

## **FARM MANAGEMENT PRACTICES OF RICE BLAST IN BURKINA FASO**

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### **ABSTRACT**

Rice blast is a fungal disease that causes enormous production losses. This study aimed to determine the socio-agronomic characteristics and management practices of rice blast on rice farms in Burkina Faso. An individual survey was carried out in 2021 on a sample of 180 rice farmers spread over four major production sites, namely the Sourou valley, the Kou valley, the Bagré plain and the Karfiguéla plain. The sites were selected according to the presence of rice blast and the importance of paddy rice production, while the farmers were selected according to their experience of at least three years in production. The results indicated a very high level of illiteracy among farmers (> 50%), with low participation of women with a mean rate of 9,25% in rice production, depending on the site. Cultivation practices were characterized by high use of organic manure (> 1500 Kg/ha) and mineral manure (> 400 Kg). The majority of farmers used resistant varieties (65,67% to 70,67%), chemical pesticides (60% - 86%) and organic manure (51,11% - 81,11%) to control rice blast. Very few farmers (0,87% - 2,87%) used biopesticides as a means of control. In view of these results, it is essential to raise farmers' awareness of the need to use biopesticides, with the support of research structures.

**Keywords:** Rice farms, Farming practices, Management, rice blast, Burkina Faso

### **1. INTRODUCTION**

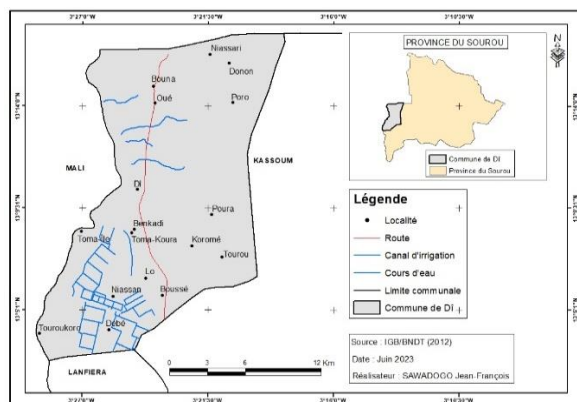
Rice blast is recognized as the most important fungal disease in rice cultivation (Bouet *et al.*, 2012). It can cause seedling damping-off, leaf spot and even panicle blotch (Mahomed *et al.*, 2022). These conditions are among the main causes of seed deterioration and yield reduction (Kachkouch *et al.*, 2012). Work carried out on rice varieties to detect fungal contaminants in rice grains at the end of

the vegetative cycle has identified a group of parasitic microorganisms that infect grains before harvest, including the fungi responsible for rice blast. However, despite the many efforts made to gain a better understanding of this disease, it is still progressing at an alarming rate and remains a threat to rice production in Burkina Faso. Limited local knowledge of epidemiology is thought to partly explain the reasons for the progression of an epidemic (Kachkouch *et al.*, 2012). Studies are therefore being carried out to determine or identify the major constraints to rice production linked to this disease in Burkina Faso's major production zones. Noting its significant proliferation in major production areas and to ensure the sustainability of rice farming, a number of concerns have been directed towards understanding rice blast management practices on their respective farms (Raveloson *et al.*, 2015). This study contributes to improving farmers' rice blast management practices on rice farms in Burkina Faso.

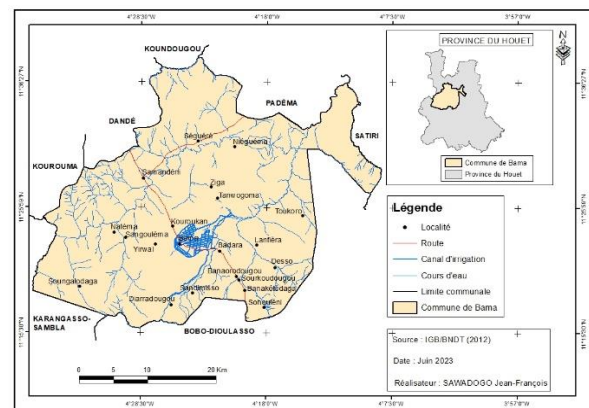
## 2. MATERIAL AND METHODS

### 2.1 Study sites

The survey was carried out at sites in the Sourou valley in Sourou province, the Kou valley in Houet province, the Bagré plain in Boulgou province and the Karfiguéla plain in Comoé province. The choice of these sites was justified by the presence of rice blast, observed during previous surveys. Sourou and Boulgou provinces have average annual rainfall of between 600 and 900 mm, with an eastern North Sudanian climate. The Houet and Comoé provinces, with annual rainfall ranging from 900 to 1,200 mm, have a South Sudanian climate (Yameogo *et al.*, 2013; Zougrana *et al.*, 2021). Figure 1 shows the location of the study sites.



