



Response of IR880 to Zn application in sandy soil, Sancti-Spiritus, Cuba.

initial soil Zn was a little more than the critical levels of 1.0 and 1.5 ppm, the positive response to Zn application may have been due to the near neutral pH of the soil. *J*

Residual effect of Zn in a sandy lowland rice soil, Sancti-Spiritus, Cuba.

Treatment (kg Zn/ha)	Zn (ppm)			
	1981		Jul	1982 <sup>c</sup>
	Jun <sup>a</sup>	Dec <sup>b</sup>	with Zn	no Zn
Control	1.77	1.97	1.97	1.97
2.9	1.72	3.79	3.00	3.83
5.8	1.93	4.47	3.59	2.75
8.5	1.89	4.94	4.59	2.89
11.5	1.93	4.41	4.58	4.11

<sup>a</sup> Before seeding. <sup>b</sup> After first crop. <sup>c</sup> After second crop.

## Rice-Based Cropping Systems

### Potential of rice-based multiple cropping systems in Pakistan

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In 1984, we surveyed 240 rice farmers to determine the economic potential of mungbean and sunflower in the thesils

Table 1. Comparison of base model with 1983-84 crop plan on the Daska farm.

	Actual cropping pattern	Optimal cropping pattern, base model
Value of objective function		\$105 6
	Area (acres)	
Basmati rice	4	5.7 <sup>a</sup>
IRRI rice	2	1.3 <sup>b</sup>
Kharif fodder	2.1	3
Wheat	11	10.2 <sup>c</sup>
Rabi fodder	1.5	2.7
	Cropping intensity (%)	
	175	178

<sup>a</sup> Basmati on excellent land with farmyard manure (FYM) (2.62 acres) + Basmati on average land with FYM (3.1 acres) = 5.72. <sup>b</sup> IRRI rice grown on excellent land with FYM. <sup>c</sup> Wheat on excellent land (3.9 acres) + on average land (6.3 acres) = 10.2.

Table 2. Comparison of base model with sunflower and sunflower and mungbean for the Daska farm.

Activity	Optimal cropping pattern		
	Base model	Sunflower	Sunflower and mungbean
	984	Value of objective function (\$)	2990
		2017	
		Area (acres)	
Basmati on excellent land with farmyard manure (FYM)	2.6	3.9	3.9
Basmati on good land with FYM	3.1	1.26	1.26
IRRI rice on excellent land with FYM	1.3	—	—
Wheat on excellent land	3.9	3.9	3.9
Wheat on average land	6.3	—	3.9
Kharif fodder	3.0	2.1	2.1
Rabi fodder	2.7	1.5	2.1
Spring sunflower	—	7.5	4.9
Kharif sunflower	—	5.6	5.6
Mungbean	—	—	8.0
		Cropping intensity (%)	
	178	200	261

of Daska, Sheikhupura, and Hafizabad in the Punjab. Short-duration (55 to 60 d) mungbean varieties developed at the Nuclear Institute of Agriculture and Biology, Faisalabad, can be sown in Apr, after wheat harvest, and harvested before basmati rice is planted in Jun. Sunflower can be sown in Feb instead of late, low yielding wheat or in July as an

alternative to rice.

Mathematical models were constructed of representative farms in Daska and Hafizabad. Sheikhupura conditions are very similar to those in Hafizabad.

Table 1 compares Daska farmers' cropping patterns for 1983-84 with profit maximizing solutions. The model

identified optimum cropping intensity as only 3% higher than farmers' cropping patterns. Cropping intensities increased by 22% when sunflower and mungbean were introduced into the model (Table 2). Introducing mungbean and sunflower at Sep prices increased cropping intensity 178-260% over the

base model, and increased income almost 200%. Similar results were obtained in Hafizabad.

Sunflower has begun replacing late wheat and kharif rice in parts of Daska, but farmers are unfamiliar with mungbean. Further research is needed on biological, economic, and marketing

implications of alternative crop rotations. The rice group at the National Agricultural Research Center, Islamabad, is collaborating with the Punjab Rice Research Institute and IRRI to expand multiple cropping research in the Punjab. *J*

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## Announcements

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### Rice: Chemistry and Technology (2d edition)

The revised edition of *Rice: chemistry and technology* incorporates advances in rice chemistry and technology since 1972. The book was primarily planned, written, and edited by B. O. Juliano, IRRI cereal chemist, during 1983 and 1984 when he was on study leave. There are new chapters on parboiling and milling emphasizing the Asian situation, extrusion-cooked rice foods, rice noodles, Japanese convenience foods, and rice straw. All technology and processing chapters were contributed by well-known authorities. Published by the American Association of Cereal Chemists, the book is priced at \$69.00 for AACC members and \$87.00 for nonmembers. Send orders to AACC Books, 3340 Pilot Knob Road, St. Paul, MN 55121, USA. *J*

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### IRRI cropping systems book published in Spanish

The International Research Development Centre of Canada has published *A methodology for on-farm cropping systems research* in Spanish. For ordering information, write: IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9. *J*

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### Inventors award to Khan

Amir U. Khan, head, Agricultural Engineering Department, IRRI, will receive the International Inventors

Award (Industry) in Stockholm, Sweden, on 13 Jun 1986. Khan is being cited for his contributions to the development of the farm machinery industry in Asia. The award will be formally presented by the King of Sweden during the 100th anniversary of the Swedish Inventors Association. *J*

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### New IRRI publications

*Field problems of tropical rice* (Hiligaynon and Tamil editions)  
*A farmer's primer on growing rice* (Hiligaynon, Pangasinan, and Creole editions)  
*Publications of the international agricultural research centers* (1985 edition) *J*

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### Rice ratooning workshop

The Rice Ratooning Workshop was held in Bangalore, Kamataka, India, 21-25 Apr 1986 to review current knowledge, identify priority problems requiring research, and develop plans for collaborative varietal improvement for rice ratooning. The workshop, sponsored jointly by IRRI, the Indian Council of Agricultural Research, and the University of Agricultural Sciences, Bangalore, was attended by 37 participants from 10 countries.

Technical sessions were held on 1)

morphology and physiology of rice ratoons, 2) evaluation and potential of rice ratooning, 3) cultural practices, and 4) genetics and varietal improvement. The technical sessions were followed by a 2-d field tour.

Workshop participants also devoted a final session to determining research priorities in 1) varietal improvement and agronomic practices, 2) cultural management, and 3) physiology. Major recommendations of the workshop are to:

- pool at IRRI and at other sites all cultivars of proven ratooning ability,
- screen all high yielding varieties for ratooning ability,
- consider main crop and ratoon crop yield as the ultimate measure of ratoonability,
- devise tests of ratooning ability that do not compromise main crop yield,
- include in genetic studies other traits that have a potential influence on ratooning,
- include water management in ratoon crop fertilizer management studies, and
- use growth analysis to compare physiological differences between ratooning and nonratooning cultivars.

IRRI will publish the 32 papers presented at the workshop along with the complete set of recommendations. *J*

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*The International Rice Research Newsletter and the IRRI Reporter are mailed free to qualified individuals and institutions engaged in rice production and training. For further information write: IRRI, Communication and Publications Dept., Division R, P. O. Box 933, Manila, Philippines.*