

RainFed Rice Production Constraints in the Satégui-Déressia Plain (Middle Logone Basin) in South-East Chad

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Abstract: *In the plain of Satégui-Déressia, agriculture plays a leading social and economic role. The plain has enormous potential for cultivable land. However, the dependence on rainfall means that women producers face social and environmental constraints that are at the root of poor production. The purpose of this article is to analyze the constraints to rice production and identify adaptation strategies. The choice of these villages is based on population density, the degradation of agricultural land and the notorious decline in rainfed crop yields. The results reveal that rainfed rice growing faces climatic and anthropogenic constraints that slow down its development. The indicators of rainfall changes such as the drop in rainfall, the early cessation of the rains, the shortening of the duration of the rainy season are perceived by more than 70% of the producers interviewed. The perception rates reached more than 55% of those interviewed for indicators such as the lengthening of the drought, the frequency of pockets of drought, and the delay in the rains. In addition, 98% of farmers are unable to obtain fertilizers or phytosanitary products to fight against pests and diseases affecting plants. Faced with these observed changes, producers are adopting strategies aimed at using new cultivation techniques, crop diversification, improved seeds, use of organic manure, etc. all this is to cope with the effects of climate change which further impoverish rural households.*

Keywords: *Production constraint, rainfed rice, Satégui-Déressia plain, southeastern Chad.*

1. INTRODUCTION

In the Satégui-Déressia plain in south-eastern Chad, local rainfed rice production is estimated at 75% and is characterized by dependence on climatic conditions (Assoué, 2021). Nevertheless, yields remain quite low and do not exceed 1.5 tonnes per hectare compared to irrigated rice which is 2.1 tonnes (Assoué et al., 2021). Today, the needs of producers such as marriage, health, school, means of transport, housing etc. are provided by rainfed rice. This basin of the middle Logone has enormous potential in terms of agricultural space for the production of rainfed rice. In this area, purely traditional rainfed rice cultivation is entering an intensification phase thanks to the use of a few enhance production and minimize human effort (Yebooue, 2016). It is family-type rice cultivation so the working materials remain rudimentary.

As this crop is dependent on climatic hazards, populations are increasingly exposed to the impacts of this climatic variability because of their production systems or less efficient crops that are closely dependent on rainfall (Sécou Omar et al. 2021). These natural factors lead to sudden agricultural disturbances which have profound repercussions on the lives of populations in general and farmers in particular (Thio et al.op.cit). of the population encounters difficulties linked to the low yields and the reduction in the areas sown annually.

This reduction in sown areas is caused by a lack of labour, because its renewal poses a real problem and is exacerbated by the emigration of young people to the cities (Sécou Omar et al., 2021, using Mendy, 2018). This is why climate change is now having an impact on the socio-economic conditions of households in this plain. rainfed rice cultivation.

The objective of this work is to understand the constraints of rainfed duriz production in the Satégui-Déressia plain (Middle Logone Basin) in southeastern Chad. It is a question of analyzing the climatic constraints unfavorable to rainfed rice cultivation and the strategies put in place by local actors to improve this production.

2. MATERIALS AND METHOD

2.1. Material

The study area is located on the right bank of the Logone River between 9°36' and 9°55' North latitude and between 16°12' and 16°24' East longitude (Figure 1). It covers an area of 18,000 km² with an estimated population of 682,817 inhabitants (RGPH 2, 2009). The population is predominantly rural with the economic activities of agriculture, livestock and trade. Rice-growing area par excellence since independence, but there are also other speculations that have been developed, such as corn, taro, sorghum, millet, etc. The plain enjoys a tropical climate of the Sudanian type characterized by a rainy season and a dry season.

