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# EVALUATION OF SOME HYBRID RICE UNDER LOW INPUT OF FERTILIZERS IN SENEGAL

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**ABSTRACT:** *This investigation was conducted at AfricaRice Sahel Regional Station, Saint Louis, Senegal during two Wet seasons, (July – November) 2010-2011. To evaluate the performances of 14 rice varieties under low input fertilizer levels. Five fertilizer compound treatments were used in this study,were used in this study, $F_0$: control (without any application), $F_1$= (37.5 – 4.4 – 8.3 kg N-P-K/ ha$^{-1}$), $F_2$= half dose of the recommend application in Senegal (75 – 8.75–16.5 kg N-P-K/ ha$^{-1}$), $F_3$= (112.5 – 13.3–24.8 kg N-P-K/ ha$^{-1}$) and $F_4$: recommended application in Senegal (150 – 17.5 – 33.0 kg N-P-K/ ha$^{-1}$). The results indicated that both of year, genotypes exhibited significant effect for all studied traits. Also fertilizer levels exhibited significant effect for all studied traits except, panicle length and 1000 grain weight. Interaction of Year* Fertilizer levels and Year* varieties revealed significant differences for most of the studied traits. There are no significant effect of the interaction of fertilizer levels*varieties and Year*fertilizer levels*variety. Data revealed that, days to maturity, plant height and panicles/m$^2$ increased with increasing of fertilizer levels. Application of fertilizer levels, significantly increased grains yield for all varieties during the two wet seasons. There no significant advantage on grain yield of IRRI hybrids compared with check variety in Senegal. Evaluation of other genotypes more adaptability in Senegal under low fertilizer levels will be more efficient.*

**Key word:** *Rice, hybrid, grain yield, fertilizer levels, low input fertilizer*

## INTRODUCTION

In sub-Saharan Africa (SSA) farmers considered fertilizer to be costly or unaffordable, particularly when fertilizer prices increased following the removal of fertilizer subsidies. Up to the present, fertilizer is more costly in most countries in SSA than in any continent in the world, mainly because of the lack of efficient fertilizer market infrastructure and poor transport network. (Thomas Fairhurst 2012). Many countries were forced to reduce fertilizer imports or expansion plans. Many farmers had to decrease their P and K inputs to offset production expenses, and some governments had to reduce fertilizer subsidies. Fertilizer is a very important input for intensive rice production. The profitability of rice production systems depends on yield and input quantities. So the appropriate fertilizer input is not only for getting high grain yield but also for attaining maximum profitability (Khuang *et al*, 2008). Nitrogen and phosphorus fertilizer is a major essential plant nutrient and key input for increasing crop yield (Dastan *et al*, 2012- Alinajoatisisie and Mirshekari, 2011-Alam *et al*, 2009). Apart from labor inputs, i.e. fertilizers are often the largest investment of farmers in their crop. But the agronomic efficiency of the applied fertilizer is often low. This can be improved by using varieties with higher internal nutrient use efficiency and / or nutrient management strategies that take into account the indigenous soil supply and an attainable yield based on climatic conditions, the farmer's knowledge in crop management and capital availability. Hence, this experiment aims to determine whether the agronomic nutrient use efficiency of rice can be improved by combining the use of a high-yielding, low-input varieties mainly fertilizers and site-specific fertilizer rates based on target yield levels.Hybrid rice possesses higher physiological efficiencies due to its vigorous root system ,greater sink size ,larger leaf are index (LAI) during grain filling and wider adaptability to various environments such as saline soil (Yongjian Sun *et al*.,2012).This study aimed to: 1)

Compare the yield performance of inbred lines and hybrid rice under different NPK levels. 2) Identify suitable hybrids to be grown low-input cropping condition in a certain environment.

## MATERIALS AND METHODS

This investigation was conducted at AfricaRice Sahel Regional Station, Saint Louis Senegal, during two Wet seasons (WS), July – December, 2010-2011. To evaluate the performances of 14 rice genotypes (13 hybrids provided by International Rice Research Institute Philippines (IRRI) and one inbred varieties Sahel 108, Sahel 134 and Sahel 201developed by Africa Rice Center) under low fertilizer levels. Five fertilizer NPK treatments (F) were used in this study, $F_0$: control (without any application) $F_1$= (37.5 – 4.4 –8.3 kg N-P-K/ ha$^{-1}$) $F_2$= half of recommend application in Senegal (75 – 8.75–16.5 kg N-P-K/ ha$^{-1}$), $F_3$= (112.5 – 13.3–24.8 kg N-P-K/ ha$^{-1}$) and $F_4$: recommended application in Senegal (150 – 17.5 – 33.0 kg N-P-K/ ha$^{-1}$). Hybrids and check varieties were sown in wet nursery, 25 days old seedlings were transplanted in a single plant (20 x 20 cm between hills) in randomized complete block design (RCBD) with three replications. Soil characteristics were estimated before crop establishment and fertilizer application (texture, total nitrogen and carbon, available P, cation exchange capacity and exchangeable bases) are presented in Table 1. The minimum and maximum temperature of 2010 and 2011 seasons at Saint Louis Senegal, 2010-2011 are showed in Figure 1. Days to 50% flowering, plant height, panicle length, spikelet sterility %, 1000 - grain weight, numbers of panicles /m$^2$ and grain yield (t ha$^{-1}$) were recorded according to Standard Evaluation System for rice (SES IRRI, 1996). All data were subjected to statistical analysis using SAS version 9.2to estimate the interaction between all parameters, genotypes, years and fertilizer levels for all traits studied.

