# FIELD PERFORMANCE EVALUATION OF A GRAIN STRIPPER FOR RICE HARVESTING IN NIGERIA

**_Adisa A. F_**
Agricultural Engineering Department, University of Agriculture, Abeokuta, Nigeria

**_Ndirika V. I. O_**
Agricultural Engineering Department, Michael Okpara University, Umudike, Nigeria

**_Yiljep Y. D_**
NAERLS, Ahmadu Bello University, Zaria, Nigeria.

**_Mhommed U.S_**
Agricultural Engineering Department, Ahmadu Bello University, Zaria, Nigeria

**Abstract:**

There was need to develop a mechanical harvester for Nigeria small rice fields which are usually inter-planted with other crops. A study of field performance evaluation of a 30cm width prototype self propelled pedestrian controlled grain stripper header which was developed in Nigeria was carried out. In evaluating the harvester's field performance, Randomized Complete Block design (RCB) was adopted to study the harvester performance at various forward speeds, stripper rotor speeds, stripper rotor heights, harvested grain purity, field capacity and harvester efficiency. It was tested on faro 44 rice variety at Basawa, Zaria. The computed mean value of crop purity was 89.70%, effective harvester mean field capacity was 0.40ha/day, harvester mean field efficiency was 56.68% and harvester mean efficiency was 78.00%.

**Keywords:** Field performance, evaluation, developed, stripper harvester.

## Introduction

Rice is a crop that is mainly used as food, being boiled or steamed and eaten with meat, fish and vegetables which have many other uses in food and commerce industries. Oloruntoba et al (2007) reported that United nations General Assembly (NUGA) declared the year 2004 as the International year of Rice (1YR). This was because rice has become primary food source for more than half of the World's population (Fresco, 2003; FAO, 2003). Rice is essential for food security, poverty alleviation and improves livelihood (The Comet, 2002).

Rice harvesting requires cutting of the matured head, threshing, cleaning and bagging which if done mechanically will not be as tedious as when done manually. Different crops require different labour types and power requirement for harvesting, however there was need to design a harvester for Nigeria small rice fields which are usually inter-planted with other crops. A self propelled pedestrian controlled prototype stripping harvester, made simple in structure and small enough to maneuver easily in small parcel of land and inter-planted rice field was to be studied and tested, which was the mainpurpose of this study (Adisa,2009).

## Methodology

### Crop Material

The rice field where this machine field performance testing was carried out was spot planted on a fairly level ground of loamy silt sand soil, rainfed upland rice which was inter-planted with quinea corn. Rice crop average plant to plant spacing was 25cm and crop height at maturity ranged between 55cm to 90cm. The rice variety was faro 44 which is one of the NERICA (New Rice for Africa), locally called Kwadala, which was planted at Basawa area of Samaru, Zaria in Nigeria.

### Experimental Field Plot Preparation

A 20m by 50m rice crop variety field was divided into three blocks for field test. Each of the blocks was subdivided into 0.3m width by 10m length plots to carryout both mechanical harvesting with the developed 30cm width prototype stripping harvester side by side with manual harvesting with sickle. Five plots were set aside per block, for trial run before the real data taking took place to ascertain the correct speeds adjustment at various rotor heights.

Randomized Complete Block Design (RCB) was employed to carryout the study. Three variables were measured through out each run:

- Header loss (grain lost on the stubble, lodged and shatter)
- MOG (Material other than grain)/ grain ratio of the materials collected.
- Percentage of grain threshed in the material collected

Header loss was measured by weighing the grain that was collected on the ground in the quadrat (shatter loss) of known area ($0.1m^2$) made of four sided iron rod. I was placed between the plants that were being harvested and extrapolated to give the loss in kilograms per hectare. The mount of grain left on the standing crops unstripped by the rotor was collected and weighed (stubble loss) and those left behind on lodged crops was collected too (lodged loss). The time taken for machine harvesting operation, turning, unclogging, grain empting and other idle times were measured using digital stop watches.

**Experimental Design**

**Factorial combinations**

The effect of combinations of stripper rotor height above the ground, machine forward speed and stripper rotor speed on field performance of the rice stripping harvester and the best performance combination were determined as follows: a randomized complete block design (RCB) was adopted to study the various levels stripper rotor speeds (5 levels), harvester forward speed (5 levels) and stripper rotor heights (2 levels) with fixed hood nose height on field losses, field capacity and field efficiency. The 2 x 5 x 5 factorial treatment combination was assigned at random using table of randomized number presented in Gupta (2005) with three replications and a crop type.

