Supplementary irrigation and climate information: from research to strengthening adaptive capacity in the Sahel

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What is the issue?

In recent decades, increased climate variability in Africa's Sahel region has revealed the extreme vulnerability of agro-pastoral production systems. Inter-annual grain production has fluctuated by an average of 20% since the late 1980s. Climate change is causing more frequent extreme weather events, recurrent and longer dry spells, and greater uncertainty concerning the start date and duration of the growing season. Traditional techniques of crop cultivation and water and soil conservation, such as *zaï* planting pits and the half-moon technique, are proving ineffective against the long, frequent dry spells.

The IDRC-funded project *Irrigation and climate change in Burkina Faso: Research on institutional and community capacity building* tested two innovative potential solutions to the problems of climate change in the Sahel: supplementary irrigation and climate information. Both strategies are priorities of the National Adaptation Programme of Action on Climate Change and Variability, which was developed in 2007.

Pilot farmers in the project were supervised in collaboration with the *Fédération Nationale des Groupements Naam*, the *Association Zood Nooma pour le Développement*, and the Regional Association for Irrigation and Drainage. Technical and scientific partners, such as the *Secrétariat Permanent du Conseil National pour l'Environnement et le Développement Durable*, the *Direction Générale des Aménagements et du Développement de l'Irrigation*, and the *Institut de l'Environnement et Recherches Agricoles*, have ensured that knowledge and experience acquired in the project are shared with policymakers.

Key messages

- **Supplementary irrigation from runoff catch basins reduces the negative impact of dry spells on agricultural production in the Sahel.**
- **Access to climate information at the start of the agricultural campaign allowed 90% of farmers involved in the project to avoid reseeding and to better schedule their farming activities.**
- **The State must continue to strengthen the ability of agricultural officers to design basins and to facilitate farmers' access to credit by guaranteeing funds.**
- **Research is needed to assess the environmental impacts of the proliferation of runoff catch basins.**

What did we do?

Supplementary irrigation is a technique by which farmers water crops during long dry spells in the rainy season using runoff water stored in basins near the crop fields. Fifteen pilot farmers from the Bam and Yatenga provinces in northern Burkina Faso tested the technique from 2010 to 2014. In each case, farmers divided their agricultural land into two plots. One plot was irrigated with 200 to 300 m^3 of water from a runoff catch basin; the other was left unirrigated.

To assess the effect of climate information on household agricultural activities, researchers recruited a sample of 80 agricultural households from the Bam and Yatenga provinces. Each household divided their land into two plots: one experimental and one control. Two days before seeding the experimental plot, households received information about the predicted start and end dates of the growing season.

What did we learn?

- **Increased grain production:** In Bam Province, fields with supplementary irrigation yielded more maize than unirrigated fields - an increase from 1.3 to 2.3 tons/ha. In Yatenga Province, yields increased from 0.8 to 2.8 tons/ha.
- **Increased irrigation during the rainy season:** Traditionally, very few farmers have provided extra irrigation for grain crops. Today, 75% of the 629 farmers surveyed are ready to adopt supplementary irrigation and 60% are willing to pay a portion of the set-up costs.
- **Relevant climate information at the start of the agricultural campaign** prevented farmers from having to reseed and promoted better organization of farming activities.
- **Income-generating activities for women:** Yields of market-bound products from gardens (e.g. tobacco, watermelons, vegetables, etc.) benefitted from the excess water stored in basins, helping pilot farmers' wives see a substantial increase in income.
- **Diversification of diet for women and children:** All pilot producers diversified their food.
- **Recognition of environmental challenges in climate change and adaptation strategies:** Technical agriculture officers were trained in the design and building of basins, resulting in 13,000 additional basins being built.
- **Local materials for basin construction:** Of the 15 pilot basins in the project, 12 were built entirely or partially from low-cost, local materials. More costly industrial materials (e.g. canvases or concrete) were necessary on land with loose soil.

Stories of change

Kané Mahamadou, a village farmer from Sandouré in Bam Province, is very pleased with the results achieved from using his new basin, built through the project, and is convinced of the technique's relevance. Inspired by Mr. Mahamadou's successful crop yields and his efforts to adapt to climate change, neighbours are beginning to commit to building their own basins.