## RESULTS AND DISCUSSION

### Analysis of variance:

Analysis of variance of, Year, Fertilizer levels, Varieties, Year * Fertilizer levels, Year*varieties, Fertilizer levels * Varieties, and Year * Fertilizer levels * Variety for all studied traits are presented in Table 2. The results indicated that there is significant effect of years for all traits studied except, spikelet sterility%. Also the fertilizer levels exhibited significant effect for, days to 50% flowering, plant height, panicles/m$^2$, spikelet sterility %, and grain yield. In the same time there are significant effects for rice genotypeson all traits studied. Interaction of Year* Fertilizer levels was significant for all studied traits except panicles/m$^2$ and 1000 grain weight, interaction of Year* varieties revealed that there was significant for all the studied traits except panicle length (cm). While the Interaction of fertilizer levels*varieties and Year*fertilizer levels*variety were not significant for all studied traits.

**Table 1: Some chemical analyses of soil used in the study.**

| Seasons | $D_b$[a] (g cm$^{-3}$) | pH[b] | EC[e] (dS m$^{-1}$) | $C_{org}$ (g kg$^{-1}$) | N | C/N | CEC (emol$_e$kg) | Exchange cations (%of CEC) | | | | | Texture [d](% of soil | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | H+ /Al3+ | Ca | Mg | K | Na | Sand | Silt | Clay |
| 2010 | 1.50 | 6.5 | 0.40 | 10.0 | 0.8 | 14 | 13.0 | 4 | 49 | 32 | 3 | 12 | 16 | 44 | 40 |
| 2011 | 1.59 | 6.6 | 0.45 | 9.8 | 0.75 | 13 | 12.5 | 7 | 45 | 31 | 4 | 13 | 16 | 30 | 54 |

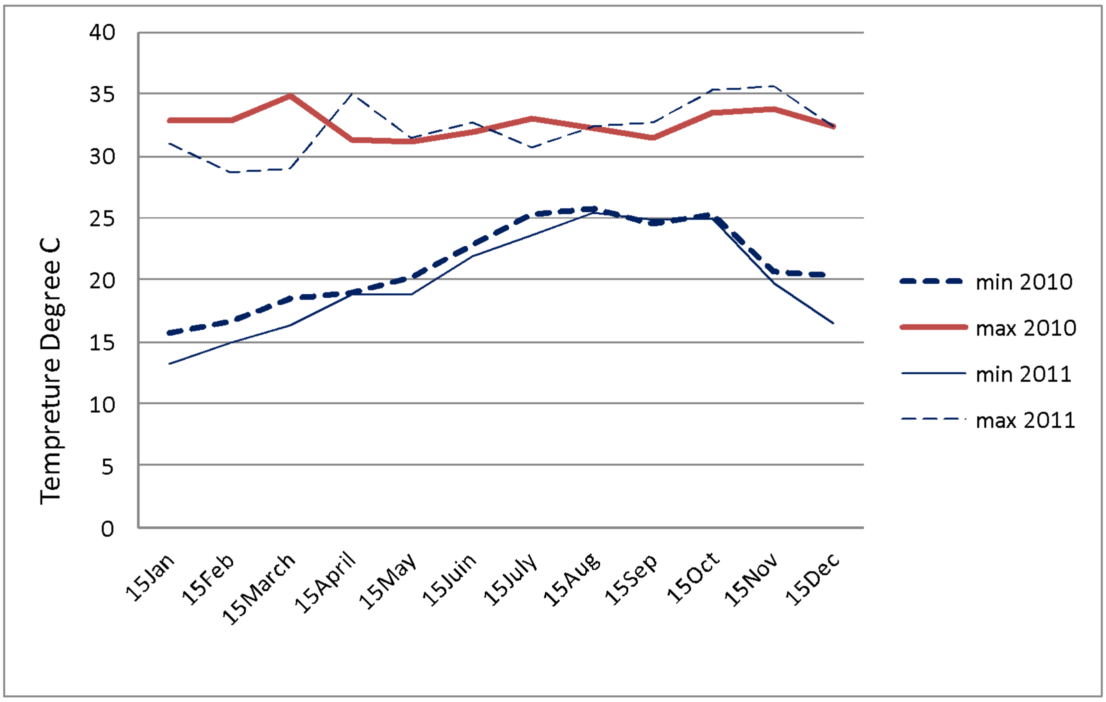


**Fig. 1: Minimum and Maximum temperature degree at Saint Louis, Senegal, 2010 - 2011.**

**Table 2: Analysis of the effect of year and fertilizer levels on all traits studied of 16 rice varietiesgrown under three fertilizer levels during two wet season 2010-2011.**