The two rotor heights $R_1$ and $R_2$ (270mm and 220mm) are the height of the lowest part of the rotor above the ground. The five forward speed ($U_1$, $U_2$… $U_5$, correspondingly, 3km/h, 4km/h, 5km/h, 6km/h and 7km/h and five rotor speeds ($V_1$, $V_2$…$V_5$), correspondingly,400rpm, 500rpm, 600rpm, 700rpm and 800rpm. The hood nose height was fixed at 100mm below plant height while hood clearance was also fixed. Out of the three variable parameters, a parameter was varied while others were fixed at a time during data collection. These three factorial experiments gave 150 combinations (R x U x V) with three replications. Field efficiency and total machine harvesting loss was compared with manual harvesting. The manual harvesting was considered as a control. The rice in each of these control plots were harvested manually. Losses and field capacity of the manual harvesting were determined.

**Parameters Computed**

The following parameters were compared in this study as:

$$\text{shatter loss, } S_L = \frac{\text{Mass of shattered grains(on the ground)}}{\text{Total yield (TY)}} \times 100\% \quad \ldots 1$$

$$\text{Cracked grain loss, } S_C = \frac{\text{Mass of cracked grains (mechanical damage)}}{\text{Total yield (TY)}} \times 100\% \ldots 2$$

$$\text{Lodging loss. } L_g = \frac{\text{Mass of grains left on lodged crops}}{\text{Total yield (TY)}} \times 100\% \ldots\ldots 3$$

$$\text{Stubble loss, } S_t = \frac{\text{Mass of grains left on stubble (standing crop)}}{\text{Total yield (TY)}} \times 100\% \quad \ldots 4$$

$C_t$ = Mass of total grain and MOG harvested (kg)

$Ty = C_t + S_L + S_c + Lg + S_i$ (kg)---( 5)

$$\text{Crop purity} = \frac{\text{Mass of grain harvested}}{\text{Mass of grain plus MOG harvested}} \times 100\% \quad \text{----(6 )}$$

$$\text{Total crop Losses } T_{tl} = \frac{S_L + S_c + L_g + S_t}{TY} \times 100\% \quad \text{-----(7 )}$$

Effective harvester field capacity = Area harvested (ha/h) …( 8 )

$$\text{Harvester field efficiency} = \frac{\text{Productivity time}}{\text{Total time taken}} \times 100(\%)$$

$$\text{Harvester efficiency} = \frac{\text{Total grain stripped and collected in box}}{TY} \times 100\% \quad \ldots(9\,)$$

$$\text{Grain purity} = \frac{\text{Clean grain}}{\text{Total material stripped}} \times 100(\%) \quad \text{----(10)}$$

**Table 1: Field performance indices (measured)**

| **Measured indices** | **Mean values** |
|---|---|
| Mean crop yield | 1,300kg/ha |

| | |
|---|---|
| Pre harvest loss | 40kg/ha |
| Crop moisture content at harvest | 21% - 15.6% |
| Height of the crops | 55cm – 90cm |
| Weight of grains left unstripped on the stubble | 18.8g/plot |
| Weight of grains left unstripped on lodged crops | 11.4g/plot |
| Weight of materials other than grains (MOG) stripped | 16.8g/plot |
| Weight of total grains and MOG stripped | 288.1g/plot |
| Weight of grains found in quadrat (shattered loss) | 22.9g/plot |
| Maximum wind velocity at time of harvest | 2.34m/s |
| Time taken to reap a plot | 14.3s/plot |
| Weight of grains threshed during harvest | 255.2g/plot |

**Table 2: Field performance indices (computed)**

| **Computed indices** | **Mean values** |
|---|---|
| Shattering loss | 6.9% |
| Cracked grain loss | 0.0% |
| Lodging loss | 3.4% |
| Stubble loss | 5.7% |

| | |
|---|---|
| Crop purity | 89.7% |
| Total grain loss | 15.9% |
| Fuel consumption rate | 8.4ml/plot |

