Ivory Coast – Rice – 2024 – HH Analysis

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Based on the Trial Report titled "TRIAL COMPARING THE PERFORMANCE OF CHEMICAL AND ORGANIC FERTILISERS WITH CROP BOOSTER ON THE AGRONOMIC PARAMETERS OF IRRIGATED RICE IN COTE D'IVOIRE (WEST AFRICA)"

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(République de Côte d'Ivoire, Ministère de l'Enseignement Supérieur et de la Recherche Scientifique)

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[1] UFR: L'Unité de Formation et de Recherches (French: Training and Research Unit)

Trial Overview

Crop

- Rice
- Variety not reported

Trial Started

- Transplanted on 10 February 2024

Report

- September 2024

Location

- Field coordinates: 7°53'39.91'' N; 5°4'13.404 W,
  in the M'Bé lowlands of Bouaké, Gbeke, central Ivory Coast, Africa.
- Trial Total Area: 570 m² (0.14 acre)

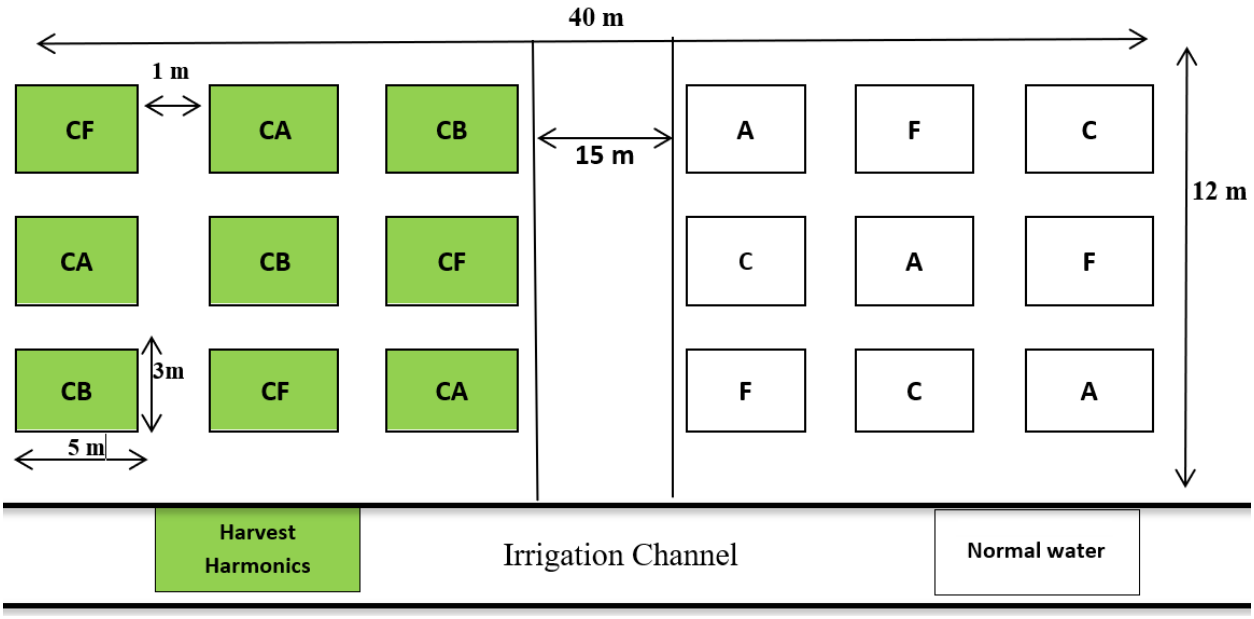
Details

- Fertilizer – basal dressing: N-P-K (12-22-22); 150 kg/ha, single dose at transplanting
- Fertilizer – top dressing: Urea with 46% N; 80 kg/ha, single dose at transplanting
- Rice straw: 12 t/ha
- Weeding: manually during land preparations
- Technology tested: Kyminasi Plants – Crop Booster ™. A single Kyminasi® Disc (KD) was installed on a metal pipe (shown below in Dr. Tierry's hand) and used to treat designated plots, for comparison with Control in various combinations.

