of farmers use forecasts of the length of rainy season and date of onset to choose which crops and variety to grow, location (more humid low lands or plain) and size of plots. Over half the farmers selected crop variety (51%) and size of plot (56.5%) according to seasonal forecasts, in particular, the rainy season onset information.

Daily climate information was used for the day-to-day crop management such as choosing the date of land preparation, plowing, sowing, planting, fertilizing, hoeing, weeding, pest control, harvesting and threshing.

	Cowpea		Sesame	
	Exposed (n=49)	Not exposed (n=27)	Exposed (n=51)	Not exposed (n=22)
Area (ha)	0.23	0.20	0.34	0.31
Improved seed (kg/ha)	8.0**	1.2	8	8
Local seed (kg/ha)	18**	49	5	8
Total seed (kg/ha)	26**	50	13	15
Manure (kg/ha)	15	26	8	16
Fertilizers (kg/ha)	33	36	23*	1
Insecticide (l/ha)	2.58	3.46	1.1	0.5
Labor (man-days /ha)	166	178	104	111

* Significant at 10%; ** significant at 5% level.

Table 1: How climate information affects inputs use

The use of farm inputs and labour requirements are different between climate-informed farmers and non-exposed farmers. For cowpea, farmers exposed to climate information used half the total seeds (26kg/ha versus 50kg/ha), but significantly more improved seeds (8kg vs 1.2kg). For sesame, the main difference is the use of inorganic fertilizer (23kg/ha for exposed farmers versus a mere 1kg/ha for the control group). With this cash crop, farmers tend to invest more in fertilizer if they feel less uncertain about climate. Non-exposed farmers tend to use more labour too, for both crops.

Such results are not surprising as good use of climate information should lead to an optimal choice of the period of key farm activities (sowing, fertilizing and pest control).

Climate information can boost farm productivity and incomes

The data in table 2 show that cowpea producers exposed to climate information obtained higher yields (847 kg/ha

on average compared to 685 kg/ha for the control group), while savings in seed and pesticides led to lower input costs. Consequently, gross margin is much greater for climate-aware farmers (66% higher than the control group).

However, climate information did not bring the same economic benefits for sesame production. In fact, farmers exposed to climate information had slightly lower yields (550kg/ha compared to 605kg for the control group) and lower margins as they invested in more fertilizer without significant returns.

	Cowpea		Sesame	
	Exposed (n=49)	Not exposed (n=27)	Exposed (n=51)	Not exposed (n=22)
Area (ha)	0.23	0.20	0.34	0.31
Yield (kg/ha)	847*	685	550	605
Gross product (FCFA/ha)	99 876	96 925	426 220	538 087
Inputs costs (FCFA/ha)	43 706*	63 128	33 435	27 782
Gross margin (FCFA/ha)	56 170	33 797	392 786	510 075

* Significant at 10%; 1 US\$=500 F CFA.

Table 2: How climate information affects farm productivity

Climate-aware farmers are more willing to invest in modern inputs but then the financial risks are greater. It raises the question of responsibilities and compensation in case of unreliable forecast (Dabiré and al, 2011). Further investigations during the 2015 season will hopefully explain more about this difference of impact between the two crops.

Farmers are ready to pay for climate information

About 68% of farmers exposed to climate information accepted to pay for the seasonal forecast and 69% for the daily climate information. The observed willingness to pay (WTP) is about 7404 FCFA for seasonal forecast (it represents as much as 22% of inputs cost for sesame production) and 3441 FCFA for the daily climate information.

	WTP (%)	WTP observed (in Francs CFA)	
Type of information		Mean	Std. Dev.
Seasonal forecast	68	7404	19,209
Decadal information	42	1776	6,240
Daily information	69	3441	11,260
Agro-met advisories	48	2884	10,606

of valid farmers = 108; 1 US\$=500 F CFA

Table 3: How many farmers are willing to pay (WTP) for climate information and how much (in FCFA)

Conclusions and recommendations

The study showed that farmers exposed to climate information changed their farm practices based on the information they received, and that this translated into better management of inputs to increase their farm productivity and improve their resilience to climate variability.

The fact that the effect of climate information on sesame production was not statistically significant illustrates how the impact of climate information services is not straightforward and in some cases do not guarantee returns. This is because of the risk induced by climate variability in Sahel, and also the fact that yields and crop incomes depend on many other factors (e.g. quality of inputs).

Promoting climate forecast services cannot be disconnected with other climate-smart tools, including crop insurance so that farmers stay resilient while trying to gain productivity. Crop insurance helps protect farmers against unforeseen climate shocks (e.g. extreme drought) while seasonal forecasts allow farmers to mitigate predictable climate risks.

Further Reading

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Research implemented by :



This research brief is part of the CCAFS West Africa programme which works with farmers from pilot sites in Burkina Faso, Ghana, Mali, Niger and Senegal to test various climate-smart innovations to adapt to climate change. It discusses the usefulness of seasonal climate forecasting as a way to improve yields and farmers' incomes in two strategic agricultural sectors in Burkina Faso, cowpea and sesame production.

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CCAFS and Info Notes

The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) is a strategic partnership of CGIAR and Future Earth, led by the International Center for Tropical Agriculture (CIAT). CCAFS brings together the world's best researchers in agricultural science, development research, climate science and Earth System science, to identify and address the most important interactions, synergies and tradeoffs between climate change, agriculture and food security.

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