Summer Weed Trial

Aim

This replicated trial has been run over numerous years to determine which summer weed control method is most efficient and economical.

Summary

- In dry regions, summer fallowing is not just about controlling weeds but mainly about conserving moisture!
- Cultivation conserved the most amount of soil moisture over the summer period.
- The three treatments which controlled summer weeds: (i) cultivation every three weeks; (ii) cultivation when required; and (iii) knockdown when required, had a significantly higher yield (0.4 to 0.7 t/ha) compared to the treatments where there was no or poor summer weed control.
- Greater than 80mm of available moisture was lost under heavy heliotrope and melon populations

Background

Below average rainfall over the autumn and winter for the last nine years has proven conservation of summer rain as soil stored water will increase yields and provide a necessary moisture bank which the crop can use when times are tough in spring. For many years farmers, scientists and agronomists have debated which practice is best, without resolution. The BCG has attempted to find the answer by comparing both chemical and cultivation methods over a number of years. 2005 was the best year to compare these methods after 191mm of rain fell over the summer period, filling the soil profile. With a full profile we could then determine which practice best conserves moisture.

The practices of fallowing are primarily cultivation or spraying. Cultivation is a practice which has dated back centuries but has a poor environmental impact with its susceptibility to wind erosion. However, there is some science to this practice besides just weed control. When it rains, water will infiltrate into the soil profile through capillaries or channels. These capillaries also cause losses via evaporation. The process of cultivation can break these capillaries, preventing evaporative loss.

Chemical fallowing focuses solely on conserving moisture via weed control. Using a knockdown, residual or a combination of both will adequately control weeds. However, if rain events persist over summer residuals can be broken down by microbial activity and may be less effective (or knockdown spray treatments have to be increased). Chemical fallowing is used successfully by direct drill farmers to minimize evaporation during the growing season through retaining stubble cover. Spraying is not always 100% effective. With the number of spray days being limited, paddocks may not be sprayed at the ideal time and there may be some surviving weeds.

So the question still remains, which practice is best to aim for?

Methods

Replicates: 3

Treatments: 5

Plot Size: 6m x 50m

Variety: Yitpi wheat

Sowing Date: 25th June 2005

Seeding Density: 175plants/m^2

Seeder: BCG seeder (narrow points, 22.5cm spacings), rolling harrow

Fertiliser:	At Sowing	MAP (50kg/ha) (N 10%,P 22%,S 1%)
Herbicides:	19/4/05	RoundupCT ® (1.5L)
	5/8/05	Atlantis® (300ml), Hasten® (1%)
	5/9/05	MCPA500® (350ml), Lontrel® (100ml)

Treatments

The five treatments are described in Table 1.

Table 1: Treatments, rates and timings

Treatment	Chemical & Rate	Description	Timing
Mechanical Cultivation		Ryan Bar	Every 3 weeks 8 workings prior to sowing between Nov 04 and June 05
Mechanical Cultivation		Ryan Bar	As required determined by presence of weeds. This treatment was cultivated four times.
Knockdown	Boost® 2%, **Roundup CT 1.5L/ha**, D-C-Trate 0.5%, Wetter 0.2%		As required determined by presence of weeds. This treatment was sprayed three times.
Knockdown with residual 1	Boost 2%, **Ally® 7g/ha** Roundup CT 1.5L/ha, D-C-Trate 0.5%, + Wetter 0.2%		One application 10th November 04
Knockdown with residual 2	Boost 2%, **Atrazine® 432g/ha,** Roundup CT 1.5L/ha, D-C-Trate 0.5%, + Wetter 0.2%		One application 10th November 04

Results

Rainfall over summer was much higher than average. The total amount of rain from November 2004 to March 2005 was 191mm, the average over this time period is 111mm.

	Monthly Rainfall (ml)					
	Nov	**Dec**	**Jan**	**Feb**	**Mar**	***Total***
2004/5	58	50.5	39.5	41.5	1.5	**191**
Average	25	22	20	23	22	**112**

Figure 1 shows the amount of moisture in the soil profile (0-100 cm depth) from January to March and again at flowering (13/10/2005). It was better in terms of soil water conservation to cultivate or spray a knockdown. A one spray approach with a residual chemical was not enough as the residual broke down and its activity wore off allowing summer weeds regrow.