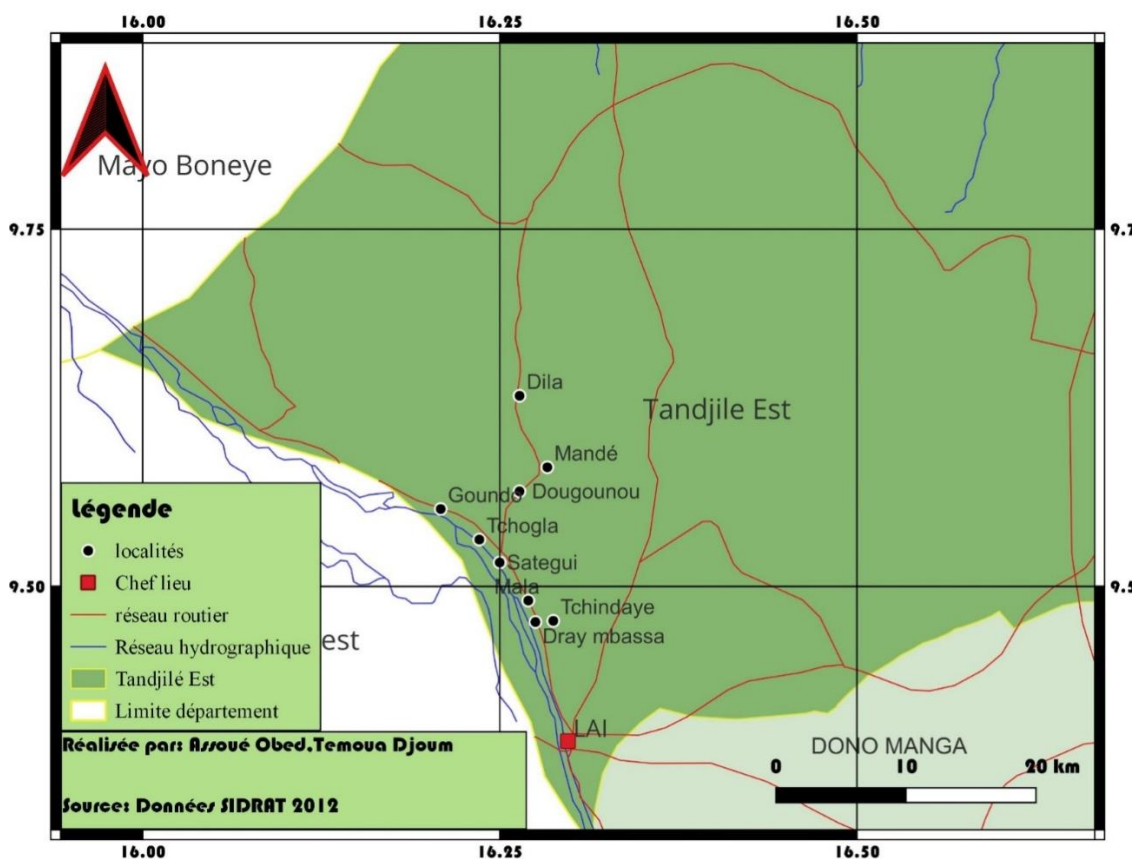


Figure1. Location of the study area.

This choice of the study area takes into account the density of rice growing around the irrigated perimeter of Satégui-Déressia in the middle Logone basin. The most determining and more or less homogeneous socioeconomic factors, in addition the demographic weight is an element which was decisive in the choice of the households questioned. The technique used is sampling by quota. As part of this research, a regular survey rate of 10% was operated on households. As a result, 135 rainfed rice producers were interviewed.

2.2. Method

The methodology used is based on surveys and field observations. The first is quantitative and focuses on the administration of questionnaires. The second is qualitative; it refers to directive and semi-directive interviews (women farmers, NGOs, local actors, Farmer Organization, decentralized State services).

The processing and analysis of statistical data made it possible to study the production constraints of rainfed rice growing in the plain of Satégui-Déressia in the middle Logone basin. The questionnaire focused on: rice growing practices, constraints related to production and the strategies developed by women producers. In addition, the interviews made it possible to analyze in depth the problem of rice production in this plain.

Table1. People practicing rainfed rice farming surveyed

Localities	People surveyed	Percentages(%)
Dray-Mbassa	15	11,11
Tchindaye	15	11,11
Mala	5	3,7
Sategui	20	14,8
Tchogla	5	3,7
Goundo	10	7,4
Dougounou	20	14,8
Mandé	30	22,22
Dila	15	11,11

Source: Field survey, August, 2022

This table 1 shows the localities (villages) surveyed. These localities were chosen based on their population density. In this plain, the peasants of all these villages practice the cultivation of rice, which is the only dominant crop. Compared to their percentage, Mandé comes first with 22.22%, Dougounou and Sategui with 14.8%, Dray-Mbassa, Dila and Tchindaye come with 11.11%, Goundo with 7.4%, Mala and Tchogla come at the end with 3.7%. This shows the evolutionary dynamics of rice cultivation in this plain.

