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# Effect of irrigation and weed management practices on Nutrient uptake and Economics of production of Aerobic rice

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***Abstract:*** *In a study conducted during 2007 and 2008 on irrigation and weed management effect on aerobic rice, scheduling the irrigation with IW/CPE of 1.2 produced significantly higher stature of yield attributes viz., total number of panicles $m^{-2}$, total number of grains and number of filled grains and grain (4702 and 4547 kg $ha^{-1}$) and straw yield and were distinctly superior to IW/CPE of 0.8 and 1.0. The nutrient uptake (nitrogen, phosphorus and potassium) by crop was also significantly highest with IW/CPE of 1.2.Weed management practices exerted significant influence on yield attributes, yield (5761 and 5595 kg $ha^{-1}$), nutrient uptake by crop and all of them were at their highest with hand weeding at 20 and 40 days, which were comparable with oxadiargyl 0.07 kg ai $ha^{-1}$ supplemented with hand weeding at 40 days. All the yield attributes and yield of rice were the lowest with unweeded check. Nutrient uptake by weeds was significantly highest with IW/CPE of 1.0 and among weed management practices with hand weeding at 20 and 40 days. Highest returns and benefit-cost ratio were recorded with the irrigations scheduled at IW/CPE ratio of 1.2 and with pre emergence application of oxadiargyl 0.07 kg ai $ha^{-1}$ supplemented with hand weeding at 40 days.*

***Keywords****: Aerobic rice, Economics, IW/CPE, Nutrient uptake, Oxadiargyl*

## I. Introduction

To fulfill the increased rice demand with shrinking resources, it will be necessary to increase yield in a unit area with less water. Water is a looming crisis due to competition among agricultural, industrial, environmental and domestic users. A growing scarcity of fresh water will pose problems for rice production in future years. The successful transition from traditional lowland cultivation to aerobic rice production should be invariably under conditions of effective water management, to keep the soil ‘‘wet’’ but not flooded or saturated. In practice, irrigation has to be applied to bring the soil water content up to field capacity once a lower threshold has been reached and hence for aerobic rice, the optimum threshold for re-irrigation still needs to be determined. Weeds are the greatest threat under upland or aerobic rice systems, resulting in yield losses between 30 and 98 per cent .Successful aerobic rice culture will largely depend on effective weed control. The use of herbicides causes environmental pollution and induces the proliferation of resistant weed biotypes. These risks and the costs of labour for weeding prompt research on environment friendly, low volume and labour efficient methods of weed control for aerobic rice. North Coastal region of Andhra Pradesh is having substantial area under rain fed /semi-dry rice and has a vast scope of growing rice under aerobic conditions. In this backdrop, the present study was undertaken with the objectives to determine the best irrigation water management practice and to find out the effective weed management practice for aerobic rice for maximum performance of aerobic rice.

## II. Materials And Methods

The experiment water and weed management practices for Aerobic rice was carried out during *kharif* 2007 and 2008. The field experiment were conducted at upland block of college farm, Agricultural College, Naira campus of Acharya N.G.Ranga Agricultural University, Andhra Pradesh, which is geographically situated at $18.24^0$ N latitude, $83.84^o$ E longitude and at an altitude of 27 m above mean sea level in the North Coastal Zone of Andhra Pradesh. Weather did not constrain the optimal performance of the crop under different treatments. Weather parameters *viz*., temperature, RH, bright sunshine hours and evaporation varied negligibly between *kharif,* 2007 and 2008. The weather parameters, during both years of study did not deviate much from the normal values of the location and were favorable for the optimal performance of the crop. During the crop period during *kharif* 2007 a total amount of 488.5mm rainfall was received in 28 rainy days as against the decennial average of 595 mm received in 32 rainy days for the corresponding period and during *kharif* 2008 a total amount of 444.5 mm rainfall was received in 28 rainy days as against the decennial average of 592 mm received in 32 rainy days for the corresponding period. The experiment was laid out in split plot design and replicated thrice. The treatments consisted of three Irrigation Schedules ($M_1$: IW/CPE ratio of 0.8,$M_2$: IW/CPE ratio of 1.0 and $M_3$: IW/CPE ratio of 1.2) and five weed management practices ($S_1$: Unweeded Check,$S_2$: Hand Weeding (HW) twice at 20 and 40 DAS,$S_3$:Pre-emergence application of Oxadiargyl @ 0.07 kg ai $ha^{-1}$ + Hand weeding at 40 DAS,$S_4$: Pre-emergence application of Bensulfuron methyl @ 0.06 kg ai ha-$^{1}$ + Hand weeding at 40 DAS and $S_5$: Pre-emergence application of Triasulfuron @ 0.006 kg ai $ha^{-1}$ + Hand

