

## Influence of crop establishment techniques and sources of nutrients on productivity, energetics and economics of rice

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### ABSTRACT

The influence of crop establishment techniques and sources of nutrients on productivity, energetics and economics of rice was studied in red clay loam soil. The SRI establishment technique recorded significantly higher grain and straw yield (10171 and 11265 kg ha<sup>-1</sup> respectively), total energy output (290329 MJ ha<sup>-1</sup>), energy output: input ratio (15.78), gross income (666.58 Rs. ha<sup>-1</sup>), net income (49256 Rs. ha<sup>-1</sup>) and B:C ratio (2.84) compared to transplanting and aerobic techniques. Among the sources of nutrients, application of FYM + recommended NPK recorded higher grain and straw yield (8871 and 9938 kg ha<sup>-1</sup>, respectively), total energy output (254629 MJ ha<sup>-1</sup>) and gross income (58196 Rs. Ha<sup>-1</sup>), whereas application of recommended NPK recorded significantly higher energy output: input ratio (15.00). In-situ incorporation of green manure (Sunnhemp) + Recommended NPK recorded higher net income (42636 Rs. Ha<sup>-1</sup>) and B:C ratio (2.79) as compared to other treatments.

**Key words:** Establishment techniques, rice, sources of nutrients, total energy output, energy output: input ratio, B:C ratio

To meet the growing demand of rice, significant research efforts have been made to break yield plateau through genetic approaches. Consequently efforts are being made to increase the yield through establishment techniques, SRI technique had an yield advantage of 10-15 per cent than transplanting. Singh *et al.* (1998) found that amending the soil with FYM @ 12 t ha<sup>-1</sup> increased the yield of rice in the absence of fertilizer by 22 per cent. Hence to study the impact of crop establishment techniques and source of nutrients on productivity, energetics and economics of rice, the present investigation was under taken.

Field experiment was undertaken during summer 2006 at Agricultural Research Station, Kathalagere, Karnataka in red caly loam soil having pH 6.60 and organic carbon 0.72 per cent. The initial status of available N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O of the experimental site was 342.6, 19.4 and 248.9 kg ha<sup>-1</sup>, respectively. Three crop establishment techniques *viz.*, Transplanting (M<sub>1</sub>), System of rice intensification (SRI) (M<sub>2</sub>) and Aerobic (M<sub>3</sub>) and four sources of nutrients *viz.*, recommended NPK (S<sub>1</sub>), *in-situ* green manure (Sunnhemp) + Recommended NPK (S<sub>2</sub>), paddy straw manuring + Rec. NPK (S<sub>3</sub>) and FYM + Rec. NPK

(S<sub>4</sub>). The experiment was laid out in randomized complete block design with three replications. The recommended fertilizer dose of 125:62.5:62.5 kg ha<sup>-1</sup> NPK was applied. Full dose of P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O was applied at the time of seeding or transplanting by using single super phosphate and muriate of potash. Fifty per cent of nitrogen was applied as basal and other 50 per cent nitrogen was applied in two splits. The paddy straw manuring was done at 5 t ha<sup>-1</sup> and FYM was applied at 10 t ha<sup>-1</sup>. Rice cv. KRH 2 was taken as the test crop. The energy output:input ratio was calculated as per recommendation of Binning *et al.* (1983).

The SRI establishment technique recorded significantly higher grain and straw yield (10171 and 11265 kg ha<sup>-1</sup>, respectively), followed by transplanting compared to aerobic technique (Table 1). The increase in yield in SRI establishment technique was attributed to planting of seedlings before third phyliochron (10/12 days old seedlings) at shallow depth of planting in wider spacing (25 cm x 25 cm), which leads to large root volume, profuse and strong tillers with large panicles, more and well filled spike lets with higher grain weight (Satyanarayana and Babu, 2004). Among the sources of nutrients, application of FYM and recommended

**Table 1. Grain yield, straw yield, Energy output: input ratio and B:C ratio of rice as influenced by establishment techniques and sources of nutrients during summer, 2006**

Treatments	Grain yield (kg ha <sup>-1</sup> )	Straw yield (kg ha <sup>-1</sup> )	Energy output: input ratio	B:C ratio
Establishment techniques				
M <sub>1</sub>	8697	9819	13.98	2.77
M <sub>2</sub>	10171	11265	15.78	2.84
M <sub>3</sub>	7478	8730	12.42	2.20
S.Em±	244.75	123.17	0.23	0.09
CD (P=0.05)	961	484	0.92	0.35
Sources of nutrients				
S <sub>1</sub>	8671	9937	15.00	2.69
S <sub>2</sub>	8819	9938	14.86	2.79
S <sub>3</sub>	8766	9940	13.45	2.72
S <sub>4</sub>	8871	9938	12.92	2.22
S.Em±	242.9	253.7	0.33	0.09
CD (P=0.05)	NS	NS	0.97	0.27

Interaction non significant

Main plot (M): Establishment techniques; Sub plot (S): Sources of nutrients

M<sub>1</sub> : Transplanting; M<sub>2</sub> : SRI; M<sub>3</sub> : Aerobic

S<sub>1</sub> : Recommended NPK; S<sub>2</sub> : *In-situ* green manure (sunnhemp) + Rec. NPK; S<sub>3</sub> : Paddy straw manuring + Rec.NPK; S<sub>4</sub> : FYM + Recommended NPK

NS : Non significant

NPK recorded higher grain and straw yield (8871 and 9938 kg ha<sup>-1</sup>, respectively) compared to other sources of nutrients. The increase in yield was attributed to increase in growth and yield parameters. The results obtained in this investigation are in conformity the findings of Babu and Reddy (2000) and Mrudhula *et al.* (2005).

The SRI establishment technique recorded significantly higher energy output ratio (15.78) compared to transplanting (13.98) and aerobic (12.42) techniques (Table 1). The increase in energy output: input ratio was mainly due to higher biomass production and total energy output. The results obtained in this study are in line with the findings of Padhi and Sahoo (1996). Among the sources of nutrients, application of recommended NPK recorded higher energy output: input ratio (15.00) compared to other sources of nutrients. The increase in energy output: input ratio in application of recommended NPK might be due to reduced energy input for cultivation practices. The results are in line with the findings of Sanjay *et al.* (2006).

The B:C ratio was higher in SRI establishment

technique (2.84) than transplanting (2.77) and aerobic technique (2.20). The increase in B:C ratio was attributed to higher grain and straw yields. The other possible reason might be increased cost of cultivation under aerobic establishment technique than transplanting. The results are in conformity with the findings of Bouman *et al.* (2002). Among the sources of nutrients, incorporation of *in-situ* green manure with application of recommended NPK recorded significantly higher B:C ratio (2.79), followed by paddy straw manuring with application of recommended NPK (2.72) compared to other sources of nutrients. This might be due to reduced cost of cultivation and slightly higher grain and straw yield compared to application of recommended NPK only. The results of the study are in agreement with the findings of Choudhary and Thakuria (1996).

From the present investigation, it can be concluded that SRI establishment technique can be recommended for higher productivity, energetics and economics. Use of FYM + Rec. NPK can be recommended for higher productivity and *in-situ* green manure (Sunnhemp) + Rec. NPK can be recommended for higher B:C ratio.

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