| | | | | | | | | | | | 0.044ha/h |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Source of variation | Degree of freedom | Computed F – Values[1] | | | | | | | | | |
| | | Shattered loss | Stubble loss | Lodging loss | Total loss | Time spent | Fuel consumed | Field capacity | Grain purity | Field efficiency | Harvester efficiency |
| Replication | 2 | 1.05 | 13.02** | 1.11 | 3.03 | 10.60** | 20.39** | 22.30** | 3.28 | 3.72 | 4.54 |
| Treatment | 49 | 1.43 | 1.41 | 0.84 | 0.98 | 2.77 | 2.04 | 2.38 | 1.17 | 1.60 | 0.09 |
| Rotor height, R | 1 | 8.23 | 0.10 | 0.66 | 0.46 | 0.39 | 0.38 | 0.74 | 4.20 | 1.01 | 0.01 |
| Forward speed, U | 4 | 0.38 | 1.49 | 0.81 | 0.42 | 11.88** | 2.56 | 4.08 | 1.07 | 4.41 | 0.38 |
| Stripper rotor speed, V | 4 | 1.98 | 0.49 | 2.36 | 1.66 | 0.23 | 0.27 | 0.56 | 1.61 | 0.33 | 1.16 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| R*U | 4 | 0.69 | 1.57 | 0.07 | 0.05 | 0.38 | 0.50 | 0.49 | 1.2 |
| R*V | 4 | 0.70 | 0.47 | 0.85 | 0.56 | 1.42 | 1.40 | 2.27 | 0.9 |
| U*V | 16 | 1.70 | 1.26 | 0.80 | 1.19 | 2.12 | 1.44 | 1.51 | 0.9 |
| R*U*V | 16 | 1.28 | 0.60 | 0.69 | 0.86 | 1.87 | 1.32 | 1.38 | 0.9 |
| Error | 98 | | | | | | | | |
| Total | 149 | | | | | | | | |

Effective harvester field capacity

| | |
|---|---|
| Harvester field efficiency | 56.68% |
| Harvester efficiency | 78% |

**Table 3: Summary of Analysis of Variance for data generated in the 2x5x5 factorial experiment (performance evaluation)**

1 ** Significant at 1% level (highly significant)
* Significant at 5% level (significant)

**Table 4 : Duncan multiple range test result of the mean separation**

| | Time spent(s) | Other Times (s) | Fuel (ml) | Total Stripped (g) | Clean Grain (g) | Unthreshed Grain (g) | MOG (chaff)(g) | Shattered loss (g) |
|---|---|---|---|---|---|---|---|---|
| R | | | | | | | | |
| 1 | 14.41[a] | 10.80[a] | 8.32[a] | 3026.67[a] | 279.33[a] | 6.08[a] | 17.26[a] | 20.73[a] |
| 2 | 14.15[a] | 11.53[a] | 8.47[a] | 277.29[a] | 256.80[a] | 4.13[a] | 16.36[a] | 25.07[a] |
| S.E ± | 0.30 | 0.45 | 0.18 | 8.54 | 8.03 | 0.43 | 0.91 | 1.07 |
| U | | | | | | | | |
| 1 | 14.80[b] | 11.07[a] | 8.54[ab] | 312.07[a] | 288.61[a] | 5.85[a] | 17.61[a] | 22.22[a] |
| 2 | 13.27[c] | 11.00[a] | 8.00[b] | 289.93[ab] | 266.05[ab] | 5.69[a] | 18.19[a] | 22.20[a] |
| 3 | 16.50[a] | 11.03[a] | 9.09[a] | 290.64[ab] | 269.41[ab] | 4.20[a] | 17.03[a] | 23.06[a] |
| 4 | 12.17[c] | 12.10[a] | 8.01[b] | 252.59[b] | 232.59[b] | 5.36[a] | 14.73[a] | 24.66[a] |
| 5 | 14.76[c] | 16.67[a] | 8.36[ab] | 269.56[ab] | 248.65[ab] | 4.42[a] | 16.49[a] | 22.38[a] |
| S.E ± | 0.48 | 0.70 | 0.28 | 13.5 | 12.73 | 0.68 | 1.44 | 1.69 |
| V | | | | | | | | |
| 1 | 14.06[a] | 11.33[a] | 8.36[a] | 283.50[ab] | 260.54[ab] | 5.03[ab] | 17.93[a] | 22.47[ab] |
| 2 | 14.40[a] | 11.80[a] | 8.65[a] | 285.43[ab] | 263.83[ab] | 4.07[b] | 17.53[a] | 24.89[a] |
| 3 | 14.50[a] | 10.70[a] | 8.32[a] | 315.54[a] | 294.11[a] | 3.91[b] | 17.52[a] | 23.81[ab] |
| 4 | 14.07[a] | 11.00[a] | 8.27[a] | 255.81[b] | 233.84[b] | 6.17[a] | 15.80[a] | 18.96[b] |
| 5 | 14.43[a] | 11.00[a] | 8.39[a] | 277.10[ab] | 255.48[ab] | 6.36[a] | 15.26[a] | 24.38[a] |
| S.E ± | 0.48 | 0.70 | 0.28 | 13.5 | 12.74 | 0.68 | 1.44 | 1.69 |