weeding at 40 DAS as subplots. A fertilizer dose of 120-60-50 kg N, $P_2O_5$ and $K_2O$ $ha^{-1}$ were applied uniformly to all the experimental plots .Nitrogen was applied in four equal splits, one each at basal, active tillering panicle initiation and heading stages. The variety Vasundhara was tried with nitrogen level of 120 kg $ha^{-1}$ during both the years of the experiment. All the other cultural practices were followed as per the recommended package of practices. The seed of rice was directly sown in lines in the non puddled and non flooded soil. The seed was treated with fungicide Carbendazim @ 1g/kg seed and then dibbled @ one seed $hill^{-1}$ with a spacing of 20 x 10 cm. Thinning and gap filling were done at 10 DAS to maintain the uniform plant stand in all the plots. The data recorded on various growth and yield parameters of rice crop were analyzed following standard statistical analysis of variance procedure as suggested by Panse and Sukhatme (1). As regards the weed studies, the data were analyzed as per the prescribed standard statistical demand. Significance of the treatments was tested by 'F' test at 0.05 level of probability and critical differences were worked out, wherever treatmental differences were found significant.

## III. Results And Discussion

Yield attributes viz., number of panicles $m^{-2}$, total number of grains $panicle^{-1}$ and number of filled grains $panicle^{-1}$ were the highest with irrigation scheduled at IW/CPE ratio of 1.2 ($M_3$), which were significantly higher than with the other two irrigation schedules tried (Table 1). All these parameters with irrigation scheduled at IW/CPE of 1.0 ($M_2$) were comparable with irrigation scheduled at IW/CPE ratio of 0.8 ($M_1$) which produced the lowest number of panicles $m^{-2}$, total number of grains $panicle^{-1}$ and number of filled grains $panicle^{-1}$. The highest grain and straw yields were recorded with the irrigations scheduled at IW/CPE ratio of 1.2 ($M_3$), which were significantly higher than with rest of the irrigation schedules tried (Fig.1). The lowest stature of yield attributes of rice under aerobic culture was noticed with irrigation schedule at IW/CPE ratio of 0.8. Similar findings were reported by Belder *et al.* (2). Grain yield of rice increased significantly with increase in irrigation schedule from 0.8 to 1.2. The improvement in yield was due to better availability of moisture, which in turn lead to efficient physiological activity. High level of dry matter production and efficient translocation of photosynthates from source to sink might be responsible for the production of increased level of yield structure. Rice plants when grown under saturated condition, develop more plant stature, leaf area, root volume, productive tillers, resulting in higher yields. These results are in accordance with those of Jadhav *et al.* (3); Singh *et al.* (4) Ambrocio Castaneda *et al.* (5) and Maheswari *et al.* (6).The highest straw yield was observed with $I_3$, which was significantly superior to other levels and the lowest straw yields were associated with $I_1$.

