

**FACTORS AND CONSTRAINTS OF RICE PRODUCTION IN THE DISTRICT OF  
ADJAHA (COMMUNE OF GRAND-POPO) IN SOUTHERN BENIN**

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**ABSTRACT**

A national agricultural priority, rice cultivation is attracting more and more attention of the Beninese government and private economic operators. It is with this observation and considerable potential, but little exploited in the Municipality of Grand-Popo for rice production, which this study was conducted. The overall objective of this study is to examine the factors and constraints to rice production in the district of Adjaha (Municipality of Grand-Popo).

To achieve this, data on rainfall and statistics of rice production last eight years were collected. The soil map and a representative sample of 65 rice farmers were used to title. Using the model SWOT (Strengths, Weaknesses, Opportunities, and Threats) helped to highlight the potentialities available to the district of Adjaha and bottlenecks that retard its growth.

The results reveal that the study environment is conducive to the cultivation of rice. And only 6% of rice potential is exploited or 81 hectares. The water control, access to agricultural equipment, credit and appropriate agricultural financing are major challenges that this sector is developed.

**Keywords:** Rice, Factors, Rice Production Constraints, Grand-popo, Benin.

**1. INTRODUCTION**

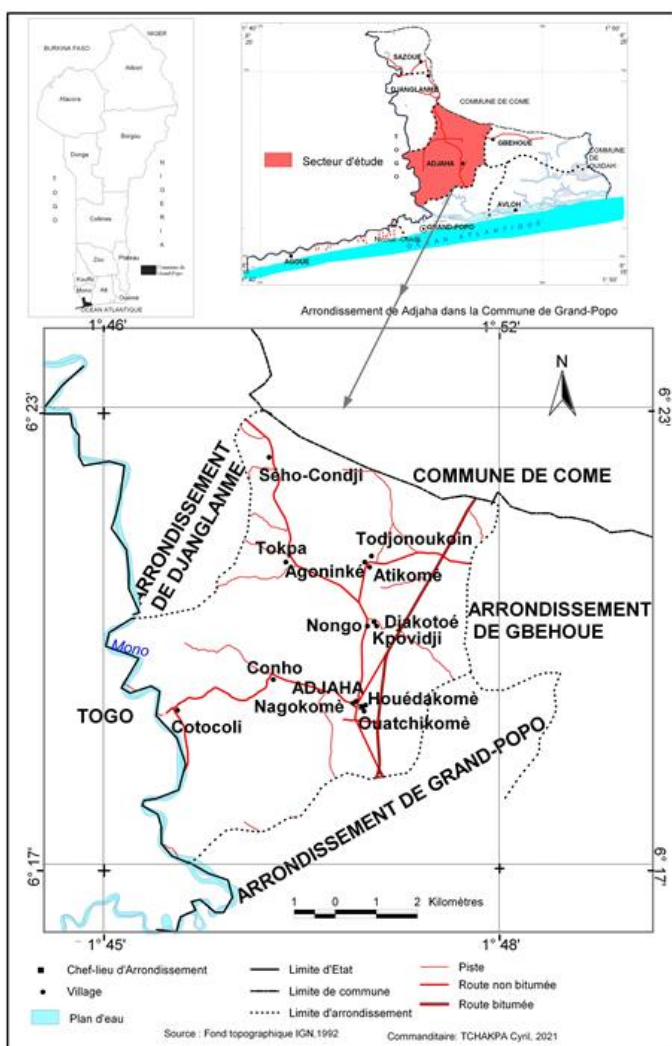
Since the period of independence, all successive Beninese governments have recognized the importance of the agricultural sector in the national economy. Agriculture accounts for 35 per cent of national GDP and employs 70 per cent of the working population, which qualifies Benin as an agricultural country (APRM, 2008).

Indeed, food and cash crops other than cotton appear more and more and clearly as essential complements not only for the economic balance of Beninese farmers, but also for food security. In this dynamic of agricultural diversification, rice occupies a prominent place.

