

The data thus far obtained, while not conclusive, lend some support to the suggestion of greater susceptibility of Olympic to barban, and experiments are continuing to see whether this is confirmed at commercial rates. There was no confirmation that application at the later growth stage leads to greater damage or lower yields.

CHEMICAL VERSUS MECHANICAL FALLOWING METHODS FOR
WHEAT PRODUCTION ON THE DARLING DOWNS

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Approximately two-thirds of the total annual rainfall on the Darling Downs occurs during the summer months. For annual wheat cropping in the area, the traditional practice is the preparation and maintenance, by means of cultivating implements, of a bare fallow between successive crops to allow moisture and available nitrogen to accumulate. Stubble burning is commonly practised to provide for ease of cultivation.

Similar cultural practices have led, in many parts of the world, to a deterioration in soil structure and fertility. Accordingly, a long-term factorial experiment has been established on a non-sloping black-earth soil at Warwick. Zero tillage and conventional mechanical fallowing are each compared under conditions of both stubble burning and stubble retention. Each of these four combinations are compared at each of three rates of nitrogen fertilizer applied at sowing: application urea at nil, 45 lb per acre (20.4 kg per hectare) and 90 lb per acre (40.8 kg per hectare).

Tined implements have been used for weed control and seedbed preparation in the conventional fallow plots, while varying rates of diquat or paraquat or a mixture of the two have been applied for weed control in the zero tillage plots.

Treatment effects on soil physical, chemical, and microbiological properties as well as on weed flora and crop growth are being investigated. The experiment was initiated in December 1968. At time of writing, one cropping and two fallowing phases have been completed and short-term effects only can be described.

The outstanding feature of the trial to date has been the markedly superior moisture accumulation during the fallowing period as a result of zero tillage and especially under conditions of stubble retention.

Percentages of Fallow Rainfall Accumulated in Soil Profile

<u>Fallow treatment</u>	<u>1968/69 Fallow</u>	<u>1969/70 Fallow</u>
Cultivated, stubble burnt	3.4	7.8
Cultivated, stubble retained	9.2	13.6
Zero tillage, stubble burnt	16.0	13.8
Zero tillage, stubble retained	29.1	25.3
	Fallow rainfall - 9.8 in. (24.9 cm)	Fallow rainfall - 12.2 in. (28.0 cm)
	Av. for period - 15.5 in. (39.4 cm)	Av. for period - 15.9 in. (40.4 cm)

Weed growth during the fallowing period was adequately controlled in all treatments. These figures would therefore indicate that the lack of soil and stubble disturbance as provided by zero tillage could be a major factor in moisture infiltration and retention in this soil type.

At sowing of the 1969 crop, soil nitrate-nitrogen levels did not differ significantly between treatments. The 1970 figures, at time of writing, are not available.

Vegetative growth of the 1969 wheat crop was greater in the zero tillage treatments presumably owing to the greater soil moisture reserves. Abnormally late and severe frosts occurred during the heading stage of the crop and the expected large grain yield differences did not eventuate. However, there was a small, though significant, difference in favour of zero tillage.

To date, this trial has strongly indicated a possible advantage in zero tillage methods over the traditional cultivated bare fallow in the efficiency of moisture accumulation during the fallowing period. The results have yet to be confirmed over a wider range of soil types and seasonal conditions.

Major problems to be overcome before the possible adoption of a zero tillage fallowing system on the Darling Downs are (a) the development of safe, effective, and economical chemical treatments for the range of weed problems likely to be encountered during the fallowing period, and (b) the design and manufacture of machinery capable of sowing through stubble into an undisturbed heavy black earth soil type. The toxic effect of nitrogen fertilizers on germinating wheat seed could be intensified owing to the narrow planting slot characteristically produced by direct-drilling machinery.