Nitrogen uptake by grain and straw tended to increase with the increasing levels of IW/CPE ratio from 0.8 to 1.2, during both the years of study (Table 2). The highest nitrogen uptake by grain and straw was observed with irrigation scheduled at IW/CPE ratio of 1.2 ($M_3$) which was significantly higher than with the other irrigation schedules tried. Nitrogen uptake by grain and straw with irrigation scheduled at IW/CPE of 1.0 ($M_2$) was comparable with that of irrigation scheduled at IW/CPE ratio of 0.8 ($M_1$), which produced the lowest nitrogen uptake by grain and straw.

Phosphorus and potassium uptake tended to increase with the increasing levels of IW/CPE during both the years of study. The highest phosphorus and potassium uptake was observed with irrigation scheduled at IW/CPE ratio of 1.2 ($M_3$), which was significantly higher than with the other irrigation schedules tried. Phosphorus and potassium uptake with irrigation scheduled at IW/CPE of 1.0 ($M_2$) was comparable with that of irrigation scheduled at IW/CPE ratio of 0.8 ($M_1$), which resulted in the lowest phosphorus and potassium uptake. This was mainly due to the efficient absorption of large quantities of mineral nutrients coupled with higher dry matter production under higher moisture levels. On the contrary, uptake of nutrients (N, P and K) by rice was the lowest with the lowest level of moisture supply ($I_1$). Similar results of poor yield attributing characters with lower doses of major nutrients was documented by Jadhav *et al.* (3).

Nitrogen uptake by weeds at harvest was significantly influenced by irrigation schedules(Table 3). The lowest uptake of nitrogen by weeds was recorded at IW/CPE ratio of 1.2, while the uptake of nitrogen by weeds with irrigation schedule at IW/CPE of 1.0 and 0.8 were comparable with each other, during both the years of study. Phosphorus and potassium uptake by weeds at harvest was significantly influenced by irrigation schedules. The lowest uptake of these nutrients by weeds was recorded at IW/CPE ratio of 1.2, while the uptake by weeds with irrigation schedule at IW/CPE of 1.0 and 0.8 were comparable with each other, during both the years of study. . Weeds grow faster than crop plants and thus absorb the available nutrients quickly, leading to inadequate supply of nutrients to the crop. Increased soil moisture through the irrigation scheduling at IW/CPE of 1.2 provided better environment for nutrient availability to crops and weeds and thereby, lower dry matter accumulation of weeds resulted in lesser nutrient uptake by weeds.

The highest gross returns, net returns and benefit cost ratio were realized with the irrigations scheduled at IW/CPE ratio of 1.2 ($M_3$), which were significantly higher than with the other two irrigation schedules tried (Table 4). This could be attributed to the higher yield of grain and straw with higher levels of moisture. These

economic returns were the lowest with the lowest level of moisture supply with the irrigation schedule of 0.8 resulting in the poor performance of the crop.

Within different weed management practices tried, hand weeding at 20 and 40 DAS ($S_2$) produced the highest number of panicles $m^{-2}$, total number of grains $panicle^{-1}$ and number of filled grains $panicle^{-1}$ (Table 1), which were, however, in parity with pre emergence application of oxadiargyl 0.07 kg ai $ha^{-1}$ supplemented with HW at 40 DAS ($S_3$) . Pre emergence application of triasulfuron 0.006 kg ai $ha^{-1}$ along with HW at 40 DAS ($S_5$) was comparable with pre emergence application of bensulfuron methyl 0.06 kg ai $ha^{-1}$ with hand weeding at 40 DAS ($S_4$). The lowest values of these parameters were recorded with unweeded check ($S_1$) during both the years of study.

Hand weeding at 20 and 40 DAS ($S_2$) recorded the highest grain and straw yields and they were comparable with pre emergence application of oxadiargyl 0.07 kg ai $ha^{-1}$ supplemented with HW at 40 DAS ($S_3$), which in turn were comparable with pre emergence application of triasulfuron 0.006 kg ai $ha^{-1}$ along with HW at 40 DAS ($S_5$). The next best treatment was pre emergence application of bensulfuron methyl 0.06 kg ai $ha^{-1}$ with hand weeding at 40 DAS ($S_4$) ,which was comparable with pre emergence application of triasulfuron 0.006 kg ai $ha^{-1}$ along with HW at 40 DAS ($S_5$) . The lowest grain and straw yields were recorded with unweeded check ($S_1$) during both the years of study.

