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# Crop Management Practices to Improve Rice Productivity in Rainfed Drought-Prone Environment of Jharkhand

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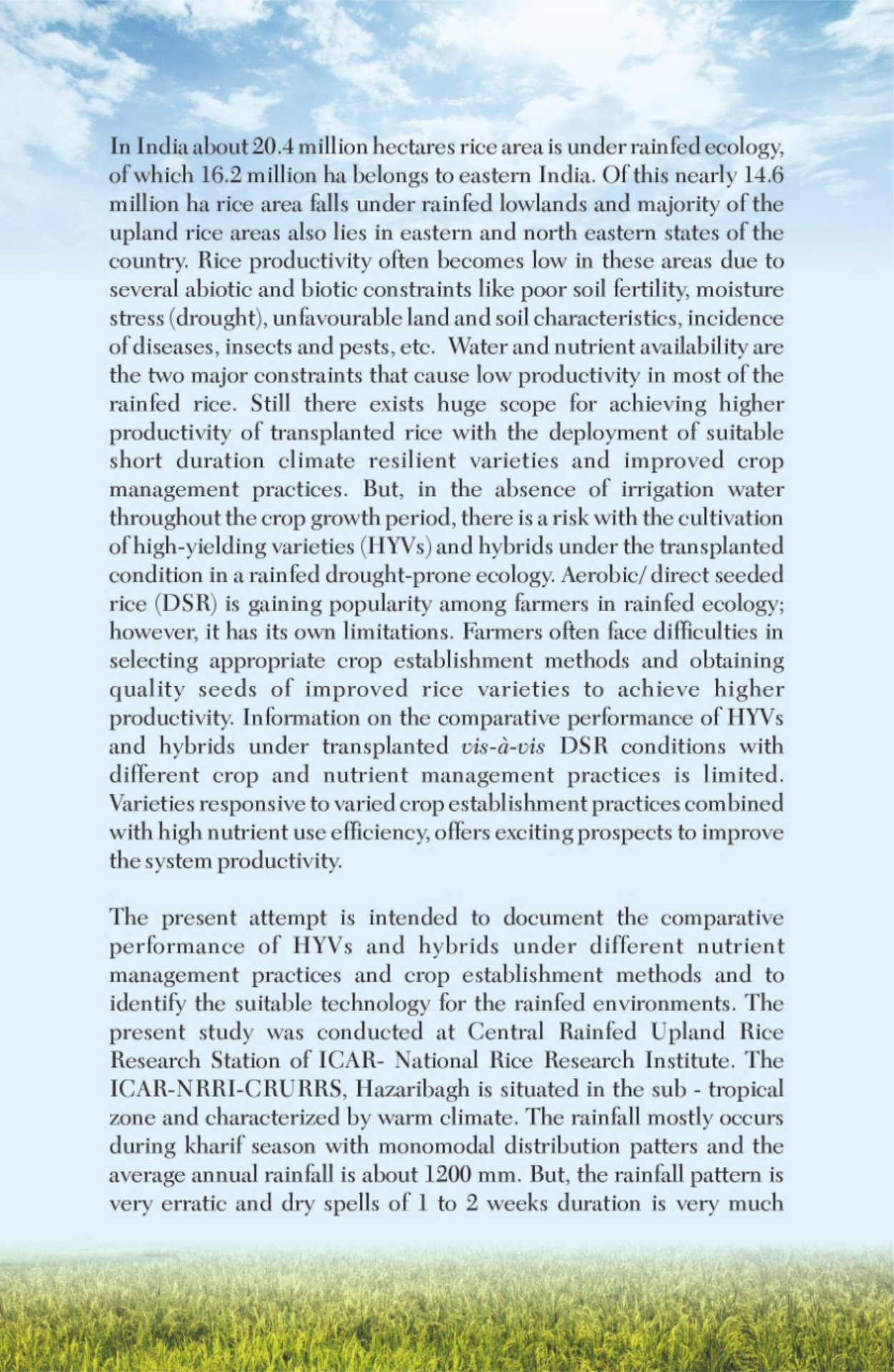


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In India about 20.4 million hectares rice area is under rainfed ecology, of which 16.2 million ha belongs to eastern India. Of this nearly 14.6 million ha rice area falls under rainfed lowlands and majority of the upland rice areas also lies in eastern and north eastern states of the country. Rice productivity often becomes low in these areas due to several abiotic and biotic constraints like poor soil fertility, moisture stress (drought), unfavourable land and soil characteristics, incidence of diseases, insects and pests, etc. Water and nutrient availability are the two major constraints that cause low productivity in most of the rainfed rice. Still there exists huge scope for achieving higher productivity of transplanted rice with the deployment of suitable short duration climate resilient varieties and improved crop management practices. But, in the absence of irrigation water throughout the crop growth period, there is a risk with the cultivation of high-yielding varieties (HYVs) and hybrids under the transplanted condition in a rainfed drought-prone ecology. Aerobic/ direct seeded rice (DSR) is gaining popularity among farmers in rainfed ecology; however, it has its own limitations. Farmers often face difficulties in selecting appropriate crop establishment methods and obtaining quality seeds of improved rice varieties to achieve higher productivity. Information on the comparative performance of HYVs and hybrids under transplanted *vis-à-vis* DSR conditions with different crop and nutrient management practices is limited. Varieties responsive to varied crop establishment practices combined with high nutrient use efficiency, offers exciting prospects to improve the system productivity.

