

microkjeldahl method, and ammonia volatilization estimated.

Ammonia volatilization losses in the

first 4 d after fertilizer application were highest with *Acacia arabica* and lowest with deep placed USG (see table).

Ammonia volatilization was higher with plant residues (more than 20%) than with urea. □

Effect of sowing time and planting method on rice yield per day

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A 3-yr study (1975-77) evaluated the effect of sowing time and method on rice (Ribe) productivity per day. Main plots were early, normal, and late sowing; subplots were planting methods, transplanting, broadcasting, and drilling. Subplots were 40 m².

In general, yield decreased with

Effect of sowing time and planting method on yield. Izmir, Turkey, 1975-77. ^a

21 May			4 Jun			20 Jun		
Duration (d)	Yield		Duration (d)	Yield		Duration (d)	Yield	
	t/ha	kg/d		t/ha	kg/d		t/ha	kg/d
127	5.1	40.2	140	Transplanting 5.6	40.0	130	5.1	39.2
120	4.5	37.5	117	Drilling 4.4	37.6	112	4.4	39.3
124	5.7	46.0	115	Broadcasting 5.7	49.6	111	5.1	45.9

^a Duration = day from sowing or transplanting to harvest. LSD at 5%: yield = 0.45, duration = 2.3, yield per day = 6.10.

delayed sowing (see table). Yields were higher with early season broadcasting

and lower with drilling in all sowing times. □

Efficacy of *Azospirillum brasilense* in increasing rice yield

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Azospirillum brasilense Tarrand et al. colonizes rice roots and fixes atmospheric N in soil. Its efficacy depends on the pre-inoculum soil N status. We studied the effect of *A. brasilense* in the field at different N (urea) application levels.

Peat-based *A. brasilense* inoculum mixed with well-powdered farmyard manure (2 kg inoculum + 15 kg farmyard manure/ ha) was uniformly

Grain and straw yield response to *A. brasilense* inoculation. Aduthurai, India.

Dose of nitrogenous fertilizer (kg N/ha)	Grain yield (t/ha)		% increase ^a	Straw yield (t/ha)		% increase ^a
	Without <i>A. brasilense</i>	With <i>A. brasilense</i>		Without <i>A. brasilense</i>	With <i>A. brasilense</i>	
0	3.1	3.1	0 ns	4.5	5.9	31*
25	3.5	3.8	9*	6.0	6.5	8 ns
50	4.1	4.4	7*	6.0	1.6	27*
75	3.6	4.4	22*	5.9	8.3	41*
100	4.3	4.1	ns	6.8	7.7	13*
CD (0.05)		0.2				

^a = significant difference, ns = not significant.

broadcast in the field after urea application. Roots of ADT36 seedlings were soaked in 1 kg *A. brasilense*/ 400 liters water solution for 20 min before transplanting.

Inoculation increased grain and straw yield over urea alone, particularly at 75 kg N/ha (see table). □

Phosphate sources for lowland rice

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We compared the efficiency of seven phosphate sources in a randomized block design replicated three times

during 1980 and 1981 wet seasons. The soil was clay loam (Typic Aquept) with pH 5.6, 0.65% organic C, and 9 kg Olsen's P/ha.

Phosphate sources were single superphosphate (6.9% P), Mussorie rock phosphate (9.5% P), mixture of single superphosphate and Mussorie rock phosphate at 3:1 and 1:1 P, urea ammonium phosphate (28-12-0 NPK), diammonium phosphate (18-20.6-0

NPK), and seedling root dip phosphate slurry prepared with single superphosphate, soil, water, and fresh cow dung at 1:2:3:1. We used 8.6 kg P/ha for the phosphate slurry and 17.8 kg P/ha for soil application. Pankaj was planted with 60-17.8-25 kg NPK/ha.

Single superphosphate and Mussorie rock phosphate at 1:1 gave better yields than 5 other treatments

and equaled 100% single superphosphate at 3:1 urea ammonium phosphate (see table). Mussorie rock phosphate and phosphate slurry were inefficient.