| | DF | Flowering (das) | Plant height (cm) | Panicle length (cm) | Number of Panicles/m² | Spikelet sterility (%) | 1000 GW (g) | Grain yield (t/ha) |
|---|---|---|---|---|---|---|---|---|
| Year | 1 | 25.7* | 46158.1*** | 2601.3*** | 1228719.3*** | 134.3 | 521.3*** | 6200.0*** |
| Fertilizer Lev | 4 | 69.1*** | 688.9*** | 1.23 | 170985.4*** | 152.6* | 1.90 | 67.6*** |
| Variety | 13 | 325.1*** | 784.7*** | 22.5*** | 26087.8*** | 110.3** | 10.9** | 1.77** |
| Year*Lev | 4 | 82.0*** | 141.1** | 10.52* | 3181.1 | 162.9** | 4.85 | 49.0** |
| Year*Variety | 13 | 51.9*** | 140.5*** | 5.02 | 35649.6*** | 121.4** | 20.8*** | 2.1** |
| Lev*Variety | 52 | 4.37 | 24.0 | 1.99 | 2080.1 | 25.74 | 4.18 | 0.54 |
| Year*Lev*Variety | 52 | 3.51 | 10.83 | 1.60 | 3293.86 | 31.52 | 3.08 | 0.54 |

## Overall mean of Year and Fertilizer levels:

Combined analysis of five fertilizer levels during two wet seasons are presented in Table 3. The results indicated that there are significant differences between two seasons for all studied traits except, spikelet sterility %. Also combined analysis of the two wet seasons for five fertilizer levels revealed that there are significant differences of fertilizer levels for all the studied traits except 1000 grain weight (Table 3). As for days to 50% flowering, data showed that there was significant difference for both years where is rice genotypes were earlier flowering in 2011 (91.6 days) compared with 2010 (93.2 days). Data also, indicated that the application of fertilizers at all added levels ($F_0$, $F_1$, $F_2$, $F_3$, and $F_4$) were significantly effect on growth duration, where is the days to flowering increase with increasing of fertilizer levels. Concerning plant height of different rice varieties, it is clear from the data that there are highly significant differences among the year andfertilizer, where the mean value of plant height in the first year (93.8 cm) was higher than the second year (82.8 cm). This could be attributed to different environmental conditions during the seasons. Data in Table 3 also, exhibited that plant height increased with increasing Flevels compared to the control (without addition of fertilizer). Similar results were found by Chu Van Hach *et al* (2006). in their study of study, fertilizer increased plant height over control for all tested varieties.Another experiment conducted by Parth Brat Yadav (2012), showed that the nitrogen levels did not affect on plant height significantly at all stages of rice growth. The plant height increased significantly up to (91.5 cm) with F4 levels (150 – 17.5 – 33.0 kg N-P-K/ ha-1). Panicle length (cm) as affected by years and different fertilizer levels are shown inTable3. Data revealed that there were significant differences in panicle length during both seasons in 2010 and 2011, where the mean values of panicle length was higher in WS, seasons 2010 was (25 cm)compared with WS, 2011(20 cm). This may be due to the high differences between day and night temperature in 2011compared with 2010 (Fig1).

Different fertilizer levels on panicle length showed that there was no significant difference with increasing levels of fertilizers. This may be due to the fact that panicle length is genetically controlled.Concerning the number of panicle/$m^2$ as affected by years andthree levels of fertilizer as shown in Table 3, data revealed a significant effect of years and different fertilizer levels on number of panicles/$m^2$. Maximum number of panicle/$m^2$ was found in 2010 season (437) than in 2011 season (328). Data indicated also, that the application of fertilizer levels increase significantly panicles/$m^2$,the highest values was (431) recorded at $F_4$levels. The effect of nitrogen application on number of panicles/$m^2$is attributed mainly to the stimulation effect of nitrogen on effective tillers formation.

Data in Table 3 shows that there was no significant effect for years, spikelet sterility percentage (%) of rice.Fertilizer treatments had significant effect on spikelets sterility %, whereis, the application of,$F_3$ and $F_4$ fertilizer levels decrease spikelets sterility% compared with other fertilizer application.

Regarding to 1000 grains weight (g) as affected by years and different levels of fertilizer, the data are presented in Table 3. It is clear from the results that there is a significant difference in the weight of 1000-grain during 2010 and 2011 seasons, where the mean values weight of 1000 grains weight is was higher in 2010 season (26.4 g) than in 2011 season (24.18 g) respectively.