Hand weeding at 20 and 40 DAS ($S_2$) recorded the highest nitrogen uptake by grain and straw (Table 2) and was comparable with pre emergence application of oxadiargyl 0.07 kg ai $ha^{-1}$ supplemented with HW at 40 DAS ($S_3$). Pre emergence application of triasulfuron 0.006 kg ai $ha^{-1}$ along with HW at 40 DAS ($S_5$) was comparable with pre emergence application of bensulfuron methyl 0.06 kg ai $ha^{-1}$ with hand weeding at 40 DAS ($S_4$). The lowest nitrogen uptake by grain and straw was recorded with unweeded check ($S_1$) during both the years of study. This may be attributed to the fact that effective weed management at critical stages of the crop weed competition, thereby the yield attributes were the highest with $S_2$. Similar results have been reported by Sharma *et al.* (7) and Ramana *et al.* (8). This might be due to the fact that hand weeding at 20 and 40 DAS and pre emergence application of oxadiargyl 0.07 kg ai $ha^{-1}$ with hand weeding at 40 DAS in rice under aerobic culture will reduce the weed competition and thereby there is improvement in the stature of growth as well as yield attributes, resulting in higher grain and straw yields. The superior performance of oxadiargyl could be attributed to the fact that it is a potent inhibitor of protox, deregulates the porphyrin pathway. These results are in accordance with those of Arul Chezhian and Kathiresan (9), Rajkhowa *et al.* (10) and Samar Singh *et al.* (11).

Hand weeding at 20 and 40 DAS ($S_2$) produced the highest phosphorus and potassium uptake by crop and was comparable with pre emergence application of oxadiargyl 0.07 kg ai $ha^{-1}$ supplemented with HW at 40 DAS ($S_3$). Pre emergence application of triasulfuron 0.006 kg ai $ha^{-1}$ along with HW at 40 DAS ($S_5$) was comparable with pre emergence application of bensulfuron methyl 0.06 kg ai $ha^{-1}$ with hand weeding at 40 DAS ($S_4$). The lowest uptake of these nutrients was recorded with unweeded check ($S_1$) during both the years of study. This might be due to the production of higher dry matter with hand weeding at 20 and 40 DAS and pre emergence application of oxadiargyl 0.07 kg ai $ha^{-1}$ with hand weeding at 40 DAS.

The lowest uptake of nitrogen by weeds among the weed management practices was recorded with hand weeding at 20 and 40 DAS ($S_2$) during both the years of study(Table 3) , which was in parity with oxadiargyl 0.07 kg ai $ha^{-1}$ supplemented with HW at 40 DAS ($S_3$) . Pre emergence application of triasulfuron 0.006 kg ai $ha^{-1}$ along with HW at 40 DAS ($S_5$) was comparable with oxadiargyl 0.07 kg ai $ha^{-1}$ supplemented with HW at 40 DAS ($S_3$) and pre emergence application of bensulfuron methyl 0.06 kg ai $ha^{-1}$ along with HW at 40 DAS ($S_4$). Unweeded check ($S_1$) recorded the highest nitrogen uptake by weeds.

