

The effects of land and fertilizer management techniques on rice productivity under intensive rotations

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In the past 10 years the rice area permitted in southern N.S.W. has expanded from 25 to almost 75 ha per farm. This increase has encouraged use of rice-rice rotations in place of the traditional rice-legume pasture rotations, where much of the nitrogen required by rice came from symbiotic N fixation. Burning, then sod-sowing, is a typical land preparation technique in intensive rice-rice rotations, but this results in loss of both C and N which may result in soil deterioration. Consequently, a study of alternative management techniques and their effects on crop yield were undertaken.

Methods

Two factorial experiments using sod-sown long grain rice were carried out in the 1979-80 and 1980-81 rice seasons (Table 1).

Table 1. Treatments used in the rice-rice rotation studies at Yanco.

<u>Land Preparation Technique</u>	<u>N kg ha⁻¹ on previous rice crop</u>	<u>Fertilization time</u>
Autumn stubble incorporation	0	Permanent flood
Spring stubble incorporation	60	
Spring burn	x 120 x	Panicle initiation
Spring burn plus cultivate (1980-81 only)		
Sow direct into standing stubble (1979-80 only)		

Results and Discussion

Plant sampling at permanent flood showed that dry matter (DM) was lowest on standing stubble plots (2.85 g m⁻²) and highest on burnt plots (9.4 g m⁻²). There was little overall difference in DM production between autumn-rotovated and spring-rotovated plots (mean 5.1 g m⁻²). The low DM on standing stubble plots resulted from the low soil temperatures (up to 10°C difference) under the straw mulch. This reduced seedling growth and, in some cases, prevented germination.

Dry matter yield and nitrogen uptake increased by 17% and 47%, respectively, with increasing stubble levels (from 11 to 16 t ha⁻¹) on plots where stubble was incorporated in autumn, while incorporation of large quantities of stubble in spring decreased DM (by 19%) and N uptake (by 14%).

The effect of fertilizer on yield depended on application time (Table 2).

All treatments had highest yield when fertilized at panicle initiation. Only the autumn-incorporate and the burn-plus-cultivate treatments gave a positive response to fertilization at sowing.

Table 2. Effect of fertilization time and land preparation techniques on yield t ha⁻¹.

<u>Preparation Technique</u>	<u>Control</u>	<u>Sowing</u>	<u>Perm. Flood</u>	<u>Panicle Initiation</u>
Autumn Incorporate	5.53	6.62	6.84	7.32
Spring Incorporate	5.40	5.39	6.53	7.20
Burn	5.58	5.60	6.96	7.35
Burn plus cultivate	5.00	6.30	7.55	7.62
Sow into standing stubble	3.65	3.84	5.35	5.12

The results presented above indicate that stubble can be incorporated between rice crops without yield loss if incorporation is carried out in autumn and fertilizer is applied at panicle initiation.