RAINWATER HARVESTING FOR AGRICULTURE: SUPPLEMENTAL IRRIGATION TO IMPROVE THE RAINFED AGRICULTURAL PRODUCTION IN BURKINA FASO

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INTRODUCTION

- Climate scenarios in West Africa (IPCC 2007):
  - Frequency of extreme weather events
  - Temperatures
  - Water resources scarcity.

- Rainfall based agriculture in Burkina Faso

- Coping with rainfall variability:
  - Traditional technique: zaï, half-moon, stone bunds.
  - Other forms of adaptation strategies: dams, irrigation schemes, short cycle varieties.

Fig. 1: Climate zones of Burkina Faso

What responses to that situation?

- The "Opération Maïs de Case" (2012-2013), launched by the MASA
- The PICIC (2011-2015), Implemented by (2iE)

How to extend the agricultural campaign through supplemental irrigation?
Presentation of the study area

- Agriculture: 80% of the population in Burkina Faso

- Nearly 49% of rural families: not able to produce or acquire sufficient food to meet their needs (FAO 2011).

- The northern part of the country: some difficulties in managing rainfed agriculture.

- The average annual rainfall in the Burkinabe Sahel: between 400 and 700 mm when going from north to south.

- Supplemental irrigation: 2nd rank of priority projects in agricultural domain in the National Program on Adaptation Strategies of Burkina Faso
MATERIAL & METHODS

Methods

- Literature review
  - Case studies
  - Peer-review articles
  - Etc.

- Surveys
  - 16 pilot producers
  - 20 other farmers
  - Technicians

- Field experiments
  - 09 villages

- Regular field trips
  - Field observations

BURKINA FASO

YATENGA

BAM

Ouagadougou

14/02/2017
- The tests conducted during 03 successive agricultural campaigns.

- Corn variety used is *Barka*, an extra-early variety (80 days) with a yield of 5.5 t/ha in experimental station.

- Mineral fertilization with 200 kg/ha of NPK brought the 12\textsuperscript{th} day after sowing (DAS), followed by 100 kg/ha of urea (46%) brought the 25\textsuperscript{th} DAS and 50 kg/ha of urea (46%) brought the 35\textsuperscript{th} DAS.

- The study was not interested in millet and sorghum, because farmers do not irrigate them deliberately in rainfed agriculture.
Size and Shape of Ponds

- Ponds have usually the shape of a truncated cone or a truncated pyramid;
- Depth between 1, 5 and 2, 5 m;
- Volume ranging from 50 to 300 m³, according to the soil texture and the longest dry spell observed in the area (22 days);
- Surfaces from 100 to 2000 m².

Table 3: Agronomic parameters

<table>
<thead>
<tr>
<th>Crop</th>
<th>Crop coefficient Kc</th>
<th>Total water requirement (mm/season)</th>
<th>Peak needs (mm/day)</th>
<th>Length of the cycle (day)</th>
<th>Irrigated area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>0.40 – 1.15</td>
<td>400 – 800</td>
<td>7</td>
<td>70 – 90</td>
<td>0.2</td>
</tr>
<tr>
<td>Millet</td>
<td>0.35 – 1.10</td>
<td>350 – 800</td>
<td>6</td>
<td>90 – 110</td>
<td>1 – 5</td>
</tr>
<tr>
<td>Sorghum</td>
<td>0.35 – 1.10</td>
<td>350 – 800</td>
<td>6</td>
<td>90 – 110</td>
<td>1 – 5</td>
</tr>
</tbody>
</table>
Safety of Farm Ponds and Agricultural Plots

- Acceptance of farm ponds: a minimum of security guarantee for children and livestock.

- Socio-cultural context: not possible for an individual to ask people to keep cattle in confinement before the commonly planned dates.

- All the 36 farmers interviewed: necessity to fence agricultural plots.

- Opinion: fully shared by officials of technical services for agriculture, livestock and the environment.

Photo 1: Unprotected pond
Supplemental irrigation as the only discriminating practice between two agricultural plots enables improved corn yields over 40%.

Dugué (1986) showed that the gain in sorghum yields due to SI in the Sahel region is more than 40% of yield.

Figure 2: Average yields over three years for pilot farmers in the intervention areas of the project.
The extension of the agricultural campaign is possible through the use of the water from ponds.

First rains (April or May) fill the ponds.

Triggers agricultural campaigns.

Water from ponds also used for other needs (Abba 2013).

Other uses should be reduced or eliminated, or integrated in the design of the pond.

Photo 2: Women and children withdrawing water for domestic uses in a village (Kongoussi Division)
Extension of the Agricultural Campaign

- In Oubritenga, farm ponds are built within agricultural plots which are protected by fences.

- Season actually begins in this area after the first significant rains, with a total rainfall exceeding 20 mm.

- This allows a first harvest in mid-July.

- Gardening ends when there is no more water in the pond, close to the end of December.

- Water can be stored between 30 and 90 days after the last rains, extending the campaign by gardening or relay cropping.

Photo 3: Access to agricultural plots
No intensification of agriculture without securing agricultural water.

This study shows that supplemental irrigation can actually extend the growing season and improve yields.

A sociological brake regarding irrigation during the rainy season, but this brake is gradually eliminated.

Supplemental irrigation is compatible with the practice of zaï and half-moons, stone bunds, etc.
- SI could enhance the adaptation capacities of farmers to drought and dry spells, with relay cropping and a better management of dry spells.

- It is important to make ponds financially accessible and to support farmers for agricultural water management. Nowadays, pumps are cheaper.

- PICIC and "Opération Maïs de Case", had a good impact on the field in all the national territory.

- SI is scaled up by the World Bank in Burkina Faso, Côte d’Ivoire and Cameroon (cotton cultivation)
THANK YOU FOR YOUR ATTENTION