Setup

As shown in the diagram below, eighteen microplots of 3x5 meters each were further divided into three blocks of six microplots each, where:

- CA: Crop Booster + rice straw
- CB: Crop Booster by itself
- CF: Crop Booster + fertilizer
- A: rice straw (to enhance soil fertility)
- C: Control
- F: fertilizer



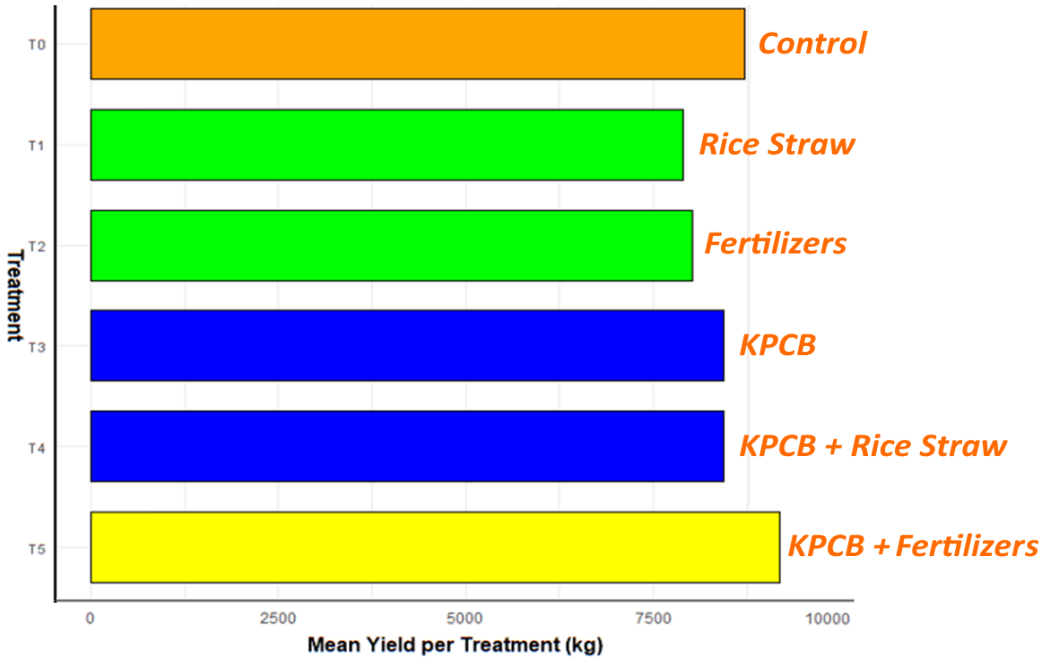
Parameters evaluated:

- Number of tillers,
- Plant height,
- Number of panicles,
- Production.

Results

Final harvest results are missing because, as Dr. Thierry stated in his report: *"a few days before the harvest, a storm hit the area, practically destroying the rice plants."*

Refer to the graph below showing the differences in YIELD results between the various treatments. The KPCB treatment (T4) by itself outperformed the other individual treatments – rice straw (T1) and fertilizers (T2) – by 7% and 5.3%, respectively. The combination of KPCB and fertilizers (treatment T5) outperformed T1 and T2 by 17% and 15%, respectively.



Conclusions

The reason why T0 had outperformed both treatments T1 to T4 has intrigued Dr. Thierry, as he stated in his report: *"What is intriguing here is the production of treatment T0, which did not receive any particular treatment but nevertheless produced more than certain treatments that did receive particular treatments."*

According to our extensive experience with KPCB technology, the most probable cause of this discrepancy was ***overfertilization*** of this crop in this trial. Harvest Harmonics highly recommends two factors to be changed in the next season:

1. Simplify the setup by ***reducing the number of elements tested*** to one standard treatment – in this case and area it can be N-P-K and urea;
2. Apply our ***POPS program (Profitability Optimization Protocol for Sustainability)*** to optimize yield, sustainability and soil health, by discovering the optimal levels of watering and nutrients.

