(Table 1). Over this period, the average first harvest yields were almost the same on both soil types, but second harvest yields were over three times higher on the Alfisols.

We have been unable to explain these surprising results in terms of nutrient or micronutrient deficiencies on Vertisols, nor can they be accounted for in terms of differential disease or pest attack on the two soil types.

We now think that the relatively low second harvest yields on Vertisols may be due to the deep cracks that develop in these soils as the dry season advances. Besides providing a ready avenue for the loss of soil moisture, soil cracking causes extensive damage to roots, many of which are stretched or ruptured as the cracks widen. Such cracks do not appear in Alfisols.

Observations on chickpeas grown at ICRISAT Center on Vertisols during the postrainy season also suggest that soil cracking leads to yield reductions; indeed this may be a general phenomenon in crops grown on cracking soils.

We are at present conducting experiments to test the hypothesis that the rupturing of the roots is a major factor in reducing yields on cracking soils.

Table 1. First and second harvest yields of medium-duration pigeonpeas grown in different years on Alfisol and Vertisol at ICRISAT Center without irrigation. The first harvest yields were collected by picking the pods at normal time of harvest in December. The second harvest was taken in March.

Year	Cultivar	First harvest yield (kg/ha)		Second harvest yield (kg/ha)	
		Alfisol	Vertisol	Alfisol	Vertisol
1976-77	No.148 and AS-71-37 (mean)	1234	689	1024	339
1977-78	BDN 1	1581	1769	704	337
1978-79	BDN 1	1130	1607	531	152
1979-80	BDN 1	1315	1102	253	56
1980-81	BDN 1	699	690	785	85
Mean		1192	1171	659	194

References

SHARMA, D., SAXENA, K.B., and GREEN, J.M. 1978. Potential of ratooning in pigeonpea. Field Crops Research 1: 165-172.

SHELDRAKE, A.R., and NARAYANAN, A. 1979. Growth, development and nutrient uptake in pigeonpeas (*Cajanus cajan*). Journal of Agricultural Science (Cambridge) 92: 513-526.

- *A.R. Sheldrake and N. Venkataratnam (ICRISAT)*

Response to Irrigation in Postrainy-Season Pigeonpea

In India, pigeonpea is traditionally grown as a rainy-season crop. Reports on pigeonpea as a postrainy crop appeared in the literature as early as 1908. In recent years it has again been demonstrated that pigeonpea can be grown as a successful postrainy-season crop in areas where winter temperatures are relatively mild.

Crop growth and per plant yield of postrainy-season pigeonpea are drastically reduced because of their sensitivity to the short days at that time. To compensate for the reduced growth, it is necessary to increase the plant density from around 4 plants/m^2 in rainy season to 33 plants/m^2 and above in the postrainy season. Even then, the yields are low because the crop must grow only on the moisture stored in the soil profile from the preceding rainy season. This moisture recedes as the crop growth proceeds. In areas, however, where the water table is high or winter rains are good, the yields may be equal to that of a rainy-season crop. Water

stress, therefore, appears to be an important factor limiting the yield of postrainy-season pigeonpea. The level of response of pigeonpea to irrigation in the postrainy season has been investigated at ICRISAT between 1977 and 1980 with a range of cultivars. The present note for the 1981-82 postrainy season gives additional results.

C 11, a medium-duration, and NP(WR)-15, a long-duration pigeonpea cultivar adapted to peninsular India were seeded on the 15th of September, October, and November on a deep Vertisol. These were given four irrigation treatments. The control T_1 received no irrigation, T_2 one irrigation during the vegetative stage, T_3 two irrigations one during the vegetative and the other at the flowering stage, and T_4 three irrigations one each during the vegetative, flowering, and pod-fill stage.

The nonirrigated control yields of both cultivars were low due to early cessation of the monsoon. In response to irrigation the grain yields increased up to three times. The response to irrigation was significantly higher in C 11 than in NP(WR)-15 (Fig.1). The delay in planting significantly decreased the nonirrigated control yields (Fig.2). The response to irrigation was also significantly reduced with delay in planting.