The lowest uptake of phosphorus and potassium by weeds among the weed management practices was recorded with hand weeding at 20 and 40 DAS ($S_2$) during both the years of study , which was in parity with oxadiargyl 0.07 kg ai $ha^{-1}$ supplemented with HW at 40 DAS ($S_3$) . Pre emergence application of triasulfuron 0.006 kg ai $ha^{-1}$ along with HW at 40 DAS ($S_5$) was comparable with oxadiargyl 0.07 kg ai $ha^{-1}$ supplemented with HW at 40 DAS ($S_3$) and pre emergence application of bensulfuron methyl 0.06 kg ai $ha^{-1}$ along with HW at 40 DAS ($S_4$). Unweeded check ($S_1$) recorded the highest uptake by weeds. . Increased uptake of nitrogen, phosphorus and potassium by weeds invariably reduced the availability of nutrients to the crop. Hand weeding twice and pre emergence application of oxadiargyl + HW recorded significantly lesser nutrient uptake by weeds.

Hand weeding at 20 and 40 DAS ($S_2$) resulted in the highest gross returns (Table 4) which were comparable with pre emergence application of oxadiargyl 0.07 kg ai $ha^{-1}$ supplemented with HW at 40 DAS ($S_3$), which in turn were at par with pre emergence application of triasulfuron 0.006 kg ai $ha^{-1}$ along with HW at 40 DAS ($S_5$). The next best treatment was pre emergence application of bensulfuron methyl 0.06 kg ai $ha^{-1}$ with hand weeding at 40 DAS ($S_4$), which was comparable with pre emergence application of triasulfuron 0.006 kg ai $ha^{-1}$ along with HW at 40 DAS ($S_5$) . The lowest gross returns were realized with unweeded check ($S_1$) during both the years of study

Pre emergence application of oxadiargyl 0.07 kg ai $ha^{-1}$ supplemented with HW at 40 DAS ($S_3$) recorded the highest benefit cost ratio and it was comparable with hand weeding at 20 and 40 DAS ($S_2$). The poorest performance of rice was recorded with $S_1$ (unweeded check) and the lowest yield level has obviously resulted in the poor economic returns. Similar trend of economic returns under aerobic culture have been reported earlier by Gowda *et al.*(12).

## IV. Conclusion

In conclusion, the study has revealed that rice can be successfully grown under aerobic culture in North Coastal Zone of Andhra Pradesh by Scheduling of irrigation at IW/CPE ratio of 1.2 resulted in the best performance of rice in terms of productivity and profitability in North Coastal Zone of Andhra Pradesh. For efficient weed management, hand weeding at 20 and 40 DAS was found to be effective, while pre emergence application of oxadiargyl 0.07 kg ai $ha^{-1}$ supplemented with HW at 40 DAS was found comparable with hand weeding.

## V. Tables and figures

**Table1. Yield parameters and yield of rice as influenced by water and weed management practices under aerobic culture**

| Treatment | Panicles / $m^2$ | | Total No. of grains/ panicle | | No. of filled grains/ panicle | | Grain yield (kg/ha) | | Straw Yield (kg/ha) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2007 | 2008 | 2007 | 2008 | 2007 | 2008 | 2007 | 2008 | 2007 | 2008 |
| ***Irrigation schedules*** | | | | | | | | | | |
| $M_1$-IW/CPE of 0.8 | 147 | 145 | 135 | 133 | 117 | 112 | 4095 | 3957 | 6768 | 6509 |
| $M_1$-IW/CPE of 1.0 | 149 | 146 | 137 | 136 | 121 | 118 | 4230 | 4073 | 6923 | 6646 |
| $M_1$-IW/CPE of 1.2 | 161 | 158 | 150 | 149 | 133 | 132 | 4702 | 4547 | 7627 | 7257 |
| SEm± | 2.29 | 2.04 | 2.80 | 2.29 | 2.80 | 1.65 | 110 | 101 | 156 | 149 |
| CD (P=0.05) | 9 | 8 | 11 | 9 | 11 | 7 | 432 | 399 | 612 | 584 |
| ***Weed management practices*** | | | | | | | | | | |
| $S_1$-Unweeded check | 81 | 79 | 66 | 64 | 51 | 41 | 803 | 691 | 1380 | 1166 |
| $S_2$-HW at 20 & 40 DAS | 183 | 180 | 170 | 168 | 156 | 152 | 5761 | 5595 | 9401 | 8981 |
| $S_3$-Oxadiargyl@ 0.007 kgai/ha+HW | 179 | 176 | 165 | 163 | 150 | 146 | 5561 | 5392 | 9025 | 8731 |
| $S_4$-Bensulfuron methyl@ 0.06kgai/ha +HW | 155 | 152 | 146 | 145 | 126 | 127 | 4530 | 4367 | 7504 | 7256 |
| $S_5$-Triasulfuron@ 0.006kgai/ha +HW | 164 | 161 | 156 | 156 | 137 | 137 | 5055 | 4915 | 8220 | 7886 |
| SEm± | 5.48 | 5.13 | 4.45 | 3.77 | 4.45 | 3.43 | 230 | 222 | 362 | 341 |
| CD (P=0.05) | 16 | 15 | 13 | 11 | 13 | 10 | 674 | 648 | 1056 | 994 |