As for the effect of fertilizerlevels on 1000 grains weight, data showed that there is no significant effect to application of fertilizer on 1000 grains weight. This Mainly due to the higher number of spikelets per panicle in plants received any levels of fertilizer than those did not receive any nitrogen. So the sink capacity is high and the source is limited, therefore, the filling of grains will be more consequently the weight of grains will be high. These findings are in agreement with those obtained by Metwally *et al* (2010), Lai *et al*. (1996), Xu and Zhou (1999) and Singh *et al*. (2004).

Grain yield (t $ha^{-1}$) significantly varied among years and nitrogen levels as shown in Table 3. There was a significant increase in grain yield in 2010 season (5.94 t $ha^{-1}$) than in 2011 season (5.09 t $ha^{-1}$). It could be attributed to different environmental conditions during both seasons as shown in Fig 1.

**Table 3: Overall mean for all studied traits for three combined fertilizer levels during two wet season 2010 and 2011**

| | Flowering (das) | Plant height (cm) | Panicle length (cm) | Number of Panicles/m² | Sterility (%) | 1000 GW (g) | Yield (t/ha) |
|---|---|---|---|---|---|---|---|
| Year | | | | | | | |
| 1 | 93.2[a] | 93.8 [a] | 25[a] | 437[a] | 22.24 | 26.4 [a] | 5.94a |
| 2 | 91.6[b] | 82.8 [b] | 20[b] | 328[b] | 23.37 | 24.18 [b] | 5.09[b] |
| Significant P value | 0.0486 | <.0001*** | NS | <.0001*** | NS | <.0001*** | <.0001*** |
| Fertilizer levels | | | | | | | |
| F0 | 89.5[c] | 84.51 [d] | 22.4 | 321 [d] | 23.5 [a] | 25.0 | 4.41 [d] |
| F1 | 91.0[b] | 86.63 [c] | 22.5 | 355 [c] | 23.7 [a] | 25.2 | 5.04 [c] |
| F2 | 93.0[a] | 88.75 [b] | 22.6 | 389 [b] | 23.8 [a] | 25.4 | 5.52 [b] |
| F3 | 94.0[a] | 89.5 [ab] | 22.7 | 416 [a] | 22.2 [ab] | 25.3 | 6.10 [ab] |
| F4 | 94.5[a] | 91.5 [a] | 22.7 | 431 [a] | 20.6 [b] | 25.2 | 6.42 [a] |
| Significant P value | <.0001*** | <.0001*** | NS | <.0001*** | 0.0040 | NS | <.0001*** |

Concerning to effect of fertilizer levels, it is clear from the results that the application of fertilizer up to F4,(150 – 17.5 – 33.0 kg N-P-K/ $ha^{-1}$) increased the rice grain yield for all varieties. The mean grain yields increased from 4.41 t $ha^{-1}$ with F0 to 6.42 t $ha^{-1}$ with F4. The increase in grain yield due to applying nitrogen was the logical resultant due to the achieving increased in its components, i.e. the number of panicles/$m^2$ and number of filled grains per panicle. Nitrogen is an essential constituent of amino acids, nucleic acids, chlorophyll and other compounds. It promotes rapid growth and increased leaf size, spikelet number/panicle, percentage of filled spikelet in each panicle and grain protein content. Thus, fertilizer affects all parameters contributing to grain yield. These results are in the same trend with (Peng *et al*. 1996; Balasubramanian *et al.* 1999; Yang *et al.* 2003; Zayed *et al.,* 2006) who reported that increasing nitrogen levels significantly improved growth, yield attributes and grain and straw yields. Furthermore, each unit increase in nitrogen levels led to significant increase in growth, yield attributing characters, and yield of rice. The response of the investigated inbred and hybrid rice varieties to nitrogen levels significantly varied. The most rice hybrids significantly responded to nitrogen up to 180 kg N ha-1. Hybrid rice possesses higher physiological efficiencies due to its vigorous root system ,greater sink size ,larger leaf are index (LAI) during grain filling and wider adaptability to varied environment with such saline soil (Yongjian Sun *et al.*,1999).

## Overall mean of rice varieties:

Data in Table 4 shows all traits studied as affected by Year, fertilizer levels and varieties. Data indicated that there are significant differences among the fourteen tested rice varieties for all traits studied characters.

