

The effect of fallow length and cultivation method on crop development and yield

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The effect of length of fallow and method of fallow weed control on the yield of wheat (var. Olympic) was tested at three sites in each of the years 1979 and 1980. The analysis of data gathered has allowed the components of cultivation relevant to crop environment, i.e., water retention, nitrate accumulation and seed bed, to be separated (Tables 1 and 2). The relationships between crop environment and crop yield components are given in Table 3.

Yields decreased with decreasing length of fallow reflecting the lower quantities of available water and available nitrogen of those treatments. Crop development, i.e., total number of fertile kernels, was largely dependent on soil nitrate content (Table 3). Kernel filling, i.e., kernel weight, was more closely related to available water at seeding than to nitrate.

The efficiency of the crops' use of soil water and nitrate was lower on the chemically prepared treatments than the mechanically prepared treatments, as demonstrated by the negative effect of the chemical dummy variable in Table 3. Not only did less plants establish on the chemically prepared treatments, but the yield per established plant was also lower (data not presented).

These results demonstrate the importance of the effect of tillage on the post-establishment environment.

Table 1. The effect of cultivation on crop yield (t ha)

Start of Fallow			Method of Weed Control	
Winter	Spring ⁺	Autumn ⁺	Mechanical	Chemical ⁺
Fallow		Seed	2.32	2.05
	Fallow	Seed	1.79	1.39
		Fallow Seed	1.55	1.10

+ Dummy variables in regressions, Tables 2 and 3.

Table 2. The influence of site, season and management on yield

$$\begin{aligned} \text{Yield (t ha}^{-1}\text{)} = & -5.5^{**} + 3.9^{**} \text{ Total Soil Nitrogen (t ha}^{-1}\text{)} \\ & + 0.03^{**} \text{ Growing Season Rainfall (mm)} \\ & - 0.014^{**} \text{ (Interaction TSN + GSR)} - 0.37^{*} \text{ Chemical} \\ & - 0.59^{**} \text{ Spring} - 0.86^{***} \text{ Autumn (R}^2 = 0.77\text{)}. \end{aligned}$$

Table 3. The relationship between crop environment, crop development and yield

		R ²
Yield (t ha ⁻¹)	= -0.076 + 0.01N****+0.0056AW - 0.58*	0.45
Kernel Number (KNO m ⁻¹)	= 0.456 + 0.007N****+0.0027AW - 0.32C*	0.57
Kernel Weight (10 ⁻³ g)	= 24.51**** - 0.006N + 0.0444AW*-1.17C	0.11

N = nitrate kg ha⁻¹ (0.065m), AW = available water mm (0.1-0.85mm)

C = chemical (dummy), nitrate and water samples obtained at seeding.

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