**Table2: Nutrient uptake (kg ha$^{-1}$) by rice under aerobic culture as influenced byirrigation schedules and weed management practices**

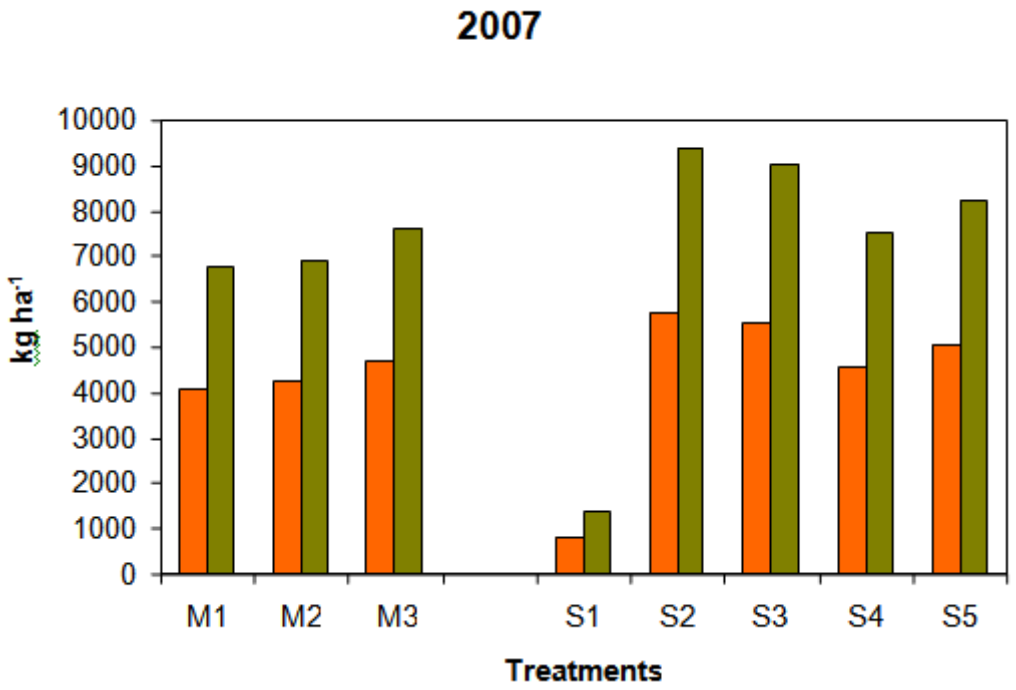
| TREATMENTS | *kharif*,2007 | | | | *kharif*,2008 | | | |
|---|---|---|---|---|---|---|---|---|
| | N uptake by grain | N uptake by straw | P | K | N uptake by grain | N uptake by straw | P | K |
| **Irrigation schedules** | | | | | | | | |
| $M_1$-IW/CPE of 0.8 | 25.79 | 42.72 | 20.57 | 136.88 | 22.57 | 37.19 | 18.66 | 125.53 |
| $M_1$-IW/CPE of 1.0 | 27.10 | 44.51 | 20.67 | 137.86 | 23.01 | 37.59 | 19.48 | 126.90 |
| $M_1$-IW/CPE of 1.2 | 30.93 | 50.39 | 26.62 | 144.20 | 27.24 | 43.66 | 23.40 | 136.64 |
| SEm± | 0.72 | 1.44 | 0.71 | 0.61 | 0.77 | 1.51 | 0.57 | 1.61 |
| CD (P=0.05) | 2.82 | 5.65 | 2.79 | 2.38 | 3.02 | 5.93 | 2.23 | 6.32 |
| **Weed management practices** | | | | | | | | |
| $S_1$-Unweeded check | 12.80 | 22.00 | 9.67 | 73.00 | 10.47 | 17.66 | 8.99 | 69.87 |
| $S_2$-HW at 20 & 40 DAS | 33.74 | 55.02 | 29.55 | 158.80 | 30.48 | 48.91 | 26.27 | 157.96 |
| $S_3$-Oxadiargyl@ 0.007 kgai/ha+HW | 32.56 | 52.80 | 27.41 | 156.96 | 29.03 | 47.00 | 24.44 | 149.11 |
| $S_4$-Bensulfuron methyl@ 0.06kgai/ha +HW | 29.53 | 48.91 | 22.57 | 153.80 | 24.91 | 40.19 | 19.99 | 131.47 |
| $S_5$-Triasulfuron@ 0.006kgai/ha +HW | 31.05 | 50.61 | 23.88 | 154.28 | 27.17 | 43.65 | 22.87 | 140.04 |
| SEm± | 0.92 | 1.36 | 1.26 | 1.03 | 1.02 | 1.43 | 1.12 | 4.59 |
| CD (P=0.05) | 2.68 | 3.97 | 3.69 | 3.01 | 2.98 | 4.17 | 3.26 | 13.38 |

