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MINIMIZING FERTILIZER CONTAMINATION OF GROUND WATER BY FERTILIZER AND IRRIGATION MANAGEMENT OF AVOCADOS

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This project was initiated in May, 1990, and was designed to monitor the effects of different fertilization regimes on the leaching of nitrogen below the rootzone. Two fertilizer amounts, 1.6 and 0.8 Ib N/tree/yr, are being applied to the trees at three time intervals (weekly, monthly, and semiannually), for a total of six treatments. Differential fertilizer treatments were initiated in May, 1991. Soil water samples (from 5-ft depth) are collected weekly and analyzed for the concentration of nitrate-N.

A second component of the project involves monitoring the effect of different irrigation treatments on the growth and productivity of avocado trees. Three irrigation treatments (60%, 100%, and 150% ET_0) were started in July, 1991. Weekly determinations of soil water content are made using tensiometers and neutron probe.

Information collected on the trees in both plots includes: tissue nutrient levels, fruit yield, and tree growth.

The results of the nitrogen leaching experiment to date indicate that the concentration of nitrate in the soil water is much lower for the trees fertilized on a weekly basis than for the other trees (Figures 1-3). The concentration of leached nitrate has been much lower for all treatments during the second year of the project than the first. This is caused by the fact that the trees received 50% more water during the second year: the average water application per tree during the first year was 5300 gallons compared to 7968 gallons during the second year. These results do not mean that less nitrate leached the second year, rather that the concentration was lower. In order to directly compare the results from the two years, it will be necessary to calculate the total pounds of nitrate leaching, which requires the measurement of the volume of water leaching. These calculations are planned for the next year of the project.

The concentrations of several nutrients (nitrogen, phosphorus, potassium, and zinc) in leaf samples obtained in September of each year are shown in Tables 1-4. There is a significant difference in the tissue nitrogen levels measured in the 1992 samples based on the amount of nitrogen the trees received. While the trees receiving 1.6 pounds per year have significantly higher tissue nitrogen levels than the trees receiving 0.8 pounds, all trees have nitrogen levels wells above 2%.

The harvest data for the last three years are summarized in Table 5. Two-way analysis of variance indicates that there is no significant difference in yields among treatments to date. The first year in which the differential nitrogen treatments could have affected fruit yields was 1992. However, as seen in Figure 4, fruit yields were very low last year. Continued

monitoring of the effect of the differential treatments will be performed in the coming years.

Table 1. Tissue Nitrogen Analysis Summary, Thornhill Ranch

Fertilization		Nitrogen (%)		
Timing	Amount (lb N)	1990	1991	1992
monthly	1.6	2.38	2.82	2.55
monthly	0.8	2.34	2.71	2.47
weekly	1.6	2.34	2.94	2.62
weekly	0.8	2.28	2.76	2.47
twice	1.6	2.52	2.73	2.48
twice	0.8	2.41	2.81	2.41

Table 2. Tissue Phosphorus Analysis Summary, Thornhill Ranch

Fertilization		Phosphorus (%)		
Timing	Amount (lb N)	1990	1991	1992
monthly	1.6	0.16	0.13	0.18
monthly	0.8	0.16	0.13	0.19
weekly	1.6	0.16	0.13	0.19
weekly	0.8	0.16	0.12	0.18
twice	1.6	0.17	0.13	0.17
twice	0.8	0.16	0.14	0.18

Table 3. Tissue Potassium Analysis Summary, Thornhill Ranch

Fertilization		Potassium (%)		
Timing	Amount (lb N)	1990	1991	1992
monthly	1.6	1.06	0.88	0.95
monthly	0.8	1.05	0.86	0.93
weekly	1.6	0.97	0.87	0.99
weekly	0.8	0.92	0.97	0.95
twice	1.6	1.02	0.79	0.82
twice	0.8	0.99	0.86	0.89

Table 4. Tissue Analysis Summary, Thornhill Ranch

Fertilization		Zinc (%)		
Timing	Amount (lb N)	1990	1991	1992
monthly	1.6	122	87	92
monthly	0.8	131	103	79
weekly	1.6	114	95	82
weekly	0.8	135	84	69
twice	1.6	115	92	105
twice	0.8	120	84	92

Table 5. Harvest Data Summary, Thornhill Ranch

Fertilization		1990		1991		1992	
Timing	Amount (lb N)	Wt/tree (kg)	Wt/fruit (g)	Wt/tree (kg)	Wt/fruit (g)	Wt/tree (kg)	Wt/fruit (g)
monthly	1.6	26	332	82	229	3	317
monthly	0.8	53	307	65	247	26	273
weekly	1.6	27	313	68	217	19	275
weekly	0.8	51	322	65	247	13	249
twice	1.6	36	304	65	223	5	273
twice	0.8	52	319	53	229	37	260

Figure 1. Nitrate-N Concentration in Soil Water Thornhill Ranch, Camarillo