République de Côte d'Ivoire

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TRIAL COMPARING THE PERFORMANCE OF CHEMICAL AND ORGANIC FERTILISERS WITH CROP BOOSTER ON THE AGRONOMIC PARAMETERS OF IRRIGATED RICE IN COTE D'IVOIRE (WEST AFRICA)

Dr. GUETY Thierry Philippe
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ABSTRACT

Crop fertilization, soil management, and soil and plant health are today's main research areas. Several innovations are being implemented, including the Crop Booster, which is emerging as a sustainable alternative for agricultural production, capable of reducing the need for chemical inputs and their harmful effects on microbial life. These advantages have led us, with the contribution of Harvest Harmonic Corp, to participate in a program to test this technology in Côte d'Ivoire. A trial of irrigated rice cultivation was set up in the M'Bé lowlands of Bouaké. The objective was comparing the performance of chemical and organic fertilisers with crop booster on the agronomic parameters of irrigated rice. A 570 m² plot was cleared and 18 microplots of 15 m² each were divided into three blocks of 6 microplots in a Fisher block design. The parameters evaluated were the number of tillers, plant height, number of panicles and production. The best results were obtained in the Crop Booster treatments, especially in production. This deserves special attention because of the results obtained.

I. INTRODUCTION

Crop fertilization, soil management, and soil and plant health are today's main research areas. Several innovations are being implemented, including the Crop Booster, which is emerging as a sustainable alternative for agricultural production, capable of reducing the need for chemical inputs and their harmful effects on microbial life. These advantages have led us, with the contribution of Harvest Harmonic Corp, to participate in a program to test this technology in Côte d'Ivoire. A trial of irrigated rice cultivation was set up in the M'Bé lowlands of Bouaké. A 570 m² plot was cleared and 18 microplots of 15 m² each were divided into three blocks of 6 microplots in a Fisher block design. The parameters evaluated were the number of tillers, plant height, number of panicles and production. The best results were obtained in the Crop Booster treatments, especially in production. This deserves special attention because of the results obtained.

This not only protects beneficial microbial populations, but also improves soil health and the overall resilience of ecosystems. The transmitted frequencies resonate with the vital processes of plants, increasing their ability to absorb light and accelerate photosynthesis. This increase in energy production promotes robust growth and development while optimising the efficiency of nutrient uptake, ensuring that essential elements reach growing tissues for maximum utilisation.

The aim of this work is to compare the performance of chemical and organic fertilisers with that of Crop Booster on the agronomic parameters of irrigated rice.

Specifically, this will involve :

- Examine the impact of treatments on agronomic parameters (yield, size, number of thallus and panicle) of rice;
- Determine the best treatment for increasing grain yield.

II. MATERIALS AND METHODS

II.1. Location of the study site

The study area is located in the administrative region of Gbeke, specifically in the department of Bouaké, in the M'bé lowlands (7°53'39.91" N; 5°4'13.404 W) in central Côte d'Ivoire. It is characterised by a bimodal rainfall pattern (1200 mm/year) with an average annual temperature of 28˚C. The M'bé lowland is semi-developed and water comes from a central watercourse which is the extension of the drainage channel of the part occupied by Africa Rice, located further upstream, closer to the dam that serves this lowland. Diversion canals are built here to flood the fields and also to drain off excess water. There is no irrigation infrastructure, but earthen bunds run along the plots to slow the flow of water to the lowlands. The main constraint is excess water after heavy rainfall, at the start of the rainy season, in the absence of an effective drainage system. Farmers can only grow rice during the wet season. During the dry season, cultivation is made difficult by irrigation problems due to the poor management of the lowlands. Some farmers limit themselves to a single rice-growing cycle.

II.2. Technical equipment

The Crop booster is a micro-transmitter (Figure 1) produced by Harvest Harmonics Corp. that uses low-frequency waves programmed into small steel alloy discs connected to the irrigation system, which carry the signals through the water to the soil and the plants.