3. RESULTS

3.1. Climate Effects as a Cause of Lower Rice Yields

The rainfall situation at the Mandé and Boumou station reveals a very high variability in the plain (Figure 1). This variability has called into question the agricultural calendar, thus imposing the rainfall rhythms on farmers. Rainfall variability, associated with the rise in temperatures, leads to dysfunctions in the agricultural seasons, which go through disturbances in the biological cycles of crops, causing a deterioration of production (Traoré, A., Traoré, K., Traoré, O., Bado, B. V., Nacro, B. H., & Sedogo, M. P. (2015). However, without the rain, we will not talk about rice cultivation rainfall in this plain.

The observation is that there is a deterioration in rainfall conditions and the poor distribution of rainfall in time and space with a Sudanian-type climate oscillating between isohyets 800-1,200 mm of rain per year.

From 1981 to 1997, 1983 to 2002 and 2008 to 2020, we went from 1,000 mm recorded to 600 mm on average to reach more than 800.7 mm in 2020. This shows that there is a change in this plain and the peasants are forced to adapt.

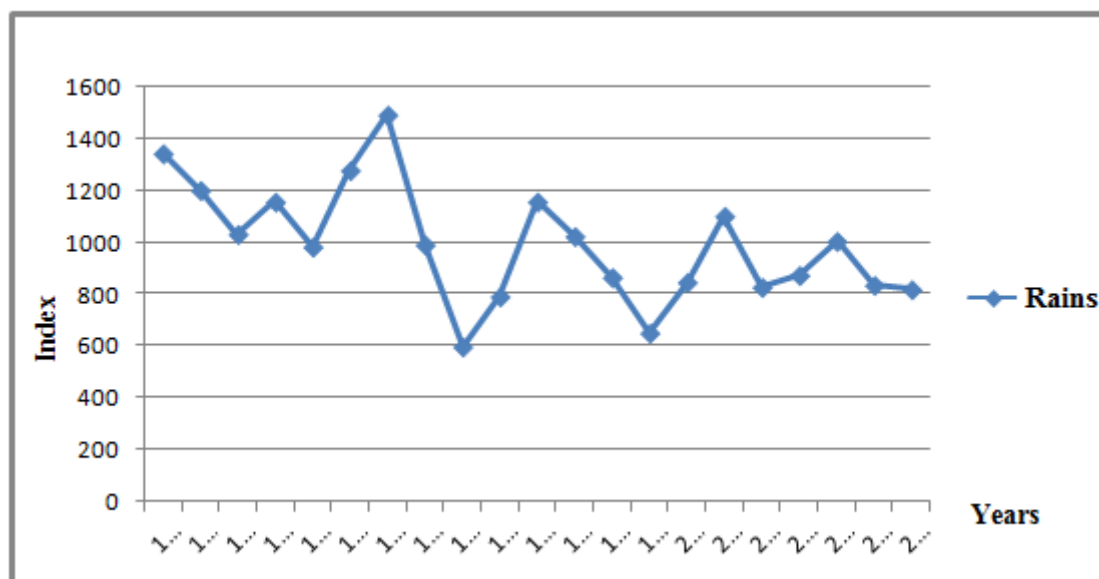


Figure2. Rainfall evolution of the last twenty-two (22) years

Source: ONDR, Lai sub-sector, 2010 and ANADER, 2020

Figure 1 shows the variability of rainfall in the region in the Satégui-Déressia plain between 1960 and 2020. It is generally between 600 and 1,500 mm per year. These rainfalls have impacts on rice production and lead women rice farmers to combine rice production with other crops such as millet, taro, maize and peanuts. Indeed, these impacts are read through intense rains and short durations often recorded. They are very favorable to flooding, especially in certain parts of the plain between the villages of Goundo, Satégui, Dila, Mandé and Dougounou, and can paralyze the practice of rice cultivation. The indicators of rainfall changes such as the drop in rainfall, the early cessation of the rains, the shortening of the duration of the rainy season are perceived by more than 70% of the producers interviewed. The perception rates reached more than 55% of those interviewed for indicators such as the lengthening of the drought, the frequency of pockets of drought, and the delay in the rains. Perception rates reached 20% of respondents for rainfall indicators such as the alternating frequency of floods and droughts (Assoué. O, et al, 2022).