**Table 4: Overall mean of 14 rice varieties for all traits studied for two combined years and three fertilizer levels**

| Genotypes | Days to 50 %flowering (das) | Plant height (cm) | Panicle length (cm) | Panicles/ $m^2$ | Sterility (%) | 1000 GW (g) | Yield (t $ha^{-1}$) |
|---|---|---|---|---|---|---|---|
| IR80228H | 94 $^{cde}$ | 87.48 $^{b}$ | 24.04 $^{a}$ | 352 $^{de}$ | 20.83 $^{bc}$ | 24.92 $^{ab}$ | 5.93 $^{a}$ |
| IR80814H | 89 $^{gf}$ | 80.65 $^{c}$ | 21.89 $^{def}$ | 385 $^{bcde}$ | 21.91 $^{abc}$ | 25.55 $^{ab}$ | 5.13 $^{b}$ |
| IR81950H | 96 $^{ab}$ | 83.93 $^{bc}$ | 23.53 $^{abc}$ | 393 $^{bcd}$ | 20.86 $^{bc}$ | 26.57 $^{a}$ | 5.17 $^{b}$ |
| IR81954H | 95 $^{abc}$ | 91.71 $^{a}$ | 22.74$^{abcde}$ | 372 $^{cde}$ | 19.01 $^{c}$ | 25.93 $^{ab}$ | 5.71 $^{ab}$ |
| IR81955H | 93 $^{e}$ | 80.68 $^{c}$ | 23.11 $^{abcd}$ | 423 $^{ab}$ | 24.26 $^{ab}$ | 24.39 $^{b}$ | 5.69 $^{ab}$ |
| IR82391H | 90 $^{f}$ | 83.78 $^{bc}$ | 22.15 $^{cdef}$ | 385 $^{bcde}$ | 24.50 $^{ab}$ | 25.31 $^{ab}$ | 5.33 $^{ab}$ |
| IR83212H | 94 $^{cde}$ | 91.75 $^{a}$ | 22.88 $^{abcd}$ | 405 $^{bc}$ | 26.35 $^{a}$ | 24.52 $^{b}$ | 5.23 $^{b}$ |
| IR84711H | 95 $^{bcd}$ | 81.38 $^{c}$ | 22.65$^{abcde}$ | 385 $^{bcde}$ | 24.40 $^{ab}$ | 25.27 $^{ab}$ | 5.46 $^{ab}$ |
| IR84741H | 89 $^{gf}$ | 81.35 $^{c}$ | 22.51 $^{bcde}$ | 369 $^{cde}$ | 23.36 $^{abc}$ | 25.26 $^{ab}$ | 5.71 $^{ab}$ |
| IR85466H | 96 $^{ab}$ | 85.81 $^{b}$ | 22.39 $^{cde}$ | 358 $^{cde}$ | 21.18 $^{abc}$ | 24.76 $^{b}$ | 5.46 $^{ab}$ |
| IR85471H | 87 $^{h}$ | 76.30 $^{d}$ | 21.37 $^{ef}$ | 392 $^{bcd}$ | 22.91 $^{abc}$ | 25.59 $^{ab}$ | 5.59 $^{ab}$ |
| IR86167H | 97 $^{a}$ | 87.08 $^{b}$ | 22.76$^{abcde}$ | 340 $^{e}$ | 23.53 $^{abc}$ | 25.73 $^{ab}$ | 5.57 $^{ab}$ |
| IRR1138 | 88 $^{gh}$ | 81.13 $^{c}$ | 23.94 $^{ab}$ | 348 $^{de}$ | 22.31 $^{abc}$ | 25.63 $^{ab}$ | 5.43 $^{ab}$ |
| Sahel 108 | 93 $^{de}$ | 74.13 $^{d}$ | 21.05 $^{f}$ | 446 $^{a}$ | 23.88 $^{abc}$ | 24.69 $^{b}$ | 5.82 $^{ab}$ |
| Significant P value | <.0001*** | <.0001*** | <.0001*** | <.0001*** | 0.0007** | 0.0035** | 0.0011** |

For days to 50% flowering, data showed that among 14 rice varieties; IR86167H (97 days) is longest days to flowering, while the IRR1138 (88 days) exhibited the earliest flowering compared with the other rice genotypes in both seasons.

Regarding plant height the data indicated that there are significant differences among the 14 rice varieties, Sahel 108 the short stature (74.13 cm), while the highest plant height was recorded for the two hybrids, IR81954H and IR83212H (91.7 cm).

For panicle length, data also, showed that IR80228H gave the longest panicle (24.04 cm), while, Sahel 08 gave the shortest panicle (21.05 cm). Concerning the number of panicle/m2, varieties differed significantly the rice variety of Sahel 108 produced the greatest number of panicles/m2 (466/m2), while the lowest number of panicles/m2 (301/m2) was found with IR.86167H. For spikelet sterility%, there are significant differences observed among all rice varieties, IR 81954H recorded lowest spikelet sterility% while IR83212H recorded highest sterility%.

Regarding 1000 grain weight there were significant differences observed between rice varieties (Table 4), The highest value of 1000-grain weight (26.57 g) was recorded with IR81950H while, the lowest value (24.39 g) was foundwith IR81955H.

Generally for grain yield IR80228H recorded the highest value of grain yield 5.93 ($tha^{-1}$) as compared with other varieties, while the lowest grain yield were recorded with, IR80814H, IR81950H and IR83212H (5.13, 5.17 and 5.23 t $ha^{-1}$), respectively.

## Year*Fertilizer levels overall mean:

Combined analysis of Year*Fertilizer levelsshowed significant differences for, days to 50% flowering, plant height, panicle length, spikelet sterility%, and grain yield, the overall mean are presented in Fig 2. Days to 50% floweringwere increasing with application of fertilizer in both seasons the earliest treatment were recorded (89 and 90 days) without fertilizer (F0) during wet seasons 2010 - 2011.

