GRASSING DOWN TRIAL: STEWLEY 1991 - 1994

Summary of results
The crop of mature trees may be depressed slightly by grassing down even where a 30 cm bare trip is maintained.
In dry seasons soil conditions are likely to be drier under short grass than bare soil.
In certain conditions longer grass may act as a moisture retaining mulch.
Nitrogen starvation is the most likely crop limiting factor, especially when fertilizer is only applied once a year in spring.
Grassing down is likely to increase any propensity to magnesium or potash deficiency problems, especially those associated with poor soil conditions and root uptake, and in dry seasons.

Introduction

If fruit has to lie on the ground for any length of time before harvesting, it is known to keep better on grass rather than on bare soil. Subsequent mechanical harvesting is easier and cleaner from a short grass sward and more fruit is free of rots, soil contamination and accompanying foreign bodies.
Sowing grass or allowing the grass to grow across the herbicide strip minimises contact with bare soil. Unfortunately grass is very competitive with young trees for both water and nutrients, both tree growth and copping will suffer.
This trial [Trial A] explored the idea that well growing mature trees would be able to stand this amount of competition without undue suppression of cropping. The trial was extended [Trial B] to assess the effects of a mid-season foliar urea spray.

Trial A: Grassing down

Method

The orchard is on a Grade 2 - 3, heavy clay soil. The trees were planted in 1973/74 [20 - 21 years old] at a spacing of 18 x 10 feet, in pairs of rows, Michelin on MM106 alternating with i) Chisel Jersey, or ii)Michelin on MM111 down the rows.
Grass was sown in the alleyways in 1991, a range of low maintenance mixtures sown at a rate of 25 g/m^2, and a 30 cm bare herbicide strip was kept down the row centre. Fertilizer was applied annually in March as 10%N: 15%P: 10%K at 2 cwt to the 'strip acre'. Control plots maintained a 2m wide bare strip. Post blossom sprays of Urea [1 kg/acre] and Magnesium sulphate were applied annually.
All records were made on Michelin on MM106 trees.

Treatment summary

Row	1991 - 94	1991/92	1993	1994
15/16	Grassed down	Fertilizer	Fertilizer	Fertilizer
20/21	Grassed down	Fertilizer	Nil	Nil
25/26	Bare strip	Fertilizer	Fertilizer	Fertilizer

Results

Tree growth

1.1 Girth increment[Table 1]

There was no significant reduction in tree girth growth in 1993 related to grassing down. However, there were signs of a negative interaction between treatment and the variety/rootstock.. Inter-tree competition was noticeable where bare soil encouraged stronger growth in more the vigorous MM111 rootstock or the Chisel Jersey trees. In these rows the alternating Michelin on MM106 grew less.

1.2 Mean fruit weight[Table 2]

There were no differences in mean fruit weight in 1993 or 94.

1.3 Fruit set/branch unit[Table 2]

There were no significant differences in fruit set in 1993/94, although there tended to be lower numbers of fruit set in the grassed down rows receiving no extra fertilizer.

1.4 Crop weight [Table 2]

Crop, measured as the weight of fruit set/ branch unit, was slightly heavier in 1994 than 1993, but there was a similar pattern between the treatments in both years.

There was no difference in the crop from trees in bare soil or grassed down with fertilizer and where trees alternated with MM111 [Rows 16,25 and 26], but crop was less in Row 21 where no fertilizer was applied in 1993.

There was a distinct reduction of crop where Michelin alternated with Chisel Jersey in grassed down rows 15 and 20..

Soil conditions

2.1 Soil moisture[Table 3]

There were no differences in soil moisture (measured as g water/g fresh weight soil) in 1993. In 1994, following a wet winter, soil was much wetter under grass than in the bare plots. By July there was little difference, although the top 15 cm under grass were slightly drier.

2.2 Soil nitrate levels[Table 4]

Soluble soil nitrate (measured as g/g soil) was initially very low, (less than 20 g/g), but increased twofold in spring 1993 by soil application of fertilizer. The grass quickly utilized this and by August the nitrate level was similar to plots were fertilizer had not been applied, that is, about 60% of the level in the control plots.

Pre-fertilizer levels in spring 1994 were again very low (less than 20 g/g soil), but after application and by late summer there were no real differences between treatments.

2.3 Soil nutrient analysis[Table 5]

Soil was tested for the whole site in Jan 1995.

As expected on this site, the pH and phosphorus [P] levels are abnormally high leading to possible trace element deficiencies.

Levels for potassium [K index = 5.4] and magnesium [Mg index = 5.2] are abnormally high leading to competition and interference between these elements, resulting in poor availability of both potash and magnesium to the trees (see leaf analysis).

Boron levels are low.

Leaf analysis [Table 6]
Leaf nutrients were analysed in August 1994. Nitrate levels were adequate. As expected, levels of potash, magnesium and boron are generally low. Leaf magnesium is especially low in trees in the grassed down plots.