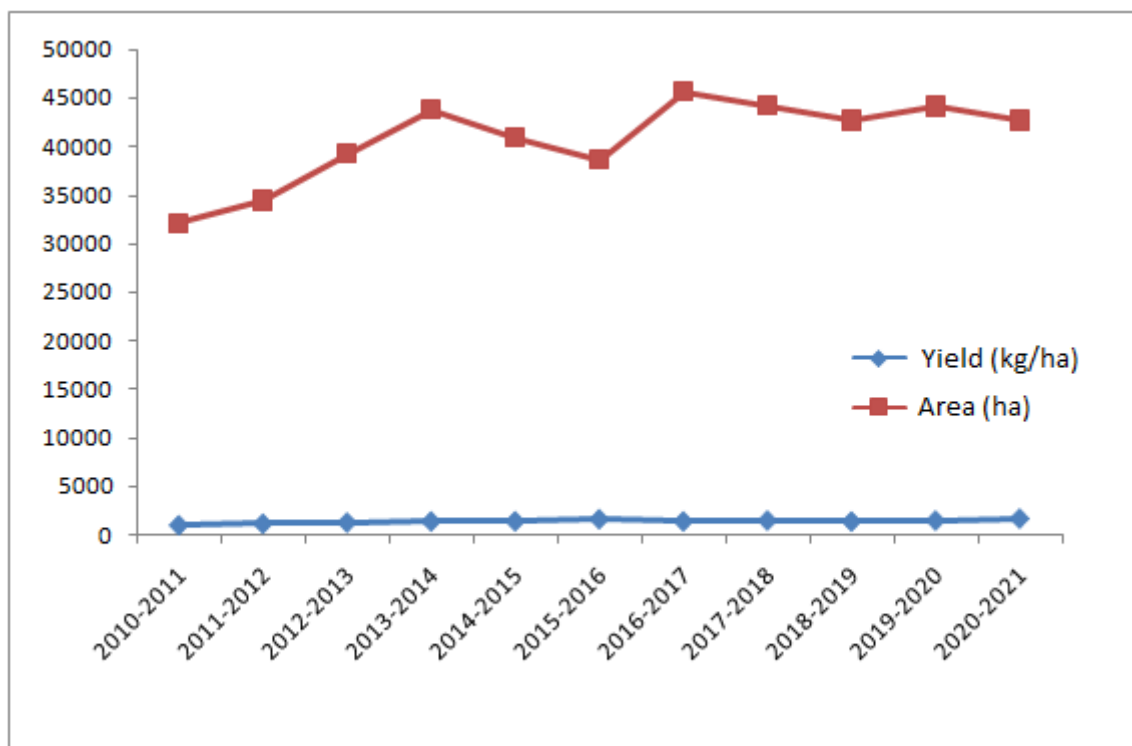


Figure3. Evolution of rain fed rice production

Source: ANADER Tandjilé, 2020

Fig 2 shows the evolution of the area in relation to the production of rainfed rice in the paline. Thus, from the 2013/2014 campaign, there is an increase in area (43,802) and a net increase in production (1,314). However, in the 2014/2015 and 2015/2016 campaigns, we see a drop in areas and an increase in production compared to the 2013/2014 campaign. From 2016 to 2021, there is a small variation in area as well as an improvement in yields.

3.2. Lack of Funding: Major Constraint for Rain Fed Rice Production

More than 85% of the producers surveyed mention the financial means as a major constraint to the production of rainfed rice. This culture is practiced without agricultural input, and concerns both men and women. The latter rely on the financial means of individuals to pre-finance their agricultural activities. For the most part, 8,000 F for a bag of paddy, 15,000 F for a husked bag per campaign.