Figure 1: Crop Booster device (A= micro-transmitter; B= irrigation tube with micro-transmitter; C= irrigation device installed)

II.3. Sowing and crop management

A 570 m² plot was cleared and 18 microplots of 15 m² each were divided into three blocks of 6 microplots in a Fisher block design (Figure 1&2). Sowing was carried out by transplanting on 10 February 2024, after a nursery period of 21 days. Weeding was carried out manually at tillering and bolting. Fertilisers were applied in a single dose at transplanting. N-P-K (12-22-22) was used as a basal dressing and urea with 46% N as a top dressing. These fertilisers were applied according to conventional practice, i.e. 150 kg/ha for N-P-K and 80 kg/ha for urea. We used 12 t/ha of rice straw.

II.4. Data collection

The parameters used for the measurements were the number of tillers, the height of the plants and the number of panicles. The height of the rice was measured using a carpenter's tape measure. The fresh weight of the rice grains was measured using a bathroom scale with small graduations. At 60 days after transplanting (DAR), the number of rice tillers and panicles per plot was counted on a 1 m^2 scale. Plant height was measured on ten plants taken randomly from each treatment in a 1 m^2 grid. Harvesting was done manually on 27 May 2024. After threshing and drying, the weight of the rice grains was determined to estimate the grain yield (GR) by treatment.