Table 1: Tree girth increment in 1993 [cm]

Row	Treatment	Tree type	Girth increment
15	Grass + fertilizer	i	0.8 ab
16	Grass + fertilizer	ii	0.5 bc
20	Grass	i	0.6 b
21	Grass	ii	0.6 b
25	Bare + fertilizer	i	1.5 a
26	Bare + fertilizer	ii	0.3 c

a,b,c Data with similar letters are not significantly different.

Table 2: Crop in 1993 - 94

Row	Treatment	Mean fruit weight [g]		Fruit set [/branch csa]		Crop weight [/branch csa]			Reduction in crop as % of bare soil
		1993	1994	1993	1994	1993	1994	1993+4	
15	Grass + N	36	43	11.5	10.2	415	436	851 b	22
16	Grass + N	37		13.1	13.9	484	594	1078 a	1
20	Grass	36	41	10.2	8.5	368	348	716 c	34
21	Grass	37		9.5	12.2	353	499	852 b	22
25	Bare + N	37	42	13.6	14.2	504	599	1103 a	
26	Bare + N	40		12.6	13.5	504	570	1074 a	

a,b,c Data with similar letters are not significantly different.

Table 3: Soil moisture (water as % fresh soil weight)

Treatment	Depth [cm]	1993		1994		
		June	August	March	July	Sept
Grass + N	0-15	27.7	24.5	62.8	21.6	15.3
Grass + N	15-30	24.2	20.8	-	20.0	-
Grass	0-15	29.3	25.9	56.9	21.6	15.0
Grass	15-30	24.0	21.9	-	20.2	-
Bare + N	0-15	28.9	24.2	50.7	25.2	17.2
Bare + N	15-30	26.0	22.6	-	20.7	-

Table 4: Soil nitrate (g N/g fresh soil)

Treatment	Depth [cm]	1993		1994		
		June	August	March	July	Sept
Grass + N	0-15	34	37	20	133	90
Grass + N	15-30	17	20	-	40	-
Grass	0-15	17	27	15	133	75
Grass	15-30	18	25	-	40	-
Bare + N	0-15	56	46	55	93	90
Bare + N	15-30	40	48	-	50	-

Table 5: Orchard soil analysis (27/1/95)

	pH	Organic matter	P	K	Mg	Mn
Test level	7.1	5.671	743	274	160	1.5
Guideline	6.0	3.026	24	120	150	2.1

Table 6: Leaf analysis of trial trees (1/9/94)

	N%	P%	K%	Mg%	Mn ppm	B ppm
Grass + N	2.15	0.21	0.91	0.14	36	10.9
Grass	2.06	0.19	0.77	0.16	23	11.7
Bare + N	2.28	0.18	0.72	0.21	27	12.7
Guideline	2.50	0.20	1.20	0.20	35	35.0

Conclusions

1] The crop of mature trees may be depressed slightly by grassing down even where a 30 cm bare trip is maintained.

2] In dry seasons soil conditions are likely to be drier under grass than bare soil, but deeper soil levels should retain adequate moisture for tree roots in normal summers. In certain conditions grass may act as a moisture retaining mulch.

3] Nitrogen starvation is the most likely crop limiting factor. Grass, even dwarf cultivars, uses much of the nitrogen applied as fertilizer. Late applications may largely go directly to grass growth rather than tree growth. More regular applications of nitrate may help to counteract competitive effects, for example, split applications during the growing season.

4] Crop is more likely to be depressed where inter-tree competition occurs between alternately planted varieties or rootstocks. Fortunately this type of planting is not frequent, but other types of external competition may have a similar effect.

5] Grassing down is likely to increase any propensity to magnesium or potash deficiency problems, especially those associated with poor soil conditions and root uptake, and in dry

seasons. Regular corrective foliar sprays would be essential.

Trial B: Effect of urea foliar sprays

Method

The above trial plot was split in 1993 and one half off both grass treatments and bare soil plots received an additional post blossom application of urea [1kg/acre. 3kg/acre in total].

Results

There were no consistent trends in any parameters measured.
[See Tables 7 and 8]

Table 7: Trial B: Effect of urea foliar spray in 1993 on cropping

	Mean fruit weight [g]		Fruit set [/branch unit]		Crop weight [/branch unit]	
Urea spray	+	-	+	-	+	-
Grass + N	37	36	13.5	11.1	500	403
Grass	37	39	9.3	10.4	344	408
Bare + N	42	38	12.2	14.0	513	538

Table 8: Juice yield and specific gravity [SG] of urea treated/untreated trees

	SG		% Sucrose		Juice yield [vol/wt x 100]	
Urea spray	+	-	+	-	+	-
Grass + N	1051	1054	12.9	13.7	59	59
Grass	1053	1050	13.3	12.7	60	61
Bare + N	1052	1054	12.9	13.9	57	58