

## Nitrogen fertilisation of sole and intercropped sorghum and soybean

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The cereal-legume intercrop systems are the simplest and most important intercropping systems. Along with yield benefits, intercropping grain legumes with cereals offer a protein contribution to an otherwise protein-deficient diet and a degree of maintenance of soil N status without N fertilization. However, low soil N status may seriously limit potential yields of high-yielding cereal genotypes in both sole and intercropping systems, prompting the use of N fertilizer. On the other hand, the use of N fertilizer in an inter-cropping system may inhibit N<sub>2</sub>-fixation by the companion legume.

### Methods

A field experiment was conducted on a Krasnozem soil (9.2 mg kg<sup>-1</sup> NO N) in S.E. Queensland to examine the effects of N fertilization (0, 60 12t kg N ha ) on sorghum and soybean grown in sole cropping and intercropping systems. Both the sorghum (cv. Nugget) and soybean (cv. Fiskeby V) were quick-maturing. One half of the fertilizer was applied at sowing with the remainder applied 37 days after planting. N fertilizer was applied either as a band or broadcast. Soybeans and sorghum were harvested 82 and 90 days after planting, respectively.

### Results and Discussion

N fertilizer application significantly increased sorghum dry matter yield 80 days after planting and grain yield in both sole cropping and intercropping systems (Table 1). Intercropping with soybean reduced sorghum grain yields, particularly at low N levels. N fertilization only increased soybean dry matter and grain yields in the sole crop situation and not in the intercropped soybean (Table 1). Fertilizer placement had no significant effects on crop yields in the sole or intercropping systems.

**Table 1. N fertilization effects on total dry matter yields 80 days after planting and on grain yields of sorghum and soybean.**

Cropping System	N Fertilizer Applied (kg ha <sup>-1</sup> )					
	Total DM Yield (t ha <sup>-1</sup> )			Grain Yield (t ha <sup>-1</sup> )		
	0	60	120	0	60	120
Sole sorghum	5.5	7.9	9.8	2.5	4.6	5.5
Intercrop sorghum	4.5	7.4	8.4	1.9	3.9	5.2
Sole soybean	3.5	4.2	4.9	1.2	1.7	2.0
Intercrop soybean	1.3	1.3	1.6	0.5	0.5	0.5
Intercrop total	5.8	8.7	10.0	2.4	4.4	5.7

Total dry matter and grain yields of sorghum and soybean were substantially reduced by intercropping. Despite the reductions in grain yields of the individual crops, intercropping resulted in Land Equivalent Ratios > 1.0 (LER =  $\Sigma$  ratio of intercrop yield to sole crop yield for each species). LER's in the intercrop system from 0 to 120 kg N ha were 1.19, 1.11 and 1.21, respectively.

The results of this study showed that intercropping provided the best utilization of land for the production of both species. N fertilization increased the productivity of the intercrop system and did not affect the relative yield advantage of the intercrop. Thus, intercropping made most efficient use of N fertilizer applied.