For plant height the results indicated that the plant height increased with increasing of fertilizer levels during the two wet seasons 2010 and 2011 November 2011than the same period in 2010 (Fig1). Data indicated that of spikelet sterility % had almost the same values with F0, F1 and F2 during the two seasons, while spikelet sterility% decrease with F3 and F4 application during 2010. Grain yield increased with increasing of fertilizer levels during the two years. So may be more economic evaluations of rice production under different fertilizer levels are needed.

The plant heights were recorded in F4 treatment (98.0 and 85 cm) during the two wet seasons 2010-2-11. This result are agreement with the findings of Chu Van Hach*et al* (2006) which showed that application of nitrogen fertilizer increased plant height over control for all tested varieties. Panicle length (cm) was significant affected by the Year* Fertilizer levels interaction, generally panicle length in WS 2010 was longer than WS 2011. This may be due to the e differences of day and night temperature.

## Year*varieties overall mean:

Interaction of Year*Varieties showed significant effect for all the studied traits except panicle length. Combined analysis of 14 rice varieties over two wet seasons for, days to flowering, plant height, panicles/m$^2$, spikelet sterility % and 1000 grain weight are presented in table 5, while data of grain yield are presented in Fig 3. Generally most of rice varieties were early flowering ranging between 88.0– 97.0 days in 2010 and 88.0 – 100.0 days in 2011. For plant height all rice varieties exhibited short stature in 2011 compared with 2010. Sahel 108 had shorter stature (82.93 and 65.33 cm) during 2010 and 2011 respectively. IR83212H and IR81954H exhibited longest plant height (106.66 and 88.66 cm) during 2010 and 2011 respectively. Most of hybrids and check variety revealed that more panicles/m2 in 2010 rather compared with 2011. Check variety Sahel 108 gave highest panicles/m2 (506.67 and 387.23) during the two wet seasons (2010 – 2011). This indicated that high adaptability of check variety compared with other tested hybrids. Spikelet sterility % ranged between (15.1 and 25.9) in 2010 and (21.4 and 25.6) in 2011. IR81954H and IR84741H recorded lowest spikelet sterility% during the two seasons respectively. 1000 grain weight of most of rice varietiesdecreased in 2011 compared with 2010. IR81950H and IR81954H showed heaviest value (28.1 and 28.7 g) in 2010 while IR85471H revealed heavies values (25.4 g) in 2011. Grain yield of most hybrids and check variety was high in 2010 compared to 2011. The hybrids IR81954H, IR84741H had highest grain yield (over 6.0 t ha$^{-1}$) in 2010 while hybrid IR84711H and release rice variety Sahel 108 had the highest grain yield during both seasons. There no significant advantage on grain yield of IRRI hybrids compared with check variety in Senegal This results concluded that generally performances of most of rice varieties were better in wet season 2010 compared with wet season 2011 for all studied traits.

The experiment in 2011 faces some challenges due to contentious flooded (three weeks) of rice field due to heavy rain. May be these hybrids can be shows advantage on grain yield under high fertilizer levels, Yongjian Sun *et al.,*1999, reported that The most rice hybrids significantly responded to nitrogen up to 180 kg N ha-1.