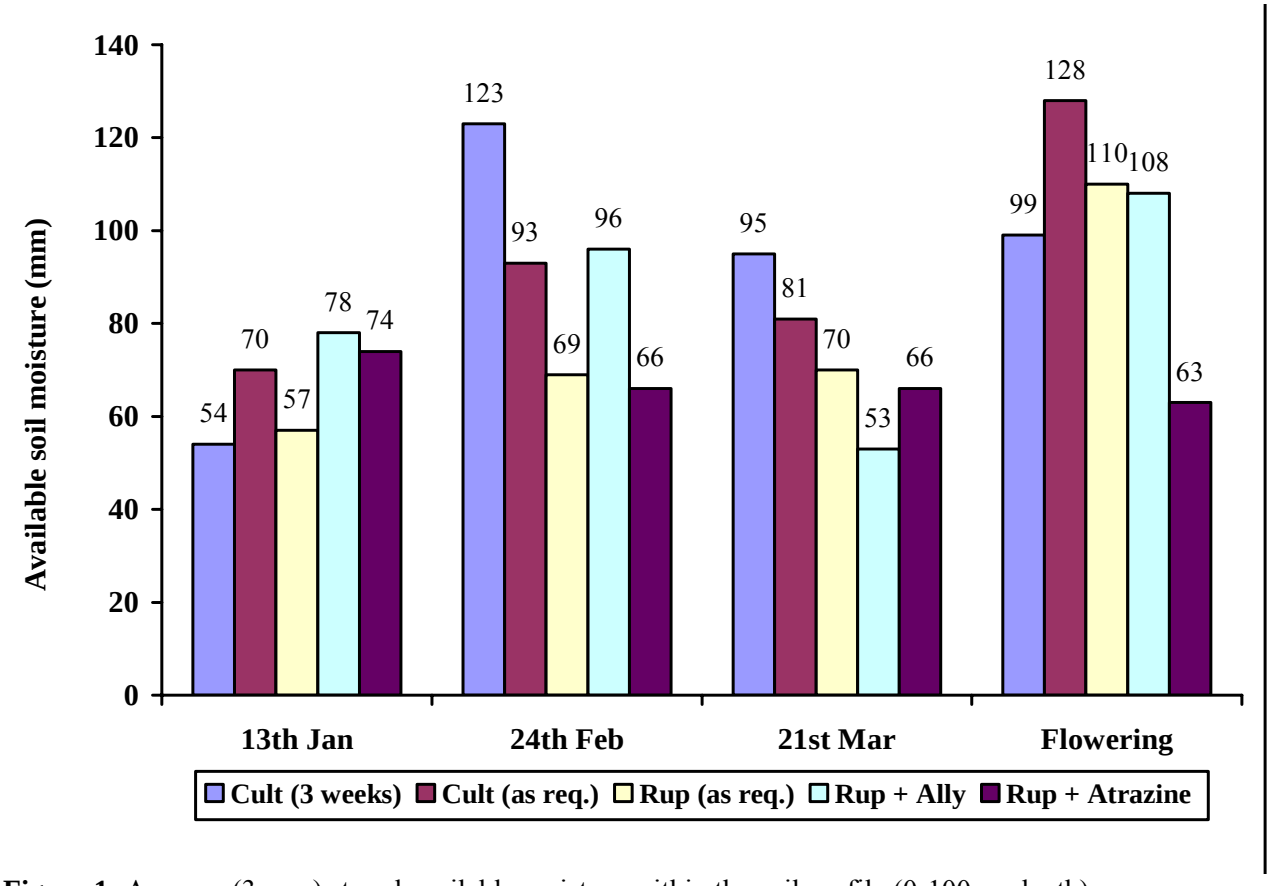

Figure 1: Average (3 reps) stored available moisture within the soil profile (0-100cm depth)

The cultivation and knockdown treatments yielded the same and were significantly higher in yield than the residual treatments, where there were a large number of summer weeds.

Due to the number of rainfall events the number of workings and sprays required to keep the plots clean increased the cost significantly (Table 2).

Table 2: Wheat Yields, quality and costing

Treatment	Yield (t/ha)	Protein (%)	Screenings (%)	Cost ($/ha)	Return – cost summer weed control ($/ha)
Cultivation [1]	2.29	13.6	4.9	$116	$277
Cultivation [2]	2.29	13.5	5.2	$60	$334
Knockdown [3]	2.11	13.1	5.7	$42	$317
Knock + Ally (1 spray)	1.86	13.5	5.3	$13	$307
Knock + Atrazine (1 spray)	1.50	13.5	6.1	$16	$242
LSD (5%)	0.23	0.5	1.1		
C.V (%)	4.2	1.7	4.8		

1. (Total 8 workings) every three weeks

2. (Total 4 workings) as required (e.g. after a rain)

3. (Total 3 sprays) as required (e.g. whatever it took to keep it clean)

* Costings: 1st working $18, 2nd working $14, Spraying $4 (operation)

* Grain prices were assumed to be AH $147.50t/ha + rewards under AWB Pool as of 20/12/2005

Uneven weed growth throughout the residual plots was observed, with certain spots under heavy weed population. The amount of moisture available under bare ground compared to areas covered in weeds was measured. Weeds, which included heliotrope and paddy melons, used over 80mm of stored moisture – which is a significant loss of moisture!

Table 3: Total soil moisture under different weed pressures.

	Available moisture (mm)
Bare ground	92
Heavy Weed Pressure*	10

* Heliotrope and melons

Interpretation

Controlling summer weeds was a worthwhile exercise. The number of operations required for each treatment obviously increased the cost, but the costs were recovered in extra crop yield. Residual sprays of ally & atrazine were not successful in keeping weeds out completely because they broke down under moist and warm conditions over the summer of 04/05. These may work better in a season with a large rainfall event at the start of the season and few other falls afterwards.

Conservation of 82mm by controlling weeds (Table 3) is the equivalent of 1.5t/ha wheat or approx $225/ha (under 350mm GSR, WUE 18kg/ha/mm). So the cost of weed control well and truly paid for itself.

Commercial Practice

Given the cost of diesel has risen and is unlikely to fall in the near future, the practice of cultivation may become uneconomical when summer rainfall is below average i.e. the cost of fuel with summer cultivating may be more than the yield benefit gained from the extra moisture retained.. In dry summers, residual sprays may be a more economical option but be mindful of the carryover or plant back on next year's crop. With the uncertainty of growing season rainfall, it could only be common sense to conserve every millimetre of moisture to support the next crop.