Rice cultivation in Benin dates back to the pre-independence period. It boomed between 1961 and 1979 with the increase in production. Yield during this period increased from 0.3 tonnes to 2 tonnes per hectare (Mensah, 2006). In addition, since 1995 there has been an increase in paddy rice production (FAO, 2005). The distribution of rice production according to the Departments in Benin is as follows (Danvi, 2003):

- South: About 43 % of the national production potential;
- Centre: nearly 16% of the potential of national production;
- North: about 41% of national potential

Located southwest of the Commune of Grand-Popo, the Arrondissement d'Adjaha is between 6° 17 and 6° 20 north latitude and between 1° 47 and 1° 52 east longitude (Figure 1).



**Figure 1:** Geographical location of the Borough of Adjaha

## 2.DATA AND METHODS

### 2.1 Data used

The data used in this research include :

- agricultural statistics on the evolution of areas sown, rice production revenue over a period of ten years, i.e. from 2008 to 2018. This information of a quantitative nature is collected at ATDA/Mono-Couffo, and at the APRM as well as that relating to rice varieties, such as: IR841

and NERICA L20. This data made it possible to see whether rice production in Grand-Popo changes every year;

- data relating to the actual population growing rice in Grand-Popo collected at ATDA / Mono-Couffo;
- climatological data (temperatures and rains) from the ASECNA files of the Bohicon station over a period of thirty years, i.e. from 1986 to 2016;
- soil data to know the nature, texture, type of soil and fertility status of the soils and the realization of the soil map ;
- qualitative data from socio-economic surveys of rice farmers and resource persons and the Town Hall;

This information accurately traces the realities related to rice production in the Adjaha District.

## ***2.2 Methods used***

Three villages were selected by reasoned choice to house the surveys. The criterion for choosing a village is the concentration of peasants and the high production of rice in that locality compared to other villages. As for the persons surveyed, the choice was made on the basis of seniority in the locality, at least 20 years. The respondent is at least thirty (30) years old and is an actor in the production rizicole. A sample of 51 rice producers and 14 resource persons out of a total output of 98, i.e. a sampling rate of 66%, was interviewed as part of this study.

Individual interviews and group discussion sessions were conducted using the questionnaires and the interview guide, respectively, to gather information from resource persons. The CAP (Knowledge, Attitudes, Practices) approach is used to collect information on problems related to constraints and to understand the perceptions and knowledge of communities. Direct observations in the field have made it possible to better identify peasant adaptation strategies to the effects of constraints in the rice-growing perimeters of the Adjaha district. All this work carried out has led to the following results.

## **3. RESULTS AND DISCUSSION**

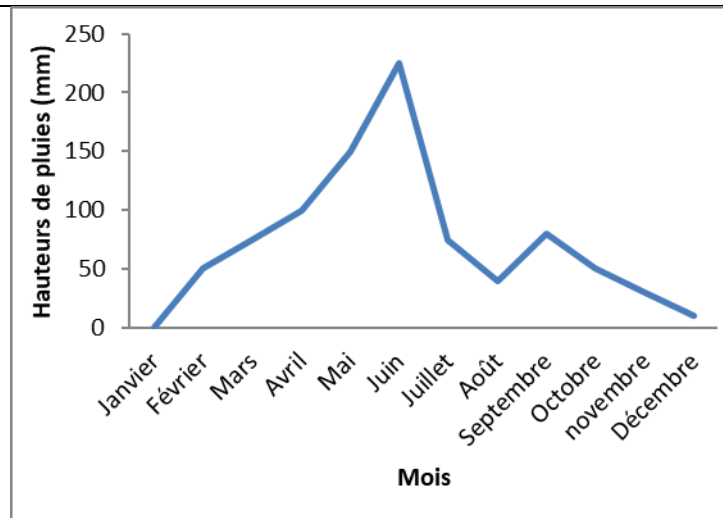
### ***3.1 Biophysical Foundations of Rice Production in the Adjaha District***

They take into account climatic, geological, geomorphological factors, the hydrographic network and the ecology of rice.