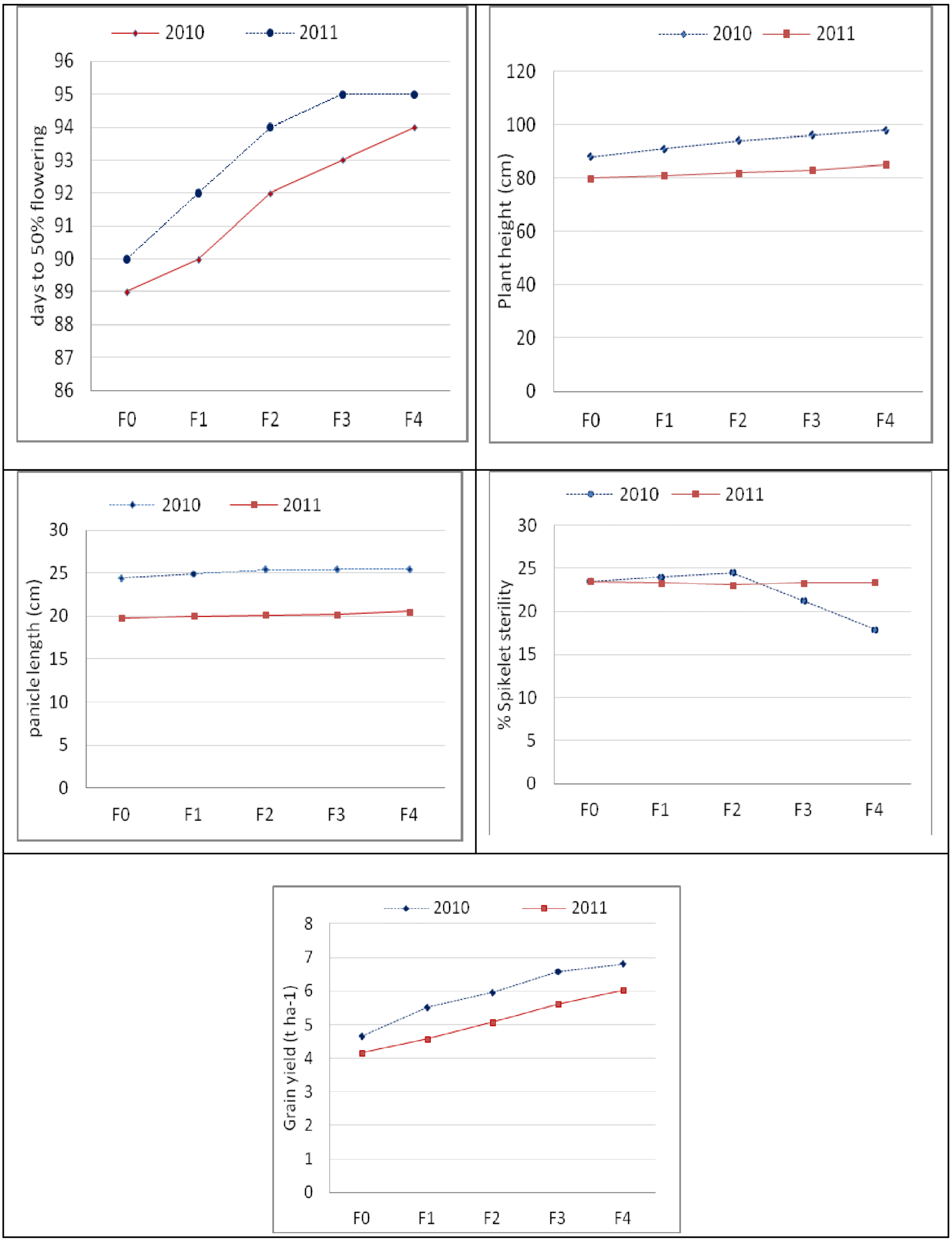


**Fig 2: Combined analysis of Year*Fertilizer levels for, days to flowering, plant height, panicle length, spikelet sterility%, panicle/m$^2$ and grain yield during two wet season under three fertilizer levels.**

**Table 5: Combined analysis of Year*Varieties for, days to maturity, plant height, 1000 grain weight, panicle/m$^2$ and grain yield.**

| Genotypes | Flowering (days) | | Plant height (cm) | | Panicles/m$^2$ | | Spikelet sterility% | | 1000 Grain weight | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Y1 | Y2 | Y1 | Y 2 | Y1 | Y2 | Y1 | Y 2 | Y 1 | Y2 |
| IR80228H | 95 | 93 | 98.73 | 86.23 | 394.47 | 309.87 | 21.5 | 23.7 | 27.0 | 22.8 |
| IR80814H | 88 | 91 | 91.30 | 80 | 468.63 | 303.23 | 17.9 | 22.3 | 27.5 | 23.5 |
| IR81950H | 97 | 96 | 93.0 | 84.86 | 477.73 | 309.07 | 18.1 | 23.6 | 28.1 | 25.0 |
| IR81954H | 94 | 96 | 104.76 | 88.66 | 452.97 | 291.57 | 15.1 | 22.9 | 28.7 | 23.1 |
| IR81955H | 92 | 93 | 90.13 | 81.23 | 464.13 | 383.33 | 22.9 | 25.6 | 25.2 | 23.5 |
| IR82391H | 90 | 90 | 93.00 | 84.56 | 431.2 | 339.03 | 24.8 | 24.2 | 25.6 | 25.0 |
| IR83212H | 94 | 95 | 106.66 | 86.83 | 504.63 | 306.7 | 28.7 | 23.9 | 25.7 | 23.3 |
| IR84711H | 95 | 94 | 92.16 | 80.6 | 458.3 | 313.43 | 25.9 | 22.8 | 26.3 | 24.2 |
| IR84741H | 91 | 88 | 89.53 | 83.16 | 357.3 | 382.27 | 25.2 | 21.4 | 26.7 | 23.8 |
| IR85466H | 95 | 97 | 99.30 | 82.33 | 363.23 | 354.23 | 18.1 | 24.2 | 25.6 | 23.8 |
| IR85471H | 89 | 86 | 84.03 | 78.56 | 471.77 | 313.9 | 22.0 | 23.8 | 25.7 | 25.4 |
| IR86167H | 93 | 100 | 98.63 | 85.53 | 413.83 | 267.5 | 23.0 | 24.0 | 26.6 | 24.8 |
| IRR1138 | 88 | 88 | 89.76 | 82.5 | 353.9 | 342.96 | 22.9 | 21.7 | 26.3 | 24.9 |
| Sahel 108 | 94 | 93 | 82.93 | 75.33 | 506.67 | 387.23 | 24.9 | 22.8 | 24.3 | 25.0 |