Interaction

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| R | NS | N | N | NS | NS | NS | NS | NS |
| * | 0.6 | S | S | 19.0 | 18.0 | 0.96 | 2.0 | 2.3 |
| U | 8 | 1. | 0. | 9 | 3 | NS | 4 | 9 |
| S | NS | 0 | 40 | NS | NS | 0.96 | NS | NS |
| E | 0.6 | N | N | 19.0 | 18.0 | NS | 2.0 | 2.3 |
| | 8 | S | S | 9 | 3 | 1.52 | 4 | 9 |
| ± | * | 1. | 0. | NS | NS | NS | NS | NS |
| R | 1.0 | 0 | 40 | 30.1 | 28.5 | 2.15 | 3.2 | 3.7 |
| * | 7 | N | N | 8 | 1 | | 3 | 8 |
| V | * | S | S | NS | NS | | NS | NS |
| S | 1.5 | 1. | 0. | 42.6 | 40.3 | | 4.5 | 5.3 |
| E | 1 | 58 | 63 | 8 | 2 | | 6 | 5 |
| | | N | N | | | | | |
| ± | | S | S | | | | | |
| U | | 2. | 0. | | | | | |
| * | | 23 | 89 | | | | | |

| | **Stubble Loss(g)** | **Lodging Loss(g)** | **Total loss(g)** | **Total yield (g)** | **Field Capacity (ha/h)** | **Field efficiency (%)** | **Grain purity (%)** | **Harvester efficiency (%)** |
|---|---|---|---|---|---|---|---|---|
| R | | | | | | | | |
| 1 | 19.04$^{a}$ | 11.84$^{a}$ | 51.62$^{a}$ | 337.03$^{a}$ | 0.045$^{a}$ | 57.39a$^{a}$ | 89.76$^{a}$ | 79.58$^{a}$ |
| 2 | 18.58$^{a}$ | 10.97$^{a}$ | 53.60$^{a}$ | 314.53$^{b}$ | 0.044$^{a}$ | 55.97$^{a}$ | 89.71$^{a}$ | 76.40$^{a}$ |
| SE ± | 1.01 | 0.75 | 2.06 | 8.73 | 0.09 | 1.0 | 0.45 | 1.01 |
| U | | | | | | | | |
| 1 | 19.24$^{ab}$ | 9.77$^{a}$ | 51.23$^{a}$ | 345.69$^{a}$ | 0.0043$^{ab}$ | 57.94$^{ab}$ | 90.06$^{a}$ | 80.43$^{a}$ |
| 2 | 18.58$^{cb}$ | 12.71$^{a}$ | 53.48$^{a}$ | 325.22$^{a}$ | 0.047$^{a}$ | 55.29$^{ac}$ | 89.19$^{a}$ | 77.60$^{ab}$ |
| 3 | 17.68$^{ab}$ | 11.52$^{a}$ | 52.36$^{a}$ | 325.97$^{a}$ | 0.040$^{b}$ | 60.34$^{a}$ | 90.33$^{a}$ | 79.17$^{a}$ |
| 4 | 21.87$^{c}$ | 11.86$^{a}$ | 55.73$^{a}$ | 293.59$^{a}$ | 0.048$^{a}$ | 51.65$^{c}$ | 89.43$^{a}$ | 74.70$^{a}$ |
| 5 | 16.68$^{b}$ | 11.17$^{a}$ | 50.25$^{a}$ | 303.32$^{a}$ | 0.044$^{ab}$ | 58.16$^{ab}$ | 89.66$^{a}$ | 78.05$^{a}$ |
| SE ± | 1.61 | 1.20 | 3.27 | 13.87 | 0.015 | 1.58 | 0.78 | 1.43 |
| V | | | | | | | | |
| 1 | 20.12$^{a}$ | 9.92$^{b}$ | 49.96$^{a}$ | 315.52$^{ab}$ | 0.045$^{a}$ | 56.11$^{a}$ | 89.30$^{a}$ | 78.27$^{a}$ |
| 2 | 19.16$^{a}$ | 12.29$^{ab}$ | 56.34$^{a}$ | 324.24$^{ab}$ | 0.043$^{a}$ | 55.69$^{a}$ | 90.21$^{a}$ | 77.61$^{a}$ |
| 3 | 19.07$^{a}$ | 9.63$^{b}$ | 52.52$^{a}$ | 350.54$^{a}$ | 0.046$^{a}$ | 57.79$^{a}$ | 90.89$^{a}$ | 79.80$^{a}$ |
| 4 | 17.09$^{a}$ | 11.07$^{ab}$ | 47.0$^{a}$ | 287.15$^{b}$ | 0.045$^{a}$ | 56.34$^{a}$ | 88.82$^{a}$ | 78.28$^{a}$ |
| 5 | 18.62$^{a}$ | 14.10$^{a}$ | 57.10$^{a}$ | 318.94$^{ab}$ | 0.044$^{a}$ | 57.48$^{a}$ | 89.46$^{a}$ | 75.98$^{a}$ |
| SE ± | 1.61 | 1.20 | 3.27 | 13.87 | 0.015 | 1.58 | 0.78 | 1.43 |
| Interaction | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| R*U | NS | NS | NS | NS | NS | NS | NS | NS |
| SE ± | 2.27 | 1.69 | 4.63 | 19.62 | 0.027 | 2.29 | 1.02 | 1.75 |
| R*V | NS | NS | NS | NS | NS | NS | NS | NS |
| SE ± | 2.27 | 1.69 | 4.63 | 19.62 | 0.027 | 2.29 | 1.02 | 1.75 |
| U*V | NS | NS | NS | NS | NS | * | NS | NS |
| SE ± | 3.6 | 2.67 | 7.32 | 31.02 | 0.036 | 3.58 | 1.59 | 2.49 |
| R*U*V | NS | NS | NS | NS | NS | NS | NS | NS |
| SE ± | 5.09 | 3.78 | 10.36 | 43.87 | 0.046 | 5.0 | 2.56 | 4.97 |

