

# **Irrigated Food Systems in Maradi, Republic of Niger: A comparison between operating accounts**

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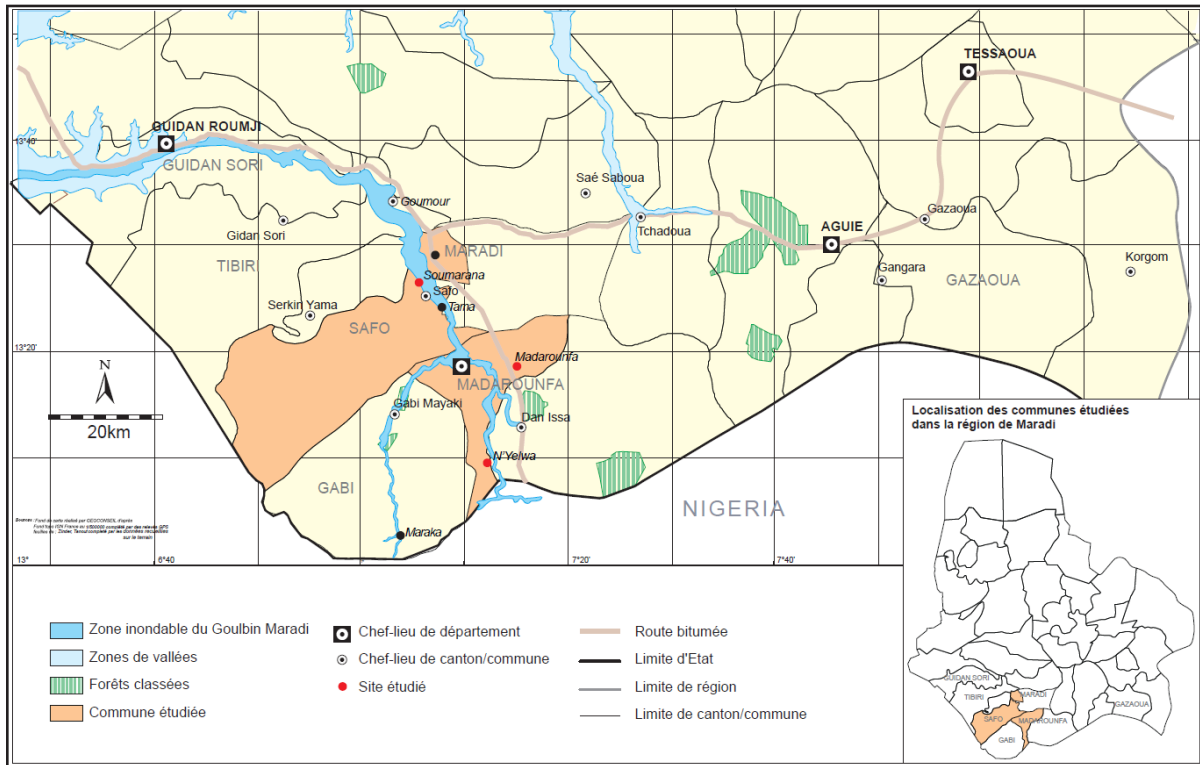
## **Abstract**

In Niger, most food systems are based on pluvial crops (millet, sorghum and cowpea). However, during the last decade, agricultural policy and technical and financial partners focused on increasing the productivity of irrigated food products. The region of Maradi, located in the Central-South of Niger, is an area traditionally dedicated to agriculture. Some parts of this region are particularly adapted for irrigation, especially the Goulbi of Kaba and the Goulbi of Maradi valleys. The goal of this study is to establish the socio-economic situation of the main irrigated food productions, based on the following indicators: (i) the crop management technics used; (ii) the results of the operating account; and (iii) the comparison between the village and the adoption of new technic (farmer field school). This paper is based on direct surveys conducted in three areas of the Maradi's region: Soumarana (commune of Safo, department of Madarounfa); N'Yelwa (commune of Madarounfa, department of Madarounfa); Madarounfa (commune of Madarounfa, department of Guidan Roundji). The software used is Minitab and Excel. The results highlight a good perspective for the irrigation system but this food system is conditioned by the petroleum price and some other input (fertilizer and seed). The operating accounts show that irrigation is a non-negligible income source, which increases the resilience of the farmers.