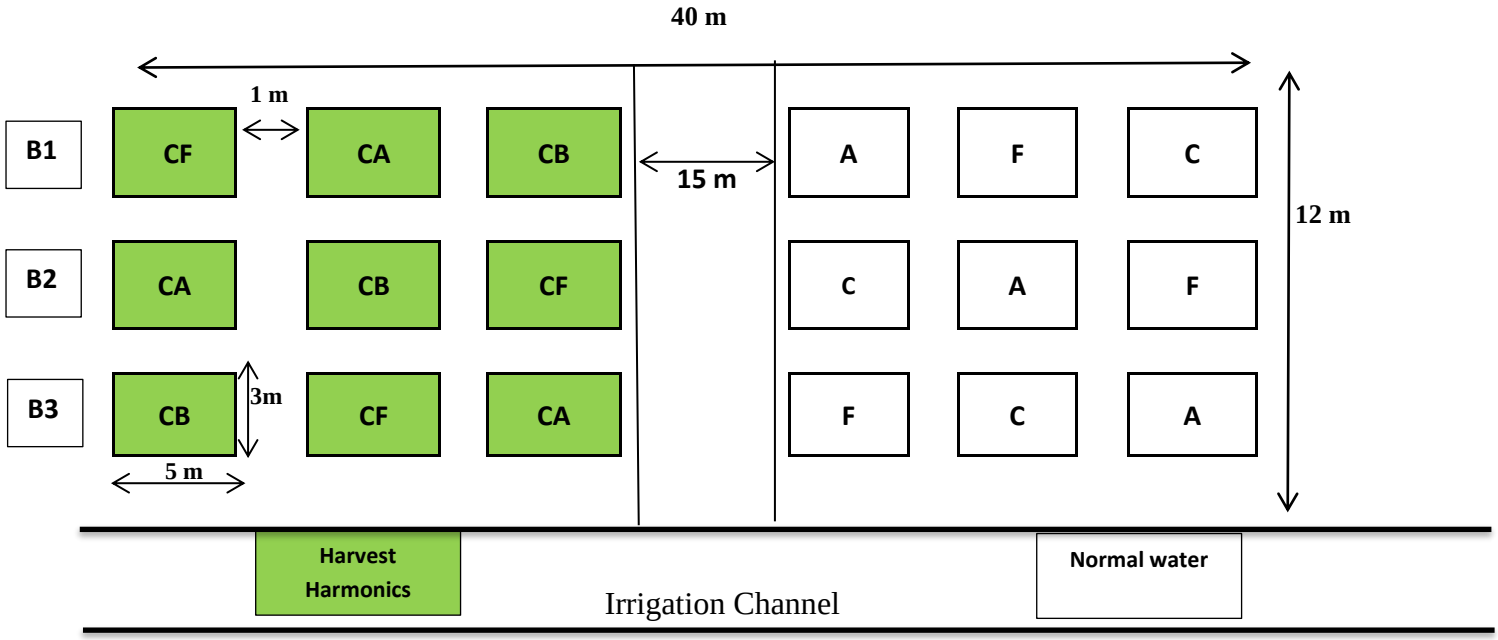

Figure 2: Trial plan

Figure 3: Trial photos

III. RESULTS

Table 1 : Factors influencing the height, number of tillers, panicles and production of rice.

	Ddl	Height		Number of Tiller		Number of Panicle	
		F value	Pr(>F)	F value	Pr(>F)	F value	Pr(>F)
Block	2	6.448	0.00194**	2.494	0.0834.	7.993	0.00037***
Treatment	5	51.117	<0,0001***	1.862	0.0990.	2.278	0.0455*
Block : Treatment	10	14.299	<0,0001***	5.278	<0,0001***	4.347	<0,0001***

	Ddl	Production	
		F value	Pr(>F)
Block	2	787420	<0,0001***
Treatment	5	236561	<0,0001***
Block : Treatment	10	326664	<0,0001***

*'***'p=0,0001, '**'p=0,001, '*'p= 0.05, '.'p= 0.1; Ddl = degré de liberté; n = 644. T0 = Control, T1 = Rice Straw, T2 = Fertilizer 150 Kg NPK +80 Kg UREA/Ha, T3 = KPCB, T4 = KPCB + Rice Straw, T5 =KPCB + Fertilizer 150 Kg NPK +80 Kg UREA/Ha*

Analysis of the factors influencing the various variables studied shows that treatment is a determining factor, with significant results for rice growth and production. Similarly, the blocks played an important role in the variation of soil properties, with a significant effect on the height (cm), number of panicles and rice production. However, their impact on the number of tillers was less pronounced but still significant. These results highlight the importance of taking into account the variations between the blocks and analysing how the treatments interact with these variations in order to better understand and optimise rice plant growth. The interaction between treatments and blocks reveals significant effects for all the variables studied, underlining the importance of considering the complex combination of environmental factors when assessing soil properties in rice cultivation. Understanding these relationships enables land management practices to be adapted to maximise crop productivity, improve soil health and promote sustainable agriculture.

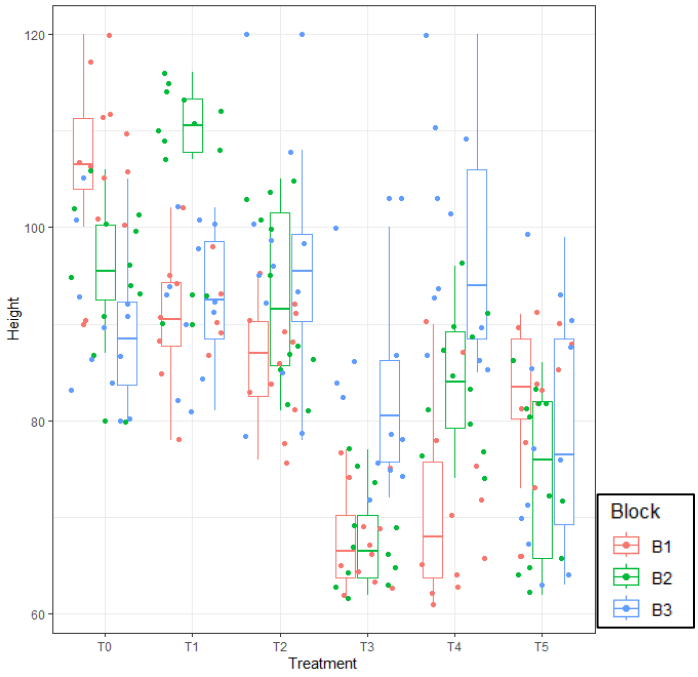

Figure 4 : Box plots illustrating variations in rice plant height within each experimental treatment according to block.