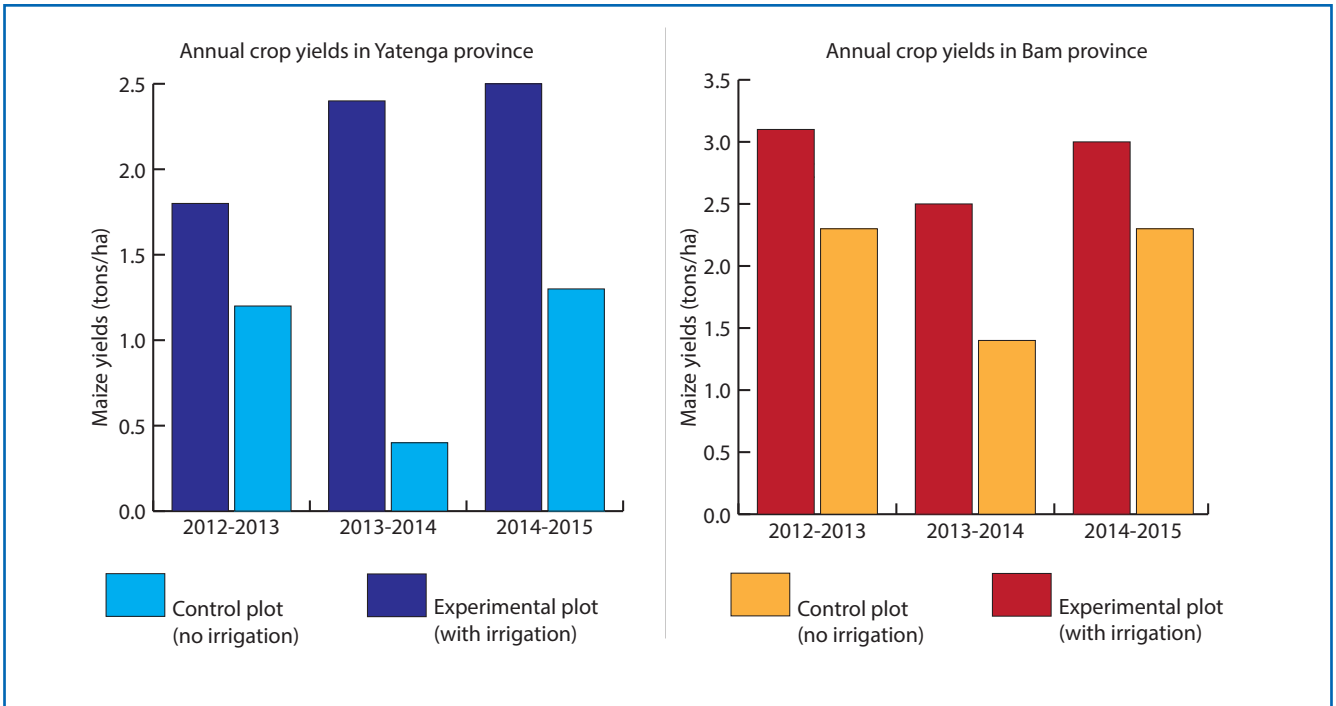

Figure 1: Contribution of supplementary irrigation to improved maize yields

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Supplementary irrigation from runoff catch basins improves food security and reduces the negative impact of dry spells on agricultural production

"We not only saved our crops; the technology let us practice market farming after the winter season, because the basin still had water in it in March. We were able to fulfil our food needs during the dry period and vary our diets."
Ms. Tasséré, wife of a pilot farmer

Burkina Faso's Ministry of Agriculture and Food Security has acknowledged the effectiveness of supplementary irrigation and has implemented a national basin construction program. Three thousand (3000) funded basins have already been built and another 10,000 are scheduled for 2015. 2iE supports the Ministry by training technical officers to design and build the basins.

What are the policy implications?

For producers:

- Producers should adopt this simple, inexpensive technology, the required materials for which are often available locally.
- Producers should avoid using basin water for domestic purposes because of the presence of pollutants (e.g. arsenic, mercury, etc.).

For the private sector:

- On land with loose soil, farmers must use industrial materials to waterproof their basin. With the development of the technique on the national and even sub-regional scale, marketing plastic tarps may be a real opportunity for the private sector.

For non-governmental organizations:

- NGOs can commit to educating producers to adopt this technique and help them install basins.

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Runoff catch basin measuring 250 m³, built with local materials: lateritic bottom and stone-lined walls

For the Ministry of Agriculture:

- In collaboration with 2iE, the State must support the training of technical agriculture officers in basin design, cultivation and irrigation techniques, to raise awareness of this technology throughout the country.
- The State, farmers' associations, and financial partners must make credit available to farmers by implementing guarantee funds.

For the Meteorology Directorate:

- The Meteorology Directorate must build weather stations and develop the capacity to disseminate climate information to improve forecasts for farmers.

What next?

Next steps should include:

- Researching soil features and channels for transmitting data to producers, so as to generate wider support;
- Raising awareness of low-cost local building materials;
- Considering the consequences of an increased number of basins on human health and on area hydrology; and
- Implementing forecast models that are better suited to the Sahelian context, and are based on reliable data.

Construction of a runoff catch basin built with low-cost, local materials

Need more information?

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