#### ***3.1.1 Climate aspects***

The municipality of Grand-Popo, of which the district of Adjaha is a part, enjoys a subequatorial climate of the Guinean type characterized by four (04) seasons more or less marked: a large dry season from mid-November to mid-March, a large rainy season from mid-March to mid-July, a small dry season from mid-July to mid-September and a small rainy season from mid-September to mid-November. Rainfall therefore takes place mainly between March and July with a maximum in June. They are spread over an average of 60 to 120 days.

Over the 90s, the average annual rainfall height was of the order of 900 mm in Grand-Popo with minimums at 730 mm and maximums at 1,145 mm (Figure 2).



**Figure 2:** Monthly evolution of precipitation in Grand-Popo (1986 to 2016)

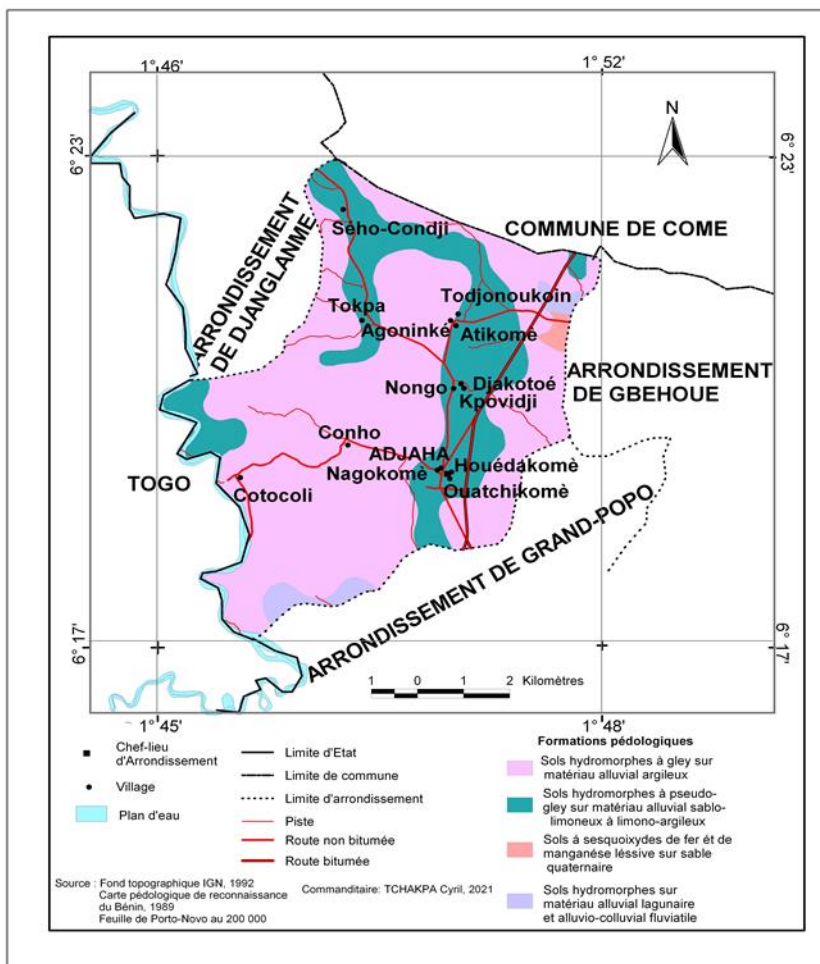
*Source : ASECNA, 2016*

The analysis of this figure shows an evolution of rainfall from January until reaching its maximum value (236 mm) in June. From this month this rainfall begins to decrease until August (40 mm) before resuming to reach 106 mm in October. This trend of rainfall evolution in Grand-Popo keeps the bimodal character of the subequatorial climate with two rainy seasons and two dry seasons. Riceproduction is largely dependent on climatic factors and constraints (the two rainy seasons and the two dry seasons), becauseagriculture in Benin and especially inthe District of Adjaha is subordinated to rainwater. In addition, we cannot talk about rainfall without addressing soil and hydrography.