According to the diagram, treatment T1 stands out clearly from the other treatments in terms of height. T1 could be considered the best overall treatment in terms of height.

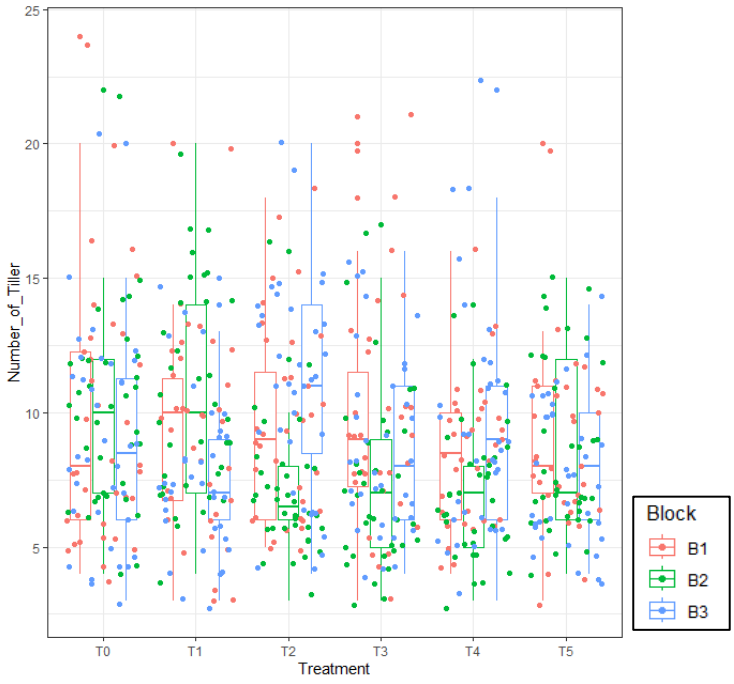

Figure 5 : Box plots illustrating variations in the number of tillers on rice plants within each of the six experimental treatments according to block.

Given that the differences between the treatments were not significant for the number of tillers, we can conclude that all the treatments (T0, T1, T2, T3, T4, T5) had a similar effect on the number of tillers.