**Keywords:** Maradi, irrigated food system, operating account.

## **Introduction**

The Maradi's Region located in the center of Republic of Niger is characterized by a rainy agricultural food system. Nevertheless some valleys, Goulbi N'Kaba and Goulbi of Maradi, are in favor of irrigation food system (Issaka M., 2001; Andres L. and Lebailly Ph., 2013). In Maradi, the population is mainly rural and represented 20 % of total Nigerian population (Karimou Barké M. et al., 2015). The spatial evolution is characterized by a forest decrease in favor of an agricultural land increase (Mahamane A., 2001). During the last decade, agricultural policy and technical and financial partners focused on the increase of productivity of irrigated food products. The irrigable land in the Maradi's region is estimated by Karimou Barké M. et al., 2015. This study identifies four irrigable areas: the Goulbi Maradi; the Goulbi N'Kaba, the Tarka valley and the flooding areas. The fossil valley (N'Kaba and Maradi) represents 33,576 hectares (ha) and 217,174 ha respectively. The Tarka Valley, located in the North of the department, is 150,002 ha. Finally, the flooding areas are defined by the temporary and permanent pond and their environment as the Madarounfa Lake. This area represents 102,922 ha (Karimou Barké M. et al., 2015). The study's area located on the Goulbi Maradi is divided in 3 areas: Soumarana, Madarounfa and N'Yelwa in the commune of Safo and Madarounfa (Figure 1).



**Figure 1 : Location of the study's areas in the Maradi Region**

## Material and method

This paper was realized by an indirect survey in three irrigated areas. The survey tries to answer the question about a socioeconomics' status, a characterization of farm; the factor who compose the operating account. In fact, the goal is to demonstrate the economic aspect of the irrigated food system. It was realized during November 2015 but also during January and February 2016. These periods are equivalent to the irrigated season: September to November; December to February. The questionnaire is composed in three parts: socio-economic characteristics; irrigated production; project factors (farmer field school). Forty farmers located in three different areas on the Goulbi Maradi did participate: Soumarana (15); Madarounfa (11); N'Yelwa (14). The survey is an exploratory phase. The number of interviewed farmers varied in function of the area: fifteen for Soumarana; fourteen for N'Yelwa; eleven for Madarounfa. The variation did not affect the analysis because the number of farmers is very low and the main goal of this study is to consider a preliminary analysis of the irrigated food system. This preliminary study is linked and integrated to a partnership with International Fund for Agricultural Development (IFAD) and two research centers (University of Abdou Moumouni in Niamey and University of Liege Gembloux Agro Bio Tech). This research tries to establish the impact of the agricultural intensification.

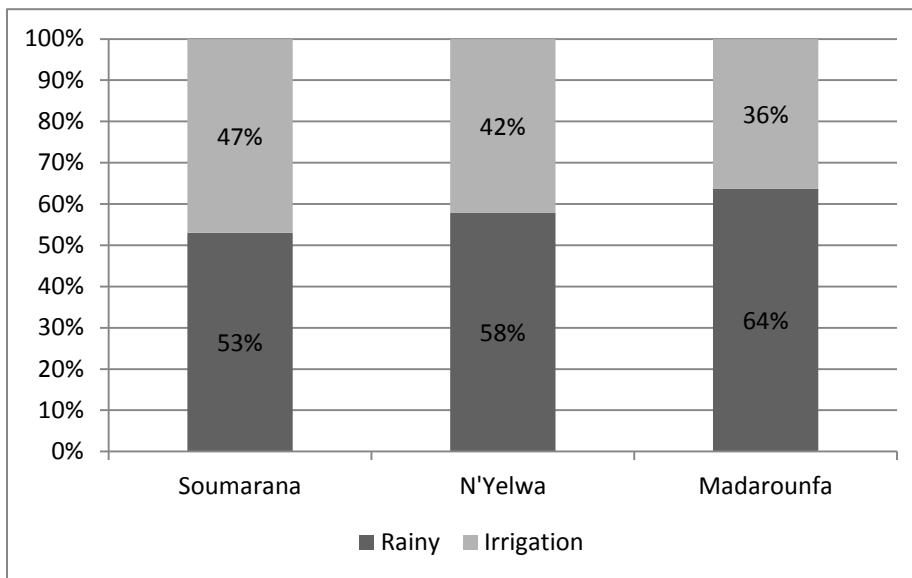
## Results and discussion

We observed that only two agricultural chiefs are female and one agricultural chief is Kanuri whereas the other chiefs are Hausa and male. There is no big difference between the three areas. The average age of the sample is 43 years old. The area is smaller than below 1 hectare (0.88 ha). The member's number per household is estimated to 11 members and the work force is 2 farmers.