Moreover, the peasants interviewed claim to have planted their seeds each year. But the difficulty lies in access to inputs, equipment or credit. In addition, 98% of farmers are unable to obtain fertilizers or phytosanitary products to fight against pests and diseases affecting plants. This is why everyone uses rudimentary tools for this production in the plain.

Table2. *Causes of the degradation of rainfed rice production in the plain.*

Phenomena	Anthropogenic causes	Consequences
Insufficient financial income of farmers	Economic poverty of the peasants, No funding	food insecurity, Rural exodus of young people, Difficulty of access to inputs resulting in reduced yields.
Lack of supervision of women rice farmers	Insufficient qualified technical staff of ANADER, Lack of a training activity monitoring system	Adoption of indigenous practices, Use of rudimentary means and materials, Periodization not calculated
stray animals	Lack of pasture for animals	Decline in productivity
Natural resources	Land disputes	Rural exodus Impoverishment of peasants

Source: *Field survey, June, 2022*

This table 2 shows that rice cultivation requires large financial means. In this case, the State and its development partners must come to the aid of these farmers in order to enable them to improve their working conditions and their lives. The causes listed are real and manifest themselves from year to year in this area, so the consequences are observed in the people surveyed.

3.3.Land: a Major Constraint to Production

Land in the plain is a very difficult issue to identify, especially in a context of scarcity of agricultural land. In this plain, the land tenure system is of the traditional type, dominated by inheritance (98%), loan (35%), rental (16%) and purchase (8%). The results show that inheritance is the most common modality. more frequent since it is the recourse chosen by 98% of women rice farmers, in this case, its management is entrusted to the eldest son of the family. But there are times when the latter proceeds to the rental, loan or sale without informing the other members of the family.

For exploitation, only boys benefit from land after marriage while girls do not have access to ownership of rice land. In rare cases, women can benefit from land when their husband dies. In a second case, 35% of women rice farmers use the loan. In this case, there is no written contract, but rather an oral agreement between the owner of the plot and the person concerned. The rental occupies 16%, the sum of which varies from 10,000 to 15,000 F/ha for an agricultural campaign and at the end the purchase is 8%, this type of access to land is increasingly sought by farmers, because for lack of means, they are obliged to sell their plots to face problems such as marriage, intercommunity conflict. Rainfed rice cultivation is intended for family consumption. According to respondents, 35% of needs are covered by production and 65% are kept for consumption for a period of 6 months (January to June). In addition to this, fishing is a related activity to ensure other additional household needs.

3.4. Coping Strategy

One of the main challenges related to climate change facing the agricultural sector is the high spatio-temporal and inter-annual variability of rainfall. At the local level, the strategies for adaptation to climate change identified concern both crop and soil management.

3.4.1. Crop Management

In the plain, the adaptations developed by the producers are diverse and varied. Most often, producers modify their cultivation technique, adopt improved seeds and new speculations, abandon crops or varieties given their long cycle. According to the observations of the various actors operating in rural areas, the testimonies of the populations and certain scientific studies, several strategies are put in place by the farmers to adapt to the rainfall variability. Faced with the decline in crop yields, and to respond to new climatic conditions, producers have chosen to modify the agricultural calendar and plowing practices, to develop irrigation and market gardening, to develop lowlands -bottoms and banks of the Logone River, or the adoption of short-cycle varieties (Assoué.O et al., 2022).

Another important element of crop management is the mechanization of agriculture. The technical route today has been modified with climate change is plowing. With the difficulties that producers have in working the soil, some have opted for the mechanization of plowing. This practice can

develop started ten years ago and is adopted by at least 13.16% of the producers surveyed. The factor favoring this practice is the proximity of the irrigated perimeter of Mandé and the creation of small village irrigated perimeters along the Logone River (Assoué et al., 2021).

Producers in the plain are increasingly faced with the uncertainty and variability of weather conditions that result from climate change. Knowing that their crops are mainly rainfed, they depend on the availability of rainwater. However, the duration and intensity of the rainy season are increasingly unpredictable and the use of irrigation equipment remains limited due to the importance of the initial investments required, the inefficient use of water resources water and lack of water storage and distribution techniques. In general, different adaptation strategies, such as the use of improved varieties for crops sensitive to climate change, should be considered but carefully assessed against their potential adverse impacts, for example, the decline of agro-biodiversity or the loss of certain local cultures (Assoué. O et al., 2022).