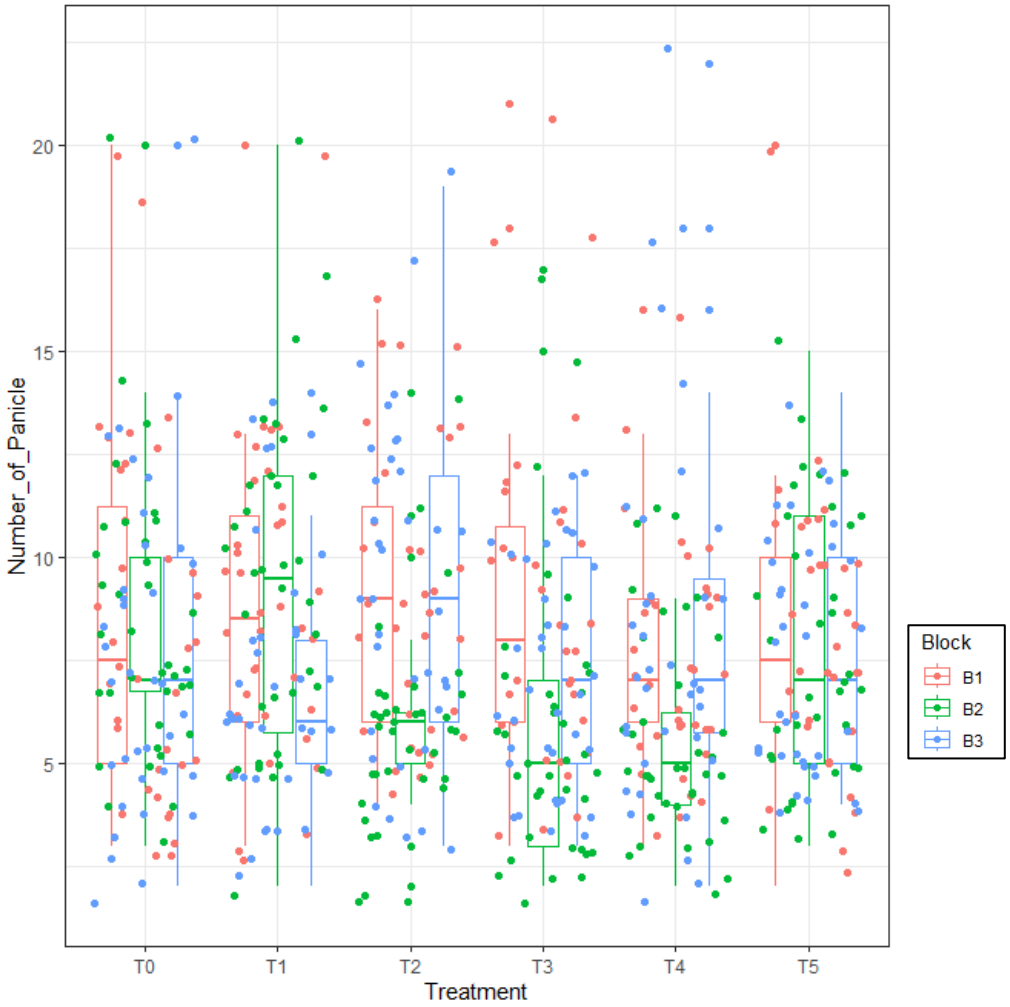

Figure 6 : Box plots illustrating variations in the number of panicles on rice plants within each of the six treatments according to block.

The differences between the treatments were not significant for the number of panicles, so we can conclude that all the treatments (T0, T1, T2, T3, T4, T5) had a similar effect on the number of panicles. However, T4 shows a marginally significant trend compared with T1.