**Table 1 : Socio-economic characteristics**

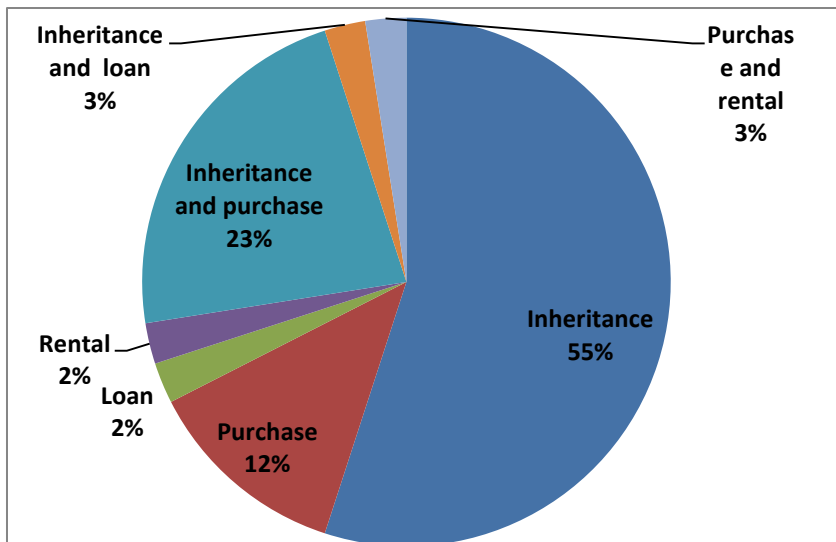
<b>Location</b>	<b>Age</b>	<b>Area</b>	<b>Member</b>	<b>Agricultural worker</b>
<b>Soumarana</b>	43	0.97	9	2
<b>N'Yelwa</b>	38	0.79	12	2
<b>Madarounfa</b>	48	0.89	12	3
<b>Mean</b>	43	0.88	11	2

The distribution of rainy and irrigated areas in each domain is different. The farmers of Madarounfa have more rainy areas (36 %) than them irrigated areas (36 %), while Soumarana and N'Yelwa present a balance between the rainy and irrigated area (Figure 2). In average, they area of Soumarana practiced the irrigation since 22 years old. N'Yelwa and Madarounfa practice respectively the irrigation since 16 and 8 years old. In average, the Soumarana's farmers have two plots whereas the two other areas are constituted by only one plot. The average of irrigated areas are respectively estimated to 0.95 (Soumarana); 0.79 (N'Yelwa); 0.89 (Madarounfa).



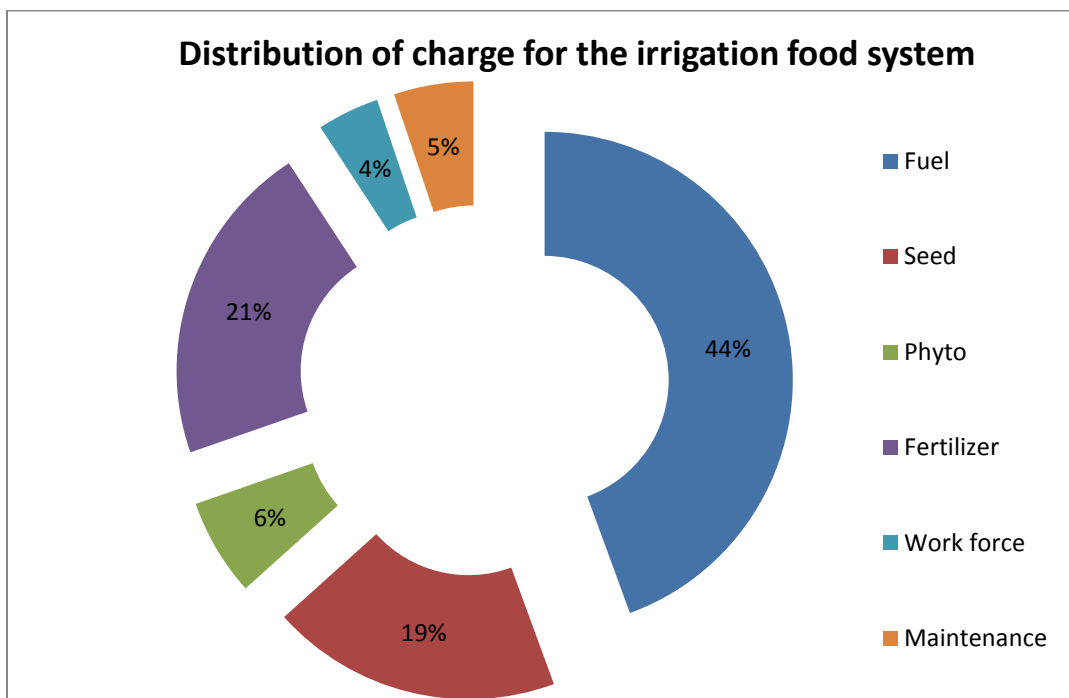
**Figure 2 : Distribution of the rainy and irrigated area in a farm**