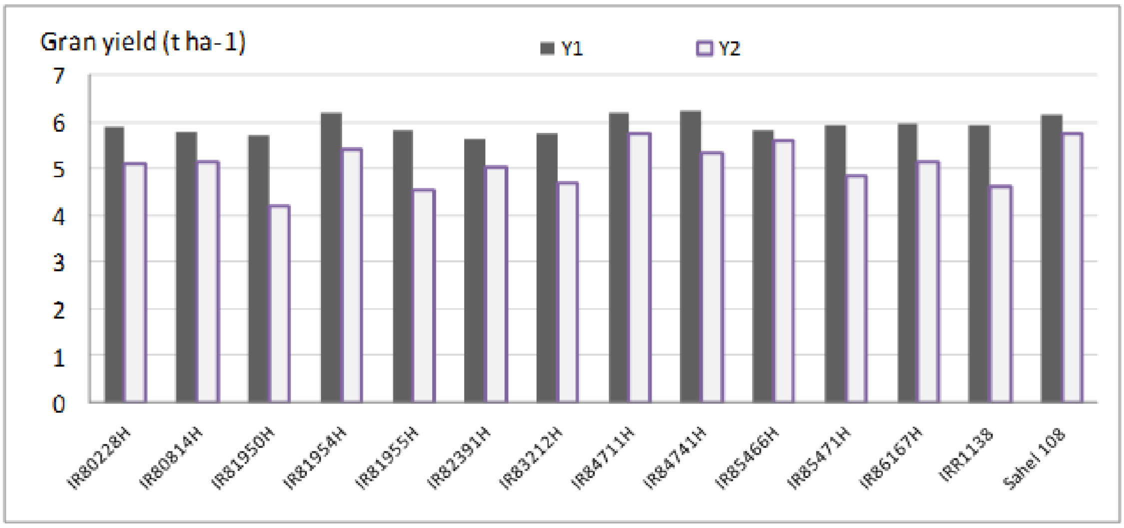


**Fig 3: Combined analysis of Year*Varieties for grain yield**

## Conclusion:

In this investigation grain yield was decreased with a decrease of fertilizer levels for most rice varieties during two wet season 2010 -2011. It is recommended to grow inbred rice under this condition. Significant differences were observed between the two years for most of the studied traits. There no significant advantage on grain yield of IRRI hybrids compared with check variety in Senegal. So test other genotypes more adaptability in Senegal under low fertilizer levels will be more efficient to identify suitable varieties for low input conditions.

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# تقييم بعض الهجن تحت مستويات منخفضة من التسميد بالسنغال.

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مركز الأرز الأفريقى – سانت لويس –سنغال

## الملخص العربي

أجريت هذة الدراسة بمحطة البحوث الأقليمية لمركز الأرز الأفريقى – سانت لويس بالسنغال خلال موسمين مطرين (يونيو – أكتوبر) ٢٠١٠–٢٠١١. وذلك لتقيم بعض الهجن والاصناف المرباه داخليا تحت مستويات منخفضة من التسميد. استخدم فى هذ الدراسة خمس مستويات من التسميد وهى ١– بدون اضافة اى سماد ٢– (٣٧.٥ – ٤.٤ – ٨.٣ ن ب ك ) ٣–اضافة نصف الجرعة الموصى بها فى السنغال ( ٧٥.٠ – ٨.٧٥ – ١٦.٥ ن ب ك ) ٤– (١١٢.٥ – ١٣.٣ – ٢٤.٨ ن ب ك) ٥– الجرعه الموصى بها فى السنغال ( ١٥٠.٠ –١٧.٥– ٣٣.٠ ن ب ك ) .أشارت النتائج أن كلا من السنوات والتراكيب الوراثية كان لها تأثير معنوى على كل الصفات تحت الدراسة. كما أظهرت النتائج ايضاً أن مستويات التسميد النيتروجينى كان لها تأثير معنوى على الصفات ماعدا طول السنبلة، وزن الألف حبة. أوضحت التفاعل بين (السنوات * مستويات التسميد)، (السنوات * الأصناف) إختلاف معنوى على معظم صفات الدراسة. لم يكن هناك أى تأثير معنوى على التفاعل بين (الأصناف* مستويات التسميد)، (السنوات * التسميد)، (التسميد * التسميد). أوضحت النتائج أن عدد الأيام حتى النضج وطول النبات وعدد السنابل /م$^{٢}$ قد زادت بزياده مستويات التسميد. أوضحت النتائج أيضاُ أن إضافة مستويات تسميد مختلفة أدت الى زياده معنوية فى محصول الحبوب وذلك لكل التراكيب الوراثية تحت الدراسة. كما أنه لا يوجد إختلاف معنوى فى محصول الحبوب وذلك بالنسبة للهجن الـ IRRI مقارنة بالصنف المختبر فى السنغال. وبذلك قد تم تقييم تراكيب وراثية أكثر ملائمه فى السنغال تحت مستويات التسميد المنخفضة والتى تكون أكثر كفاءه.