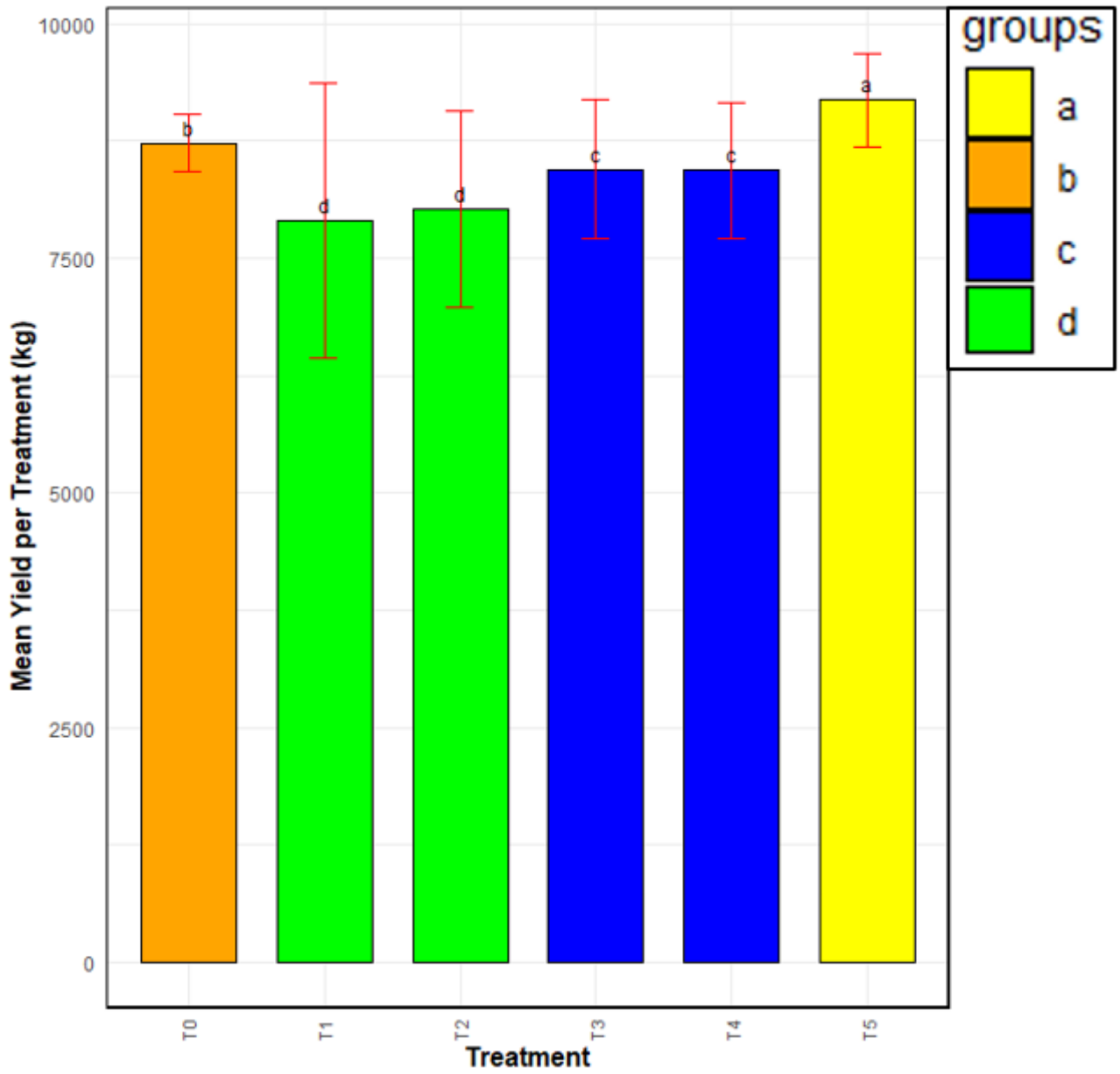

Figure 7: Bar charts illustrate the variation in yield between the different treatments

Each bar represents the average yield for a specific treatment group. These bars are colour-coded to correspond to predefined groups, and error bars indicate standard deviations from the mean. A one-way analysis of variance (ANOVA) was performed to assess significant differences between treatments. The analysis revealed substantial variations in mean yield between treatment groups, as indicated by the following F-statistics: F (5, 638) = 30.54; 2.2 x 10-16. The figure is boxed to improve visual clarity and highlight the variations observed. Subsequent analysis was refined by

pairwise post-hoc t-tests, using Fisher's smallest significant difference (LSD) correction at the 5% significance level, which confirmed the presence of significant differences between treatments.

Treatment T5 stands out as the best treatment in terms of productivity, followed by treatment T0, which is the control treatment, then treatments T3 and T4, and finally treatments T1 and T2. What is intriguing here is the production of treatment T0, which did not receive any particular treatment but nevertheless produced more than certain treatments that did receive particular treatments. In any case, the Crop Booster appears to be a technology that should be integrated into the consideration of alternatives for rice production in view of the preliminary results. It should also be noted that the difficulties in setting up the experiment meant that it was not possible to verify the actual presence of frequencies in the irrigation water by having water samples analysed by Harvest Harmonic Corp, in order to certify that the system had been correctly installed. In addition, certain external factors need to be taken into account when estimating production: a few days before the harvest, a storm hit the area, practically destroying the rice plants. All this could be added to the explanation of the production obtained. Further work is planned to further manipulate this technology correctly.

IV. CONCLUSION

This first trial of the Crop Booster system in Côte d'Ivoire, in the M'Bé lowlands of Bouaké, showed very good results in terms of rice growth and production. Crop Booster treatments were generally considered satisfactory compared to other treatments. This fact calls for real attention to be paid to this new technology. Difficulties in setting up the trial contributed to limiting the number of parameters to be studied. It is important to know about changes in soil properties and the environment in addition to irrigation water.