Usually, the way to acquire land is by legacy or legacy adds with another mode such as purchase, loan and rental. Only 25 per cent of the farmers have land tenure to prove the property.



**Figure 3 : Distribution of the transmission method**

The operating accounts are calculated with the fees and the estimated income. The fees assemble the cost of seed, phytosanitary products, fertilizers, worker force, irrigation maintenance and usage fee. The income has been estimated with the farmer and regroups the estimated income per campaign. In the first time, we would like to develop the operating account per product but some costs were used for all production during the irrigated campaign. The fuel is the first charge concerning for the irrigated food system and is due to the introduction of motopump in this system. The second and third principal fees are the fertilizer and the seed. Before the last decade, the fertilizer and the phytosanitary goods were produced by the Nigeria Market but actually, most of the farmers buy them in the Maradi's market. According to this observation, the benefit of the irrigated activities depends on on the price of the fuel (figure 4).



**Figure 4 : Distribution of charges for the irrigation food system**

Each farmer from each village has presented a benefit per campaign. This average of benefit has been estimated to 412 euros in Soumarana; 377 euros in N'Yelwa and 582 euros in Madarounfa (table 2).

**Table 2 : Charge and income of each studying area**

	<b>Charge</b>	<b>Income</b>	<b>Benefit</b>
<b>Soumarana</b>	134,543	404,600	270,057
<b>N'Yelwa</b>	98,025	345,161	247,136
<b>Madarounfa</b>	112,227	493,955	381,727

The comparison of mean has been established to distinguish the difference between the targeted villages. The variance and normality test confirm the possibility to realize the test of equality of mean. The results in Figure 5 show a significant difference between the level of the income and the benefit in function of the village.

**ANOVA Table<sup>a</sup>**

			Sum of Squares	df	Mean Square	F	Sig.
Income * Village	Between Groups (Combined)		386675,509	2	193337,754	4,380	,020
	Within Groups		1633130,866	37	44138,672		
	Total		2019806,375	39			
Benefit * Village	Between Groups (Combined)		292182,568	2	146091,284	3,233	,051
	Within Groups		1672032,807	37	45190,076		
	Total		1964215,375	39			
Charge * Village	Between Groups (Combined)		9,832E9	2	4,916E9	2,597	,088
	Within Groups		7,004E10	37	1,893E9		
	Total		7,987E10	39			

a. The grouping variable Village is a string, so the test for linearity cannot be computed.

**Figure 5 : Comparison in function of the village**

We compared the fees, the income and the benefit regarding to the activities of the farmer field school. Two activities are evolved with the charge, income and benefit. Those concern the visit of the Farmer field school and the support advice. The comparison of means is not significant for the advice and the farmer field school. But all farmers of the enquiry need a farmer field school and the indirect impact of the project is perhaps the causes of this non-difference between the beneficiaries and the non-beneficiaries.

### **Conclusion**

In conclusion, in the Maradi' region, the irrigated food system presents an interest to ensure a food security and a better income. The impact of the IFAD project is not clear, especially for the quantitative data (income, benefit). But the qualitative analysis demonstrates some impact of the project, especially for a crop management technic and the purchase of good fertilizer and phytosanitary, and improved seeds. The comparison of means is largely affected by the indirect impact. In fact, some non-beneficiary's farmers have adopted some innovations because the transfer is linked by the observation and discussion between the farmers.

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