* - significant at 5% level, **- Highly significant at 1% level, N.S – Not significant.
Means with different letters are significantly different in the groupings

**Table 5: Comparison of mechanical harvester with manual Harvesting using student's 't' test**

| S/No | Parameters | Harvesting methods | | Calculated t-value | Table t-value | Level of significance |
|---|---|---|---|---|---|---|
| | | Mechanical | Manual | | | |
| 1 | Mean loss, % of total yield | 13.5 | 20.27 | 2.14 | 1.75 | * |
| 2 | Mean time spent per plot, seconds | 14.3 | 120 | 13.0 | 2.60 | ** |

*- significant at 5% level

** - Highly significant at 1% level

n.s – Not significant

**Table 6: Rice stripper optimum settings of critical operating parameters**

s

| S/No | Parameters | At rotor height 270mm | At rotor height 220mm |
|---|---|---|---|
| 1 | Harvester forward speed | 3km/h | 4km/h |
| 2 | Stripper rotor speed | 670rpm | 560rpm |
| 3 | Harvester nose height above ground | 530mm | 480mm |
| 4 | Field capacity | 0.078ha/h | 0.075ha/h |
| 5 | Fuel consumption rate | 27.6 litre/ha | 26.6 litre/ha |
| 6 | Harvester efficiency | 81% | 77% |
| 7 | Grain purity | 90.2% | 87.5% |
| 8 | Threshed grains, percent of total stripped | 97.5% | 92.7% |

**Results and discussion**

**The Field Performance Indices (Measured)**

From Table 1, mean crop yield was 1,300kg/ha and the pre-harvest loss was found to be 40.0kg/ha at the crop moisture content 21.0% to 15.6% on wet basis because it took seven days to complete the field experiment. The crop height range at maturity was 55cm to 90cm, which was an indication that the seed material used in planting was not pure and also non-uniformity in the soil fertility distribution. Average shattered loss was

22.9g/plot, stubble loss was 10.8g/plot and lodging loss was 11.4g/plot, showing lodging loss to be the least because there was no serious lodging of crop on the rice field where the experiment was carried out. Stripper threshability was 88.6% on the average of total grain stripped.

**The field performance Indices (Computed)**

Table 2 shows the mean values of the computed field performance indices with shattering loss of 6.9% being the highest, followed by stubble loss of 5.7%, lodging loss of 3.4% and cracked grain loss was 0.0% out of the total loss of 15.9%. There was no cracked grain found because the stripping elements was made of rubber and the inner hood surface on which the fleeing stripped grains landed was linned with rubber carpet to reduce grains rebouncing. The mean grain purity was 89.7%, harvester field efficiency was 56.78% and harvester efficiency was 78%. Harvester mean field capacity was 0.044ha/h (0.40ha/day) which was small due to the small size of the prototype machine stripping width of 30cm.