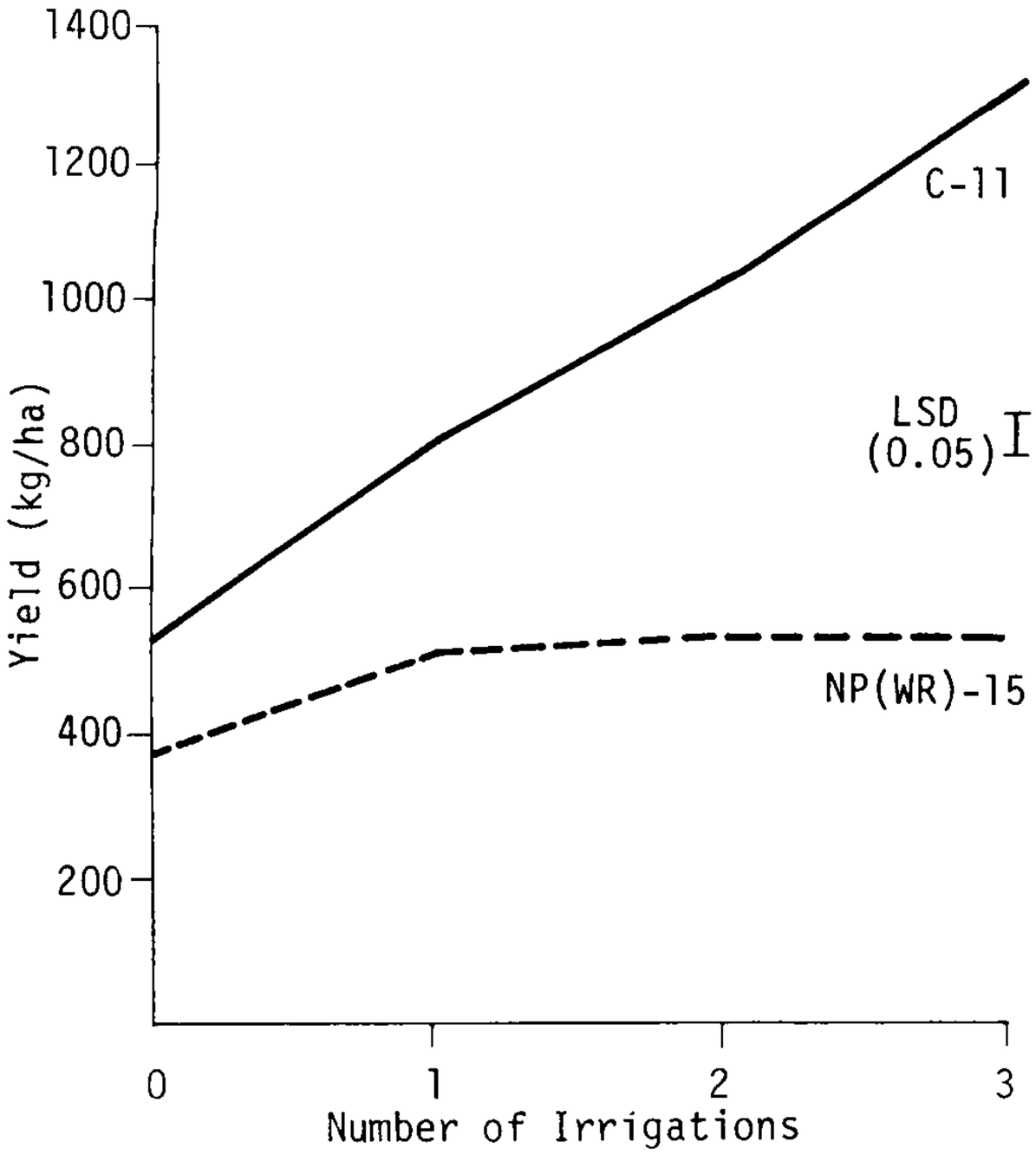

Figure 1. The mean response of pigeonpea cultivars to irrigation when sown at three dates in the postrainy season.