**Table3: Nutrient uptake (kg ha$^{-1}$) by weeds under aerobic culture as influenced by irrigation schedules and weed management practices**

| TREATMENTS | *kharif*,2007 | | | *kharif*,2008 | | |
|---|---|---|---|---|---|---|
| | N | P | K | N | P | K |
| **Irrigation schedules** | | | | | | |
| $M_1$-IW/CPE of 0.8 | 15.67 | 5.17 | 14.12 | 18.85 | 6.91 | 17.45 |
| $M_1$-IW/CPE of 1.0 | 15.36 | 5.02 | 13.67 | 18.11 | 6.55 | 17.05 |
| $M_1$-IW/CPE of 1.2 | 13.89 | 4.77 | 12.95 | 15.12 | 5.05 | 15.21 |
| SEm ± | 0.34 | 0.05 | 0.16 | 0.54 | 0.11 | 0.20 |
| CD (P=0.05) | 1.32 | 0.18 | 0.62 | 2.12 | 0.42 | 0.77 |
| **Weed management practices** | | | | | | |
| $S_1$-Unweeded check | 45.10 | 14.61 | 39.84 | 46.84 | 15.50 | 41.10 |
| $S_2$-HW at 20 & 40 DAS | 4.34 | 1.64 | 4.39 | 6.22 | 2.43 | 6.42 |
| $S_3$-Oxadiargyl@ 0.007 kgai/ha+HW | 7.07 | 2.21 | 5.75 | 8.41 | 3.40 | 8.92 |
| $S_4$-Bensulfuron methyl@ 0.06kgai/ha +HW | 10.73 | 3.45 | 9.53 | 13.16 | 4.94 | 13.54 |
| $S_5$-Triasulfuron@ 0.006kgai/ha +HW | 7.62 | 3.03 | 8.36 | 12.16 | 4.57 | 12.89 |
| SEm ± | 1.07 | 0.32 | 0.91 | 1.31 | 0.42 | 1.38 |
| CD (P=0.05) | 3.12 | 0.94 | 2.67 | 3.83 | 1.22 | 4.04 |