**Result of Analysis of Variance (ANOVA) and Duncan Multiple Range Test (DMRT) of Mean Groupings**

From Table 3, the ANOVA results shows that the replication was highly significant for stubble loss, time spent, field capacity, forward speed and so also highly significant for time spent. The blocking was considered effective in reducing the experimental error since replication (f) was significant (Gomez and Gomez, 1976). Stripper rotor speed was significant for shatter loss, and so also forward speed for field capacity and field efficiency. The effect of variation in crop height, obstruction of machine tyre by crop stalks (spot planted field) and uneven ground gradient was responsible for the significance effect on forward speed which also affected the field capacity and field efficiency. Row crop planting may be solution to reduce rice crop obstruction to the moving machine tyres as observed with spot planting crop pattern.

Duncan Multiple Range Test (DMRT) Table 4 revealed two significant levels of shatter loss means grouping for the stripper rotor speed with $V_4$ (700rpm) having the lowest value for this means loss. This also showed that the means of harvester forward speed have only one group of significant level with the lowest means value at $U_2$ (4km/h).

**Comparison between Harvester and Manual Harvesting**

Table 5 is the result of comparison between harvester and manual harvesting. Comparing mean values of harvester and manual harvesting losses shows that the means were significantly different at 5% level. Also, 't' test results of comparing mean values of the time spent for these two harvesting methods shows that the mean were significantly different at 1% level. The s't' test value was high for time spent because the stripper performed lifting, stripping, threshing and grains/MOG transporting in 14.3seconds while the manual took 120 seconds to do the same. Also the manual harvesting had higher loss of 20.27% than the 13.5% of the machine because a lot of losses were experienced during manual threshing, some grains went away with the chaff and some paddy kernels were found broken.

**The Rice Stripper Optimum Setting of Critical Operating Parameters**

Table 6 is the result of the best settings for the harvester at the two rotor heights 270mm and 220mm. The best machine settings at 270mm rotor height was stripper rotor speed 670rpm, forward speed 3kh/h, which gave field capacity of 0.078ha/h, harvester efficiency of 81%, grain purity of 90.2% and threshed grains was 92.5% of total grain stripped. Best machine settings at 220mm rotor height, forward speed at 4km/h and rotor speed at 560rpm gave field capacity to be 0.075ha/h, harvesting efficiency was 77%, grain purity was 87.5% and threshed grains was 92.7% of total grain stripped.

**Conclusion**

A pedestrian controlled prototype self propelled grain stripper harvester developed in Nigeria was evaluated on an upland faro 44 rice field at Basawa, Zaria. A Randomized Complete Block design (RBC) was adopted to study the effect of stripper rotor heights at various harvester forward speeds and stripper rotor speeds on field losses, harvester grain purity, field capacity and harvester efficiency. The computed mean value of crop purity was 89.70%, effective harvester field capacity was 0.40ha/day, harvester field efficiency was 56.68% and harvester efficiency was 78.00%. It was observed that machine performance was hindered on spot planted rice field which performed better on row crop planted field.

**References:**

Adisa A. F. 2009. Development and Performance Evaluation of a Pedestrian Controlled Rice Stripper. Unpublished P.hD. Thesis, Ahmadu Bello University, Zaria, Nigeria.

FAO, 2003. The International Year of Rice 2004. Concept Paper, International Year of Rice Secretariat, Food and Agriculture Organization of the United Nations, pp2.

Fresco, L. O. 2003. International Year of Rice 2004: Concept Paper International Year of Rice Secretariat, Food and Agriculture Organization of the United Nations, pp11.

Gomez, K. A. and Gomez, A. A. 1984. Statistical Procedures for Agricultural Research, 2nd Edition, John Wiley and Sons, Inc. New York.

Oloruntoba, A., Ashimolowo, O. R., and Solomon, V. A. 2007. Rice Farmers Perceptions of Agricultural Credit in Rural Communities of a Local Government in Nigeria. Journal of Agriculture and Rural Development, Volume 1, Swaziland Printing and Publishing Company Limited, Swaziland.

The Comet, 2002. News Paper of the Comet, June, 17, 2002, pp24.