### 3.1.2 Geological factors (Soil, vegetation, relief)

On the territory of the municipality of Grand-Popo three types of soil, corresponding to the three main sets of relief and three (03) dominant types of vegetation emerge:

- the soils of the Littoral and the dune cords (district of Avlo, Grand-Popo and Agoué) are sandy, made up of fine sands, poor in organic matter and very permeable and wherewell-drained alluvium sand uses dominate. Thesesoils are coconuts nucifera (coconut trees);
- in the plateau sector (districts of Adjaha, Djanglanmey and Sazué), the land is hydromorphic and fertile. They correspond to the lower parts of sandy formations, subject to the fluctuations of a shallow water table. They are alluvium and sandy collusions of covering on clays. The vegetation consists of wooded savannah in *Guinean Elaeis sis* (oil palm), *ceiba pentandra* (cheese maker), *Milicia excelsa* (Iroko);
- a little further inland in the mangrove (lagoon and marshy areas), these are alluvial and hydromorphic soils, soils of low valleys and coastal lagoons with vegetation dominated by a herbaceous formation, more or less dense lake species such as mangroves (*Avicenia* and *Rhizophora*),rushes, grasses (Figure 3).



**Figure 3:** Soil map of the district of Adjaha

The arrondissement of Adjaha is the "central" arrondissement of the commune of Grand-Popo. It covers an area of 65 km<sup>2</sup>. In addition, it is composed mainly of floodplains crossed by an arm of the Mono River, the Sazué and its effluents, a narrow strip of farmland oriented South / North and along the National Interstate Road (RNIE 1). The district of Adjaha (study area) is essentially composed of hydromorphic soils on lagoon alluvial and alluvial-colluvial fluvial material. It is a type of soil very suitable for growing rice because of its organic matter content.

### 3.1.3 The river system

The hydrographic network consists of the mono river which has its source in the Monts Alédjo in the Atacora in the north and flows in its upper part in Togo before constituting in its lower part the natural border between Benin and Togo from Aplahoué; a series of tributaries and effluents

the Sazué, Agogo and the lagoon of Grand-Popo with a length of 15km. During the great rainy season (mid-March to mid-July) the Mono River overflows its bed and invades the surrounding fields. It should be noted that when it retreats in the dry season, alluvium and agricultural materials are deposited that fertilize the soil. This means that rice farmers rarely use inputs or not because the soil is naturally fertilized.

### **3.2 Ecology of rice**

Rice is an annual herbaceous plant with a round stem covered with the round sessile leaves flat teardrop-shaped and a terminal panicle. Under favourable and exceptional climatic conditions, the plant can be used for more than a year. Rice is adapted to an aquatic habitat. The rice cycle can be divided into 03 phases:

- Vegetative phase: includes germination, emergence and tillering. It lasts from sowing to the panicle differentiation phase. Depending on the temperature, the germination phase lasts from 5 to 20 days (5 days in hot conditions and 20 days under low temperatures)
- The reproductive phase: it ranges from panicle initiation to fertilization. This phase lasts 19 to 25 days. It includes panicle initiation, mounting, spruce and fertilization. From the panicle initiation, the tillering stops. During this phase, the rice plant is particularly sensitive to adverse conditions (drought, low temperatures, etc.).
- Grain filling and maturation phase: it goes from the fertilization of the grains to maturity. During this phase, a filling of the grains is done by a movement of nutrients from the plant to the grains. The grains go through a phase of milky grain, then pasty grain and finally mature grain. This phase lasts from 30 to 42 days, depending on the temperature and humidity conditions of the environment.