The present attempt is intended to document the comparative performance of HYVs and hybrids under different nutrient management practices and crop establishment methods and to identify the suitable technology for the rainfed environments. The present study was conducted at Central Rainfed Upland Rice Research Station of ICAR- National Rice Research Institute. The ICAR-NRRI-CRURRS, Hazaribagh is situated in the sub - tropical zone and characterized by warm climate. The rainfall mostly occurs during kharif season with monomodal distribution patters and the average annual rainfall is about 1200 mm. But, the rainfall pattern is very erratic and dry spells of 1 to 2 weeks duration is very much

common during the crop growth period.

Four HYVs (Hazaridhan, Sadabahar, Sahbhagi Dhan and DRR Dhan 44) and two hybrids (PAC 801 and PA 6444) were compared under two crop establishment methods (transplanting and wet DSR) and two fertilizer dose. F1 and F2 are fertilizer doses of 80-40-30 and 120-60-30 kg N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O/ha respectively under transplanting where as F3 and F4 are fertilizer doses of 80-40-30 and 120-60-30 kg N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O/ha respectively under wet DSR.

HYVs, in general took 7-10 days more time to flower under transplanted conditions than DSR as a result of transplanting shock (Fig 1). So this time can be saved if direct seeded method of crop establishment is followed. On an average, the wet-DSR method of crop establishment produced comparable yields as that of transplanting method, displaying a marginal yield gain of only 0.5 t/ha due to switching from DSR to TPR (Fig. 2). Differential performances of varieties were observed under crop establishment methods and it was found that current hybrids are less suitable for direct seeded method of crop establishment. There was a significant reduction in grain yield of about 17.7% in case of hybrids, whereas HYVs showed marginal yield reduction of about 5.0% as a result of switching from transplanted to DSR method.

It implies that under DSR method crop flowers early without any significant yield penalty in case of HYVs, whereas the yield losses are more in the case of hybrids. Higher nutrient doses exhibit a positive response under direct-seeded conditions.

It can be recommended to go for direct-seeding of HYVs under limited resources in drought-prone rainfed ecology. The current available hybrids may not be suitable for direct seeding though crop can be harvested a week early. More specific hybrids suitable for direct seeded is required to utilize the time gap in multiple cropping system to increase the overall system productivity.

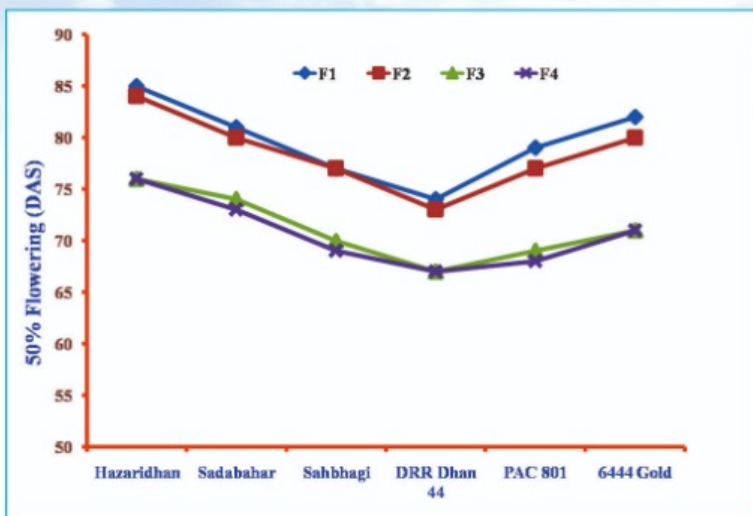


Figure 1 Effect of crop establishment methods and fertilizer application on 50% flowering (DAS) for different varieties.

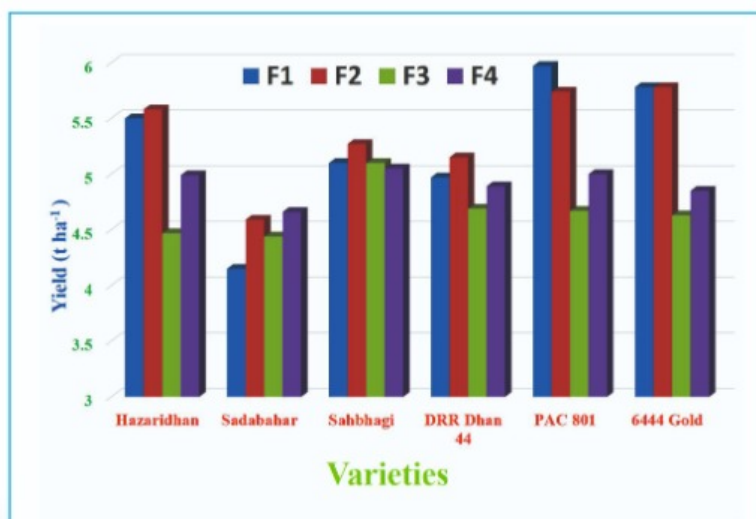


Figure 2. Productivity of rice varieties under different crop establishment methods and fertilizer application

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