**Table 4: Economics of rice under aerobic culture as influenced by irrigation schedules and weed management practices**

| Treatments | *kharif*,**2007** | | | *kharif*,**2008** | | |
|---|---|---|---|---|---|---|
| | **Gross returns (Rs ha$^{-1}$)** | **Net returns (Rs ha$^{-1}$)** | **Benefit Cost ratio** | **Gross returns (Rs ha$^{-1}$)** | **Net returns (Rs ha$^{-1}$)** | **Benefit Cost ratio** |
| **Irrigation schedules** | | | | | | |
| $M_1$-IW/CPE of 0.8 | 44965 | 32560 | 3.56 | 43474 | 30827 | 3.38 |
| $M_1$-IW/CPE of 1.0 | 46452 | 34005 | 3.67 | 44715 | 32068 | 3.48 |
| $M_1$-IW/CPE of 1.2 | 51595 | 39048 | 4.05 | 49821 | 36974 | 3.82 |
| SEm ± | 1194.82 | 1191.25 | 0.09 | 1104 | 1104.64 | 0.08 |
| CD (P=0.05) | 4690 | 4676 | 0.37 | 4336 | 4336 | 0.32 |
| **Weed management practices** | | | | | | |
| $S_1$-Unweeded check | 8856 | -2614 | 0.77 | 7610 | -4093 | 0.65 |
| $S_2$-HW at 20 & 40 DAS | 63252 | 50081 | 4.80 | 61338 | 47935 | 4.58 |
| $S_3$-Oxadiargyl@ 0.007 kgai/ha+HW | 60953 | 48803 | 4.99 | 59156 | 46703 | 4.75 |
| $S_4$-Bensulfuron methyl@ 0.06kgai/ha +HW | 49807 | 37087 | 3.91 | 48025 | 35071 | 3.71 |
| $S_5$-Triasulfuron@ 0.006kgai/ha +HW | 55485 | 42665 | 4.33 | 53886 | 40833 | 4.13 |
| SEm ± | 2525.74 | 2523.33 | 0.19 | 2422.26 | 2422.26 | 0.19 |
| CD (P=0.05) | 7371 | 7364 | 0.58 | 7069 | 7069 | 0.54 |



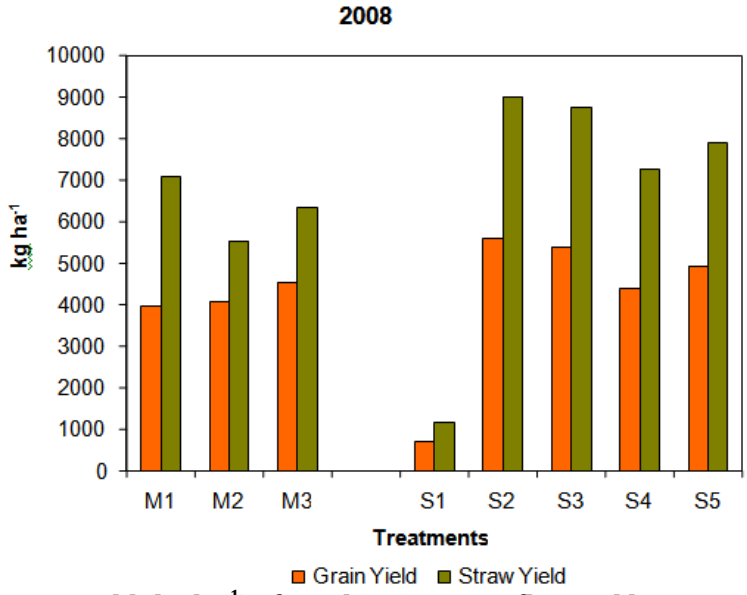



**Fig 1: Grain and straw yield (kg ha$^{-1}$) of aerobic rice as influenced by irrigation schedules and weed management practices**

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