3.4.2 Farmer Organizations, an Alternative for Better Support

All of the actors interviewed deploy individual and/or traditional strategies and collective strategies in terms of village associations, producer groups, etc.

In addition, the grouping in a village association or village association allows producers to help each other. Indeed, 55% of producers are organized in village associations, so there is a legal person around which everything happens. These associations participate in all rice-growing work (sowing, transplanting, harvesting, threshing).

Table3. *The different associations identified*

	Number	%
Youth association	05	16.14
Women's Association	08	25,8
Associations of heads of households (men)	11	35,48
Mixed association	07	22,58
Total	31	100

Source: *Field survey, August 2022*

Table 2 shows that men have created more associations in the plain, in total 11 or 35.48%. Then, for women, there are 08 associations or 25.8% and mixed and youth associations come respectively with 22.58 and 16.14%. This dynamic shows that in the plain, there are groups of peasant producers at different levels. These associations exist throughout the study area.

4. DISCUSSION

Analyzing the production constraints of rainfed rice growing in the Sategui-Déressia plain and the adaptation strategies of farmers are undoubtedly linked to the influence of the climate in this geographical area. This is why climate factors are important to take into account to ensure sustainable socio-economic development at the regional or even national level. The farming world has a close link with its environment and its dependence on vis du climat is the result of perfect knowledge of the evolution of climatic parameters (FAO, 2007, 123 p).

Agossou, et al, (2012, 18 p), considers that the strategies developed by producers in southern and central Benin depend on the production objectives of their farms. Faced with the instability of their livelihoods, peasants react differently. Faced with chaos such as floods and reduced rainfall, some farmers seek above all to stabilize their income rather than maximize it. Assoué et al, (2022) believe that strategies such as abandoning crops, or crop varieties, changing the technical route (modifying the agricultural calendar) do not vary from one category to another. These adaptation measures do not particularly require the mobilization of resources but are in response to the common perception of producers of climate change.

Gouataine et al, (2019, 14 p), points out that the variation in rainfall and temperature negatively impact the production and yields of sorghum and rice, thus creating pockets of drought and famine. This situation has a greater impact on the lives of the rural population, which has been able to develop

certain strategies to protect itself from the harmful effects of climatic variability. have developed several strategies, alongside those deployed by some state or non-state bodies, in order to minimize the weight of the crisis that local rice cultivation is going through.

The results reveal that in this area, rice cultivation in this plain is traditionally more widespread than irrigated rice cultivation. These farmers cultivate varieties adopted in Africa.

This result is in agreement with the finding of Sécou Omar et al. (2021) in Senegal and Traoré et al (op. cit.) in Burkina Faso which show that rainfed rice cultivation offers a strong potential, but is poorly controlled with low yields. Indeed, average yields are around 1.5 t/ha. The poor mastery of the technical route of production requires training of producers to increase yields and boost the production of rainfed rice.

5. CONCLUSION

This study allowed us to inventory the major constraints of rainfed rice production and the adaptation strategy of farmers in the Sategui-Déressia plain in southern Chad. In a context marked by the phenomena of climate change, our study area is characterized by highly variable rainfall. This is why the effects of climate change are now perceived by producers through poor agricultural performance which does not promote the economic development of farmers.

However, anthropogenic factors (lack of supervision, the land problem, rural exodus, etc.) are at the origin of the degradation of farming practices in this plain, so much so that this rice cultivation is of the traditional type with the use of rudimentary agricultural tools.

Prospects for the development of rainfed rice cultivation are proposed. Among them, the increase and diversification of agricultural income by promoting a good processing, marketing and distribution policy. It also involves strengthening food self-sufficiency by implementing a support, intensification and modernization program for family-type rice cultivation based on traditional strategies. Investigations into local practices for adapting to the effects of climate change have revealed the diversity of available techniques. The results of this study reveal that rainfed rice cultivation in the Sategui-Déressia plain is faced with environmental socio-economic factors that hamper rice productivity.

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