Rice is a light plant that requires good sunstroke, a factor directly proportional to the relative yield. The optimum is reached for averages of the order of 500 calories/cm<sup>2</sup>/day.

Rice is quite plastic when it comes to soils. However, it prefers fine-textured soils containing 40% clay, which is not very permeable. Coarse elements are unfavorable to the cultivation of rice. In dry cultivation, like other cereals, it requires a rich, loose, loamy to limono-clay soil. Rainfed rice is grown on steeply sloping hilllands, on plateau or low-slope land or on low-slope land with groundwater assistance. Rice monoculture is not profitable (WARDA, 200-5, p. 13)



(Photo 1).

**Photo 1** : Rice plant *Shooting*: ATIYEVI, January 2017

This is a rice plant that is located near a tap. The harvest has been done for two months but because of the permanent humidity around the tap, we can still see its presence. This is the Bérice 21 variety.

**3.3 Rice production in Adjahdistrict**

**3.3.1 Sowing period**

There are two methods of sowing, namely direct sowing and indirect sowing. Direct sowing involves sowing the rice seed with a machine called a 'seeder' on dry land, while indirect sowing involves making a nursery for the rice before planting it over the entire area. From April, those who sow directly begin by sowing while those who do indirect sowing wait for the first rains until May before sowing (Table I).

**Table I : Rice calendar**

Month	Jan	Feb	March	April	May	June	Jul	August	Sep	Oct	Nov	Dec
Varieties												
Cycle court				Semis						Harvest		
Cycle long				Semis						Harvest		

*Source: Field survey January 2017*

**3.3.2 Pre-harvest operations**

They can be summarized as follows:

- Soil removal (remove shrubs)
- Mowing (ridding weeds from the ground)
- Ploughing (is done through the tractor)
- Soil planing or Soil spraying (make the soil flat and homogeneous)
- Make 400m<sup>2</sup> lockers and an online seedling
- Make aisles between the lockers to facilitate the passage to the peasant
- Weeding (1-3 times) or the use of fertilizers (01 bag of Urea of 50 kg accelerates development, 02 bags of MPK of 50 kg increase yield)

- Smoking
- Avian hunting (lasts 30-45 days after sowing)
- Maturity and harvest

Plate 1 presents the only tractor available in the municipality of Grand-Popo and its accessory used during ploughing.



**Plate 1:** Tractor (1) and Tractor Accessory (2)

*Shooting: ATIYEVI, Adjaha January 2017*

### **3.3.3 Farmers' organizations**

#### **3.3.3.1- Communal Union of Rice Farmers of Grand-Popo (UNCRG-P)**

It is an umbrella organization that brings together all the groups and cooperatives of the municipality of Grand-Popo. Its county seat is Adjaha-Centre. It is the voice of the rice producers of the commune. It is involved in the production and marketing of rice in the commune.

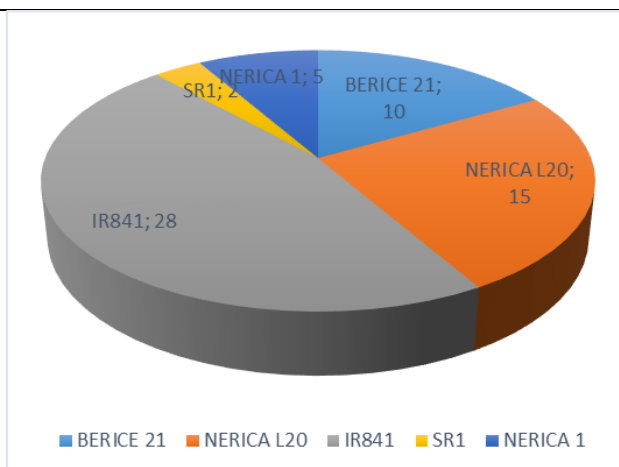
#### **3.3.3.2- Cooperatives**

The cooperative allows the members (rice producers) who compose it to have access to technical services, credits and to benefit from the projects proposed by the support partners. It has a maximum of 07 members. The district of Adjaha has 04 cooperatives namely: LOM-NAVA; GIFT OF GOD; GNONOU-WOBO; KPONDENOU