Sourou Valley location



Kou Valley location

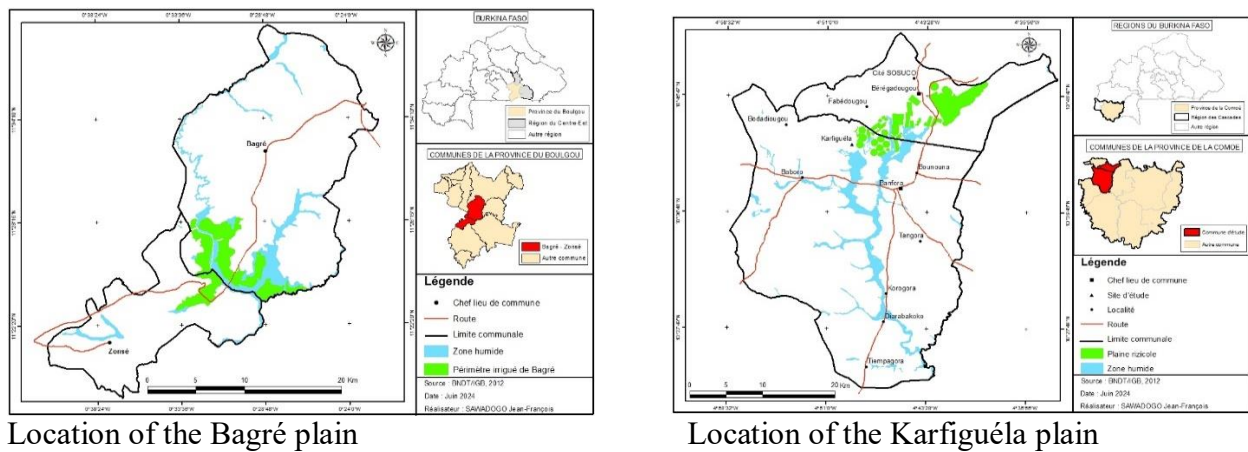


Figure 1: Location map of survey areas

## 2.2 Material

The different populations of producers in the different localities were involved.

The survey questionnaire and record sheets were used in the field.

## 2.3 Methods

Once the survey forms had been drawn up and the sites identified, the first step before conducting the formal survey was to administer the questionnaire to the paddy rice producers. A total of 180 producers were surveyed. Images of leaf and panicle blast were presented to producers to facilitate recognition. Sites were selected according to their high presence of blast and the importance of paddy rice production, while producers were selected according to their experience of at least three years in paddy rice production. Data collection was based on individual interviews. The main aspects examined were the socio-agronomic characteristics of producers and rice blast management practices applied on their farms.

## 2.4 Data collection

The first step was to record the general characteristics of each producer (surname and first name, age, gender, level of education), followed by the identification of the agronomic characteristics of the farms (use of organic manure, mineral manure, yields by site and by type of fertilization), and finally the blast management practices of the farmers (use of resistant varieties, biopesticides, chemical pesticides, organic manure). Interviews were conducted depending the language spoken by the respondent.

## 2.5 Statistical analyses

The data collected were entered in Microsoft Excel 2013. XLSTAT.2016 software was used for analysis of variance. Means for each parameter were compared using the Fisher test at the 5% probability threshold.

### 3. RESULTS

#### 3.1 Social characteristics of surveyed farmers

The social characteristics of rice farmers are presented in table I.

