

## The response of irrigated navy beans to applied nitrogen

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As navy beans do not nodulate consistently (1), N fertilizer is used to grow commercial crops. Irrigation is uncommon, but should markedly increase because of attractive grain prices as compared with alternative crops. Nutrient requirement of irrigated crops is known to be high (1). But there is insufficient data to allow sufficiently precise fertilizer recommendations to be made. This paper examines yield responses of irrigated navy beans to be applied.

### Methods

A complete randomised block experiment of three replicates was established on 24 January, 1985. on a black earth on the Queensland Agricultural College (QAC). Soil  $\text{NO}_3^-$  and  $\text{NH}_4^+$  were determined on 0- 10 cm and 0-60 soil samples taken from each plot before treatment imposition. Five rates of N (0, 40, 80, 120, and 160 kg N ha) were applied as urea. Broadcast and incorporated immediately before planting. The cultivar Kerman was sown to establish a population of 250 00 plants ha<sup>-1</sup>. The experiment was irrigated at planting, just prior to flowering and early pod fill. At maturity grain yield was determined.

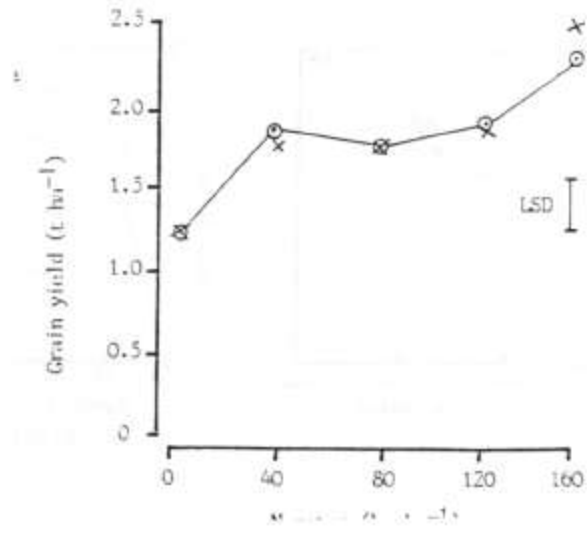
### Results and discussion

Figure 1 shows grain yields. The yield response was partitioned into linear and cubic components (both  $P < 0.31$ ). The latter accounts for the non-response between 40 and 120 kg ha<sup>-1</sup>. This complex response may be explained by a 'starter' effect at low N rates with symbiotically-fixed N also contributing. Higher N rates increasingly suppressed N fixation so that N assimilation (and thus yield) remained constant; followed by total suppression of fixed N. from which point yields responded to further applied N. Subsequent work of this nature should employ a greater range of N rates to further investigate the cubic fit of the data, and to establish maximum Yield. In this experiment, had 120 kg ha been chosen as the highest rate. Then 40 kg ha<sup>-1</sup> would have appeared to be sufficient; but considerable yield response would have been foregone.

A covariance analysis of  $\text{NO}_3^-$  and  $\text{NH}_4^+$  levels, with N rates and yield, produce( a predictive equation ( $R^2 = 0.94$ ,  $P < 0.05$ ). Predicted yields differed little from actual yields (Fig. 1); so that available N contributed little to the plot to plot variation.

As frequently occurs on QAC. NHA- comprised the major part of the extractable soil N. A current soil test for navy beans considers only  $\text{NO}_4^-$  in the 0 - 10 cm. For irrigated navy bean crops.  $\text{NH}_4$  should also be examined and to greater depth, to more fully assess the amount of plant - available N.

Fig 1. Actual yields  $\odot$ ; Predicted yields  $\times$



1. Malcomson, G.H. (1984). Navy Sean Growing in Queensland Workshop Papers, Q1d. Agric. College. p. 12.1.