#### **3.3.4 Varieties of cultivated rice**

The rice varieties grown by rice farmers are only those improved: IR 841, NERICA L20, BERICE 21, SR1, NERICA1





**Figure 4:** Varieties grown according to the proportions of producers

*Source: Field survey January 2017*

From the observation of Figure 4, 28 rice farmers or 47% of the rice producers surveyed say that the rice variety IR 841 is more productive and requires less maintenance compared to only 15 rice farmers (25%) who think that the Nerica L20 is more suitable because of its tolerance to climatic hazards. They are 10 rice farmers (17%) to find that the Berice 21 variety allows to have the rice of long and coarse grain, moreover its cooking is fast. As for the Nerica 1 variety, five rice producers or 8% of the rice farmers surveyed prefer it because its grains are small and thin. Only 3 rice producers are for the SR1 variety because of the pale color of its grains.

Indeed, the certified seed of IR 841 rice is an improved lowland rice variety whose cycle is 120 days and which gives a yield in peasant environment of 5 tons / ha according to studies conducted by the National Institute of Agricultural Research of Benin in 2005. All growers use certified seed and often renew it. 68% of producers take their seeds from the previous year's harvest. The trend at national level is to promote the popularization of the IR 841 variety, which is well appreciated by both producers and manufacturers in the major rice-growing regions of Benin (Malanville, Zou-Collines, Mono-Couffo). The availability of improved rice seeds is not an issue in the study area. They are offered by ATDA.

From all the above it should be noted that the variety IR 841 is adapted to the environment because of its profitability and its perfume appreciated by 47% of the respondents (Table II).

**Table II: Characteristics of rice varieties grown in Adjaha district**

Varieties	Yield (tons/ha)	Cycle length (days)	Perfume	Grain characteristic	Cultivation system	Hulling performance
<b>NERICA L20</b>	2.5-4.0	90	Unscented	Long and thin	Lowland rain	65 %

<b>BERICE 21</b>	3.5-5.5	120	Unscented	Long and big	Lowland rain	65 %
<b>IR 841</b>	5.0-6.5	120	Fragrant	Small and large	Lowland rainland sometimes irrigated	70 %
<b>NERICA 1</b>	4.0-6.0	90	Less Fragrant than IR 841	Small and thin	Lowland rain	55 %

Source: Field survey, Adjaha 2017

### 3.3.5 Evolution of rice production in terms of area and yield

The evolution of production and area are in perfect correlation. However, yields do not follow at the same pace. This state of affairs is confirmed by the complaints of 56 rice producers listened to or 86% of all rice producers during field work (Figure 5). From 2010 to 2013, the area sown increased from 25 hectares to 149 hectares, an increase of 124 hectares. This increase is explained by the agricultural season (2010-2013) launched by the Beninese government for the benefit of farmers by providing them with means of production through subsidies (Figure 5).

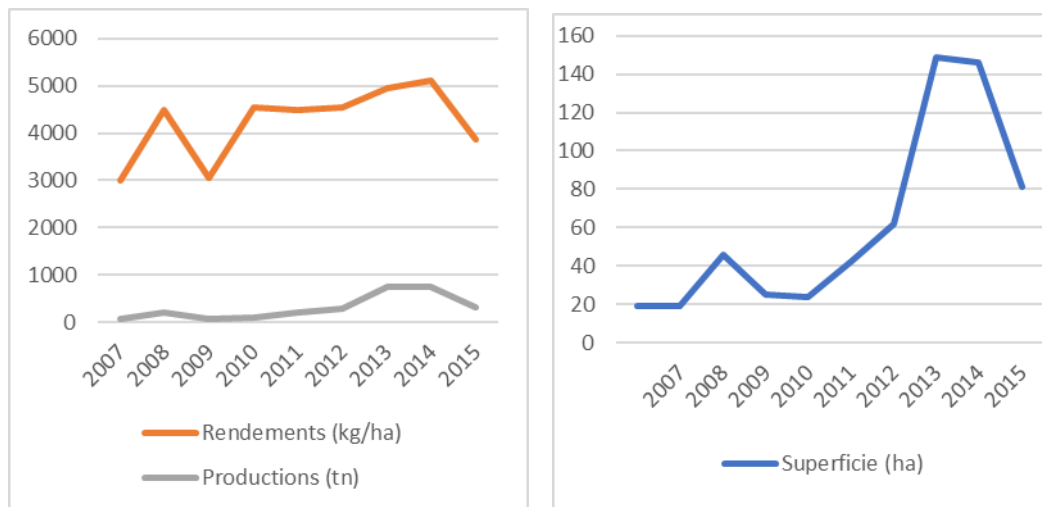


Figure 5: Change in area, yield and production 2010 to 2015

Source: Statistical data processing ATDA Grand-Popo (2017)

Missing data on the evolution of paddy production in the municipality of Grand-Popo do not allow to discuss the evolution of production in this study area in depth. However, based on data from 2007 to 2015 (ATDA, 2017), there is a decrease in production over the period 2014-2015. As shown in Figure 5, the decline in production is mainly due to a decline in the area under cultivation. This regression testifies to many difficulties encountered by rice farmers in the region, namely: the lack or insufficiency of financial means, the arduousness of working the land

because of its high clay content, the scarcity of labor and its high cost, and the vagaries of the weather.

#### **4.CONSTRAINTS RELATED TO RICE PRODUCTION IN ADJAHA DISTRICT**

##### **4.1 At the level of the strict rainfall system**

The strict rainfall system is one in which rice production is conditioned solely by rainfall. In other words, it is a production system totally dependent on the rainy season (1000 and 1800 mm during the growing season). Yields are still well below those conveyed by research for many reasons, including the lack of control of technical routes, difficulties in accessing inputs and credit, the degeneration of varieties, insufficient water supply, the high nuisance of weeds and climate pejoration do not favor its development.

This production system is found under multi-year crops such as oil palm or banana and some food crops such as cassava, maize and legumes where rice is grown either in combination, rotation or stealth (South and Centre).

##### **4.2 At the level of the low-lying rainfall system**

The lowland rainfall system is a system that combines precipitation and the little water reserve present in the shallow. The constraints are: the low level of control of the water and its poor quality for an intensification of the exploitation, the isolation of the production areas in relation to the markets, the strong pressure of weeds, insects, termites, birds and climatic pejoration. Other constraints include: the lack of subsidies in the field and the difficulties of supplying seeds and fertilizers.

##### **4.3 At the irrigated system level**

The irrigated system is a system that allows the permanent availability of water in the field. The main constraints are: the difficulties of irrigation of the entire area, the flooding of certain perimeters preventing double cultivation (case of undigested perimeter), the mismatch between the pumping system and the realities of the environment without forgetting the scarcity of salaried labor.

##### **4.4 Measures to improve and promote local rice**

To improve and promote local rice, some measures are envisaged:

- Water control for rice production;
- Access to land;
- Access to appropriate agricultural credit and financing;
- Access to agricultural equipment and its maintenance;
- Access to technical innovations and professional knowledge;
- Accessibility of specific fertilizers, pesticides and herbicides available.

#### **5. CONCLUSION**

The geographical determinants of rice production in the district of Adjaha in the commune of Grand-Popo are very favourable and constitute a natural asset for the production of this crop. The establishment of rice farmers in cooperatives is a significant asset because it allows them to benefit from State aid and the benefit of projects that they cannot win individually. It allows rice

producers to have access to credit and technical services. With regard to the difficulties encountered by rice producers, measures are being taken in this area to alleviate them.

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