**Table I: Social characteristics of surveyed farmers**

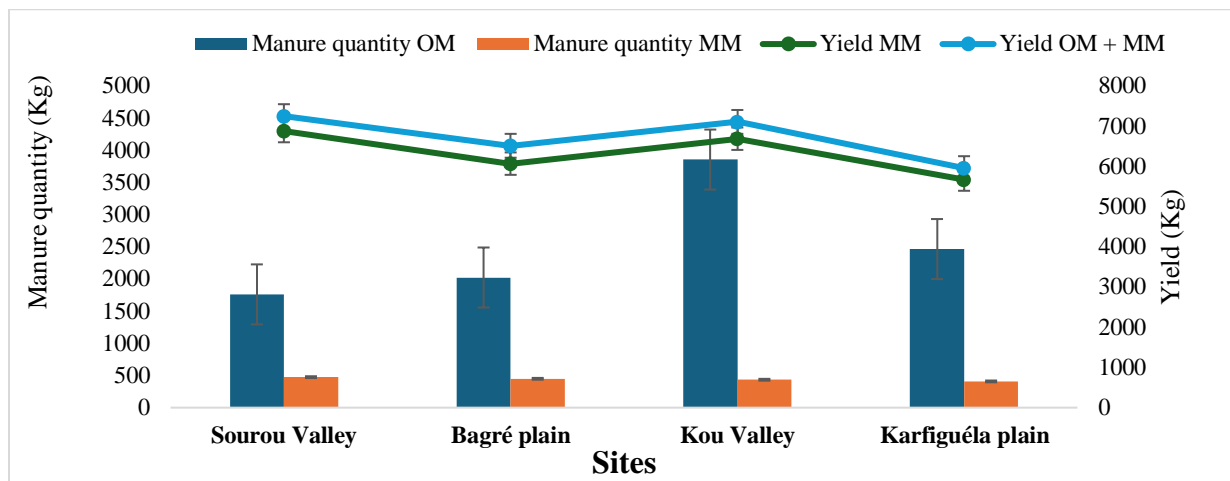
Sites	Years of experience	% of surveyed		Educational level	
		Men	Women	Literate	Illiterate
<b>Sourou Valley</b>	11 <sup>d</sup>	96.67 <sup>a</sup>	3.33 <sup>c</sup>	37.78 <sup>b</sup>	62.22 <sup>a</sup>
<b>Bagré plain</b>	36 <sup>b</sup>	89.67 <sup>c</sup>	10.33 <sup>b</sup>	43.67 <sup>d</sup>	56.33 <sup>a</sup>
<b>Kou Valley</b>	39 <sup>a</sup>	90.00 <sup>b</sup>	10.00 <sup>b</sup>	45 <sup>c</sup>	55 <sup>b</sup>
<b>Karfiguéla plain</b>	27 <sup>c</sup>	86.67 <sup>d</sup>	13.33 <sup>a</sup>	37 <sup>a</sup>	63 <sup>c</sup>
<b>Pr &gt; F</b>	<b>&lt; 0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.001</b>
<b>Signification</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>HS</b>

S: Significant, HS: Very Highly Significant. Values on the same line with the same letter are not statistically different at the 5% probability level.

Analysis of variance shows a significant difference between sites at the 5% probability level. The number of years of experience varies from one site to another. The results show that farmers on the Bagré plain and those in the Kou Valley have the highest number of years of experience in rice cultivation, with 36 and 39 years respectively. The survey also revealed that the number of literate producers varies from one production site to another, with a very low level on the Karfiguéla plain (37%) compared to the Sourou Valley, Kou Valley and Bagré plain sites, where the literacy rate is 37.78%, 45% and 43.67% respectively. The results also showed that the percentage of women producers remains low on the sites, with 3.33% in the Sourou Valley, 10.33% on the Bagré Plain, 10% in the Kou Valley and 13.33% on the Karfiguéla Plain.

#### 3.2 Agronomic characteristics of rice farms

A variation in the agronomic characteristics of rice farms on the different sites is observed and presented in figure 2.



**Figure 2: Agronomic characteristics of surveyed rice farms**

**Legend:** OM: organic manure, MM: mineral manure.

The results show a significant difference between sites at the 5% probability threshold.

The results show that organic manure (composed mainly of animal manure from cattle, sheep, goats and well-decomposed poultry droppings) and mineral manure (NPK and urea) are applied at different rates on the different sites. All farmers use mineral fertilizer (NPK + Urea). Those using organic fertilizer do so in combination with mineral fertilizer. The highest quantities of organic manure were applied by farmers in the Kou Valley (3856.81 kg/ha), and the highest quantities of mineral manure were applied in the Sourou Valley (474.23 kg/ha). The results showed a variation in paddy rice yields across all sites, with a significant increase among farmers using the combination of organic and mineral fertilizers compared with those using mineral fertilizers alone. The highest yields were recorded in the Sourou Valley, with 6980 kg/ha for farmers using mineral fertilizer alone and 7252 kg/ha for farmers using a combination of mineral and organic fertilizers. The lowest yields were recorded on the Karfiguéla plain, with 5673 kg/ha for farmers using mineral fertilizer alone, and 5958 kg/ha for those applying a combination of the two types of fertilizer.

### 3.3 Adoption rate of rice blast management practices

The adoption rate of rice blast management practices by farmers at the different sites is shown in table II.

**Table II: Rate of adoption of rice blast management practices**

Adopted practices	Pourcentage of surveyed producers				Pr > F	Significations
	S.V	B.P	K.V	Ka.P		
<b>Resistant varieties</b>	70.67 <sup>a</sup>	66.67 <sup>b</sup>	55.33 <sup>c</sup>	65.67 <sup>b</sup>	< 0.01	HS
<b>Biopesticides</b>	1.33 <sup>b</sup>	1.87 <sup>b</sup>	2.87 <sup>a</sup>	0.87 <sup>c</sup>	< 0.01	HS
<b>Chemical pesticides</b>	60.00 <sup>c</sup>	72.22 <sup>b</sup>	84.44 <sup>a</sup>	86.00 <sup>a</sup>	0.0001	VHS
<b>Organic manure</b>	51.11 <sup>d</sup>	63.33 <sup>c</sup>	76.67 <sup>b</sup>	81.11 <sup>a</sup>	0.0001	VHS

Legend: HS: Highly significant. VHS: Very highly significant, S.V: Sourou valley, B.P: Bagré plain, K.V: Kou valley, Ka.P : Karfiguéla plain. Values on the same line with the same letter are not statistically different at the 5% probability level.

Analysis of variance showed a significant difference between adoption rates for rice blast management practices. The survey showed that the highest adoption rates for the use of resistant varieties and biopesticides were recorded in the Sourou valley (70.67%) and the Kou valley (2.87%) respectively. The highest adoption rates for the use of chemical pesticides and organic fertilizers were recorded on the Karfiguéla plain. at 86% and 81.11% respectively.



Organic manure

Fungicides: azoxystrosbin et mangozeb

**4. DISCUSSION**

The social characterization of rice farms enabled us to determine the proportions of paddy rice producers by gender and educational level. Although women are involved in rice production at some sites, their level of involvement remains very low (<14%) compared with men. This can be explained by their production preference or habit. Generally speaking, women prefer to produce legumes such as cowpeas and groundnuts. The low involvement of women in the rice production process could also be explained by socio-cultural reasons that exclude or restrict women from taking part in farming activities. There are also economic reasons, due to the fact that in traditional

African society, family money is managed by the man who heads the household. The results of a survey by Compaore *et al.* (2019) carried out among rice growers in the commune of Dano in the south-west region of Burkina Faso showed that 88% of rice growers were men compared with 12% of women. They also showed that the majority of the study population had a fairly low level of education. the majority being illiterate (61%). with 32% having attended at least elementary school and 21% having benefited from agricultural training. Similar work carried out by Koussoube *et al.* (2018) in the case of potato cultivation showed that there are more men than women practicing the activity. Also. Sanon *et al* (2020). in strict rainfed rice cultivation in the North and South Sudan zones of Burkina Faso. indicate that 37% of the producers surveyed were women. The agronomic characteristics of rice farms vary from site to site. Average yields per farmer at the different sites are also proportional to the amount of mineral fertilizer applied. The work of Sanon *et al* (2020) showed that the quantities of fertilizer applied per hectare in strict rainfed rice-growing systems in the North and South Sudanian zones of Burkina Faso were relatively low compared with the norm. at 398.44 kg for organic fertilizer. 90.88 kg for NPK fertilizer and 56.36 kg for urea fertilizer. The latter also showed that the best paddy rice yields were recorded among farmers using a combined application of organic and mineral fertilizers.

A large proportion of respondents at the various sites used resistant varieties and chemical pesticides as management practices. According to Zhan *et al* (2018). there are many biotic constraints in rice growing. including fungal diseases such as blast. which are a major problem affecting rice production. A small proportion of respondents use biopesticides to manage rice blast as a seed treatment. Calthio is used to combat the fungus present in seeds. The non-adoption or low use of biopesticides in the fight against blast is explained by their lack of awareness in agricultural extension and their inaccessibility. Many producers are also unaware of the manufacturing process. According to Guerber and TeBeest (2006). infested seed is one of the main sources of primary inoculum for blast.

## **5. CONCLUSION**

This study aimed to identify the socio-agronomic characteristics and the rice blast management practices. The study revealed that the majority of rice farmers are illiterate. In addition, the use of chemical pesticides remains very high. with a very low rate of adoption of biopesticides. In view of these findings. it is imperative to develop control alternatives that protect human and animal health while preserving the environment. It is therefore important to evaluate the resistance of resistant rice genotypes and the effect of biopesticides in controlling rice blast.

## **Acknowledgments**

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### **Author Contributions**

OS planned the experiments, interpreted the results, analysed the data statistically, SA and KK supervised the project.

### **Conflict of interest**

The authors declare no conflicts of interest.

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