Single superphosphate, single superphosphate and Mussorie rock phosphate at 1:1 and urea ammonium phosphate were superior for grain P uptake. Full Mussorie rock phosphate and phosphate slurry contributed less P to the grain. □

Effect of P sources on rice yield and P uptake. Bhubaneswar, India.

Treatment	Yield (t/ha)		P content (%)		P uptake (kg/ha)	
	1980	1981	1980	1981	1980	1981
Single superphosphate 100%	3.0	3.7	0.36	0.37	10.8	13.7
Mussorie rock phosphate 100%	2.6	3.2	0.29	0.32	7.5	10.2
Single superphosphate 75% + Mussorie rock phosphate 25%	2.7	3.6	0.31	0.33	8.4	11.9
Single superphosphate 50% + Mussorie rock phosphate 50%	3.0	3.8	0.35	0.39	10.5	14.8
Urea ammonium phosphate	3.0	3.5	0.36	0.37	10.8	12.9
Diammonium phosphate	2.9	3.5	0.33	0.34	9.6	11.9
Phosphate slurry	2.8	3.0	0.29	0.30	8.1	8.7
Control (60, 0, 30 kg NPK/ha)	2.4	2.9	0.24	0.29	5.7	8.4
CD at 5%	0.4	0.2	0.001	0.002	—	—

Rice-Based Cropping Systems

Irrigated rice-based cropping strategies in coastal Maharashtra

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Most ricefields in coastal Maharashtra remain fallow following one monsoon (Jun-Oct) crop. However, a growing number of medium and small irrigation projects are enabling dry season cropping. Because irrigation water usually is released from mid-Dec to early Jan, we evaluated irrigated crops at 2 planting times, 15 Dec and 5 Jan, in 1983-84 and 1984-85.

Soil was medium black. clayey with 6.3 pH, 0.65% organic C, 28.85 kg available P_2O_5 /ha, and 190.0 kg available K_2O /ha. The rice crop (Jaya) transplanted in early Jul and fertilized

Grain yield and net returns of the postrice dry season crops, by sowing date. Maharashtra, India, 1983-85.

Crop ^a	Grain yield (t/ha)		Net return (\$/ha)	
	15 Dec	5 Jan	15 Dec	5 Jan
Sorghum (120-60-60)	3.27	2.41	290.18	209.87
Wheat (100-50-50)	1.96	2.03	251.67	269.02
Green gram (25-50-0)	0.76	0.42	64.38	26.97
Cowpea (25-50-0)	3.25	2.45	717.29	578.59
Black gram (25-50-0)	0.96	0.53	110.66	3.56
Pigeonpea (25-50-0)	14.8	1.56	243.03	266.22
Groundnut (25-50-0)	3.09	2.99	454.82	426.84
Sunflower (50-30-0)	1.79	1.67	317.30	273.91
Soybean (25-50-0)	0.56	0.37	60.61	92.29
Niger (25-25-0)	0.81	0.34	83.57	50.37
Sesamum (25-25-0)	0.55	0.64	78.34	115.89
Mean			231.87	178.83

^aFigures in parentheses indicate kg NPK/ha.

with 100-50-50 kg NPK/ha yielded 4 t/ha. The postrice crops were harvested from mid-Mar to late Apr.

In general, early sowing was more profitable than late sowing (see table).

Cowpea sown on 15 Dec had the highest net return (\$717.29/ha). Planting date of wheat, pigeonpea, groundnut, sunflower, and sesamum did not affect net return. □

Announcements

An inside look at the Green Revolution

International agricultural research efforts are providing an extra 50 million tons of grain to the world's poorest countries — enough food to feed almost 500 million people.

according to a new book by Warren Baum.

The author, a former chairman of the Consultative Group on International Agricultural Research (CGIAR) — an international consortium of 34 donors that collectively supports food crop

research in developing countries — says that food crop varieties developed at the CGIAR's 13 international agricultural research centers have dramatically transformed agriculture in developing countries: "Mass starvation, particularly in Asia, has been averted by greater production