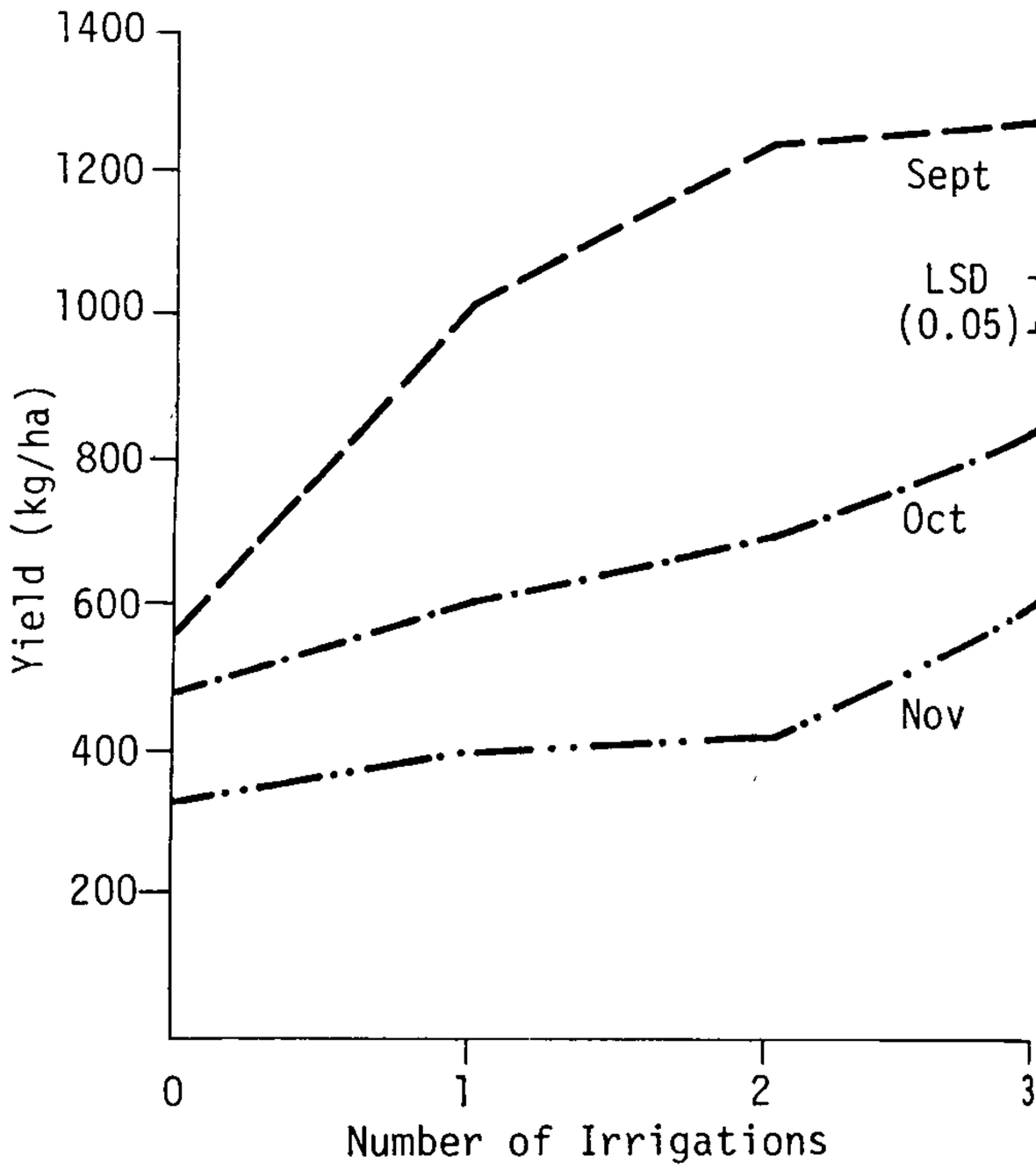

Figure 2. The mean response to irrigation of two pigeonpea cultivars sown at different dates in the postrainy season.

The postrainy-season pigeonpea is generally grown on Vertisols. At the time this pigeonpea is sown, these soils have a water content close to field capacity in their deeper layers. The beneficial effects obtained from irrigation or late rainfall, therefore, appear to depend upon the wetting of the surface regions of the soil which alleviates the water stress around the shallow roots. It is also likely that irrigation also prevents, reduces, or delays the appearance of soil cracks as the soil dries out. We think that this soil cracking may reduce both first and second harvest yields of pigeonpea sown in the monsoon season (see Sheldrake and Venkataratnam, this issue of Newsletter) and also yield of chickpea (Saxena, N.P., ICRISAT, personal communication). Even though both soil moisture stress and soil cracking aggravated with time, the response to supplemental irrigation was decreased when sowing was delayed from September to November. This suggests that some other factor, such as temperature, photoperiod, or ruptured roots due to soil cracking may be of equal or greater importance than moisture in determining the yield of the postrainy-season pigeonpea crop.

- *I. Madhusudana Rao, N. Venkataratnam, D.G. Faris, and A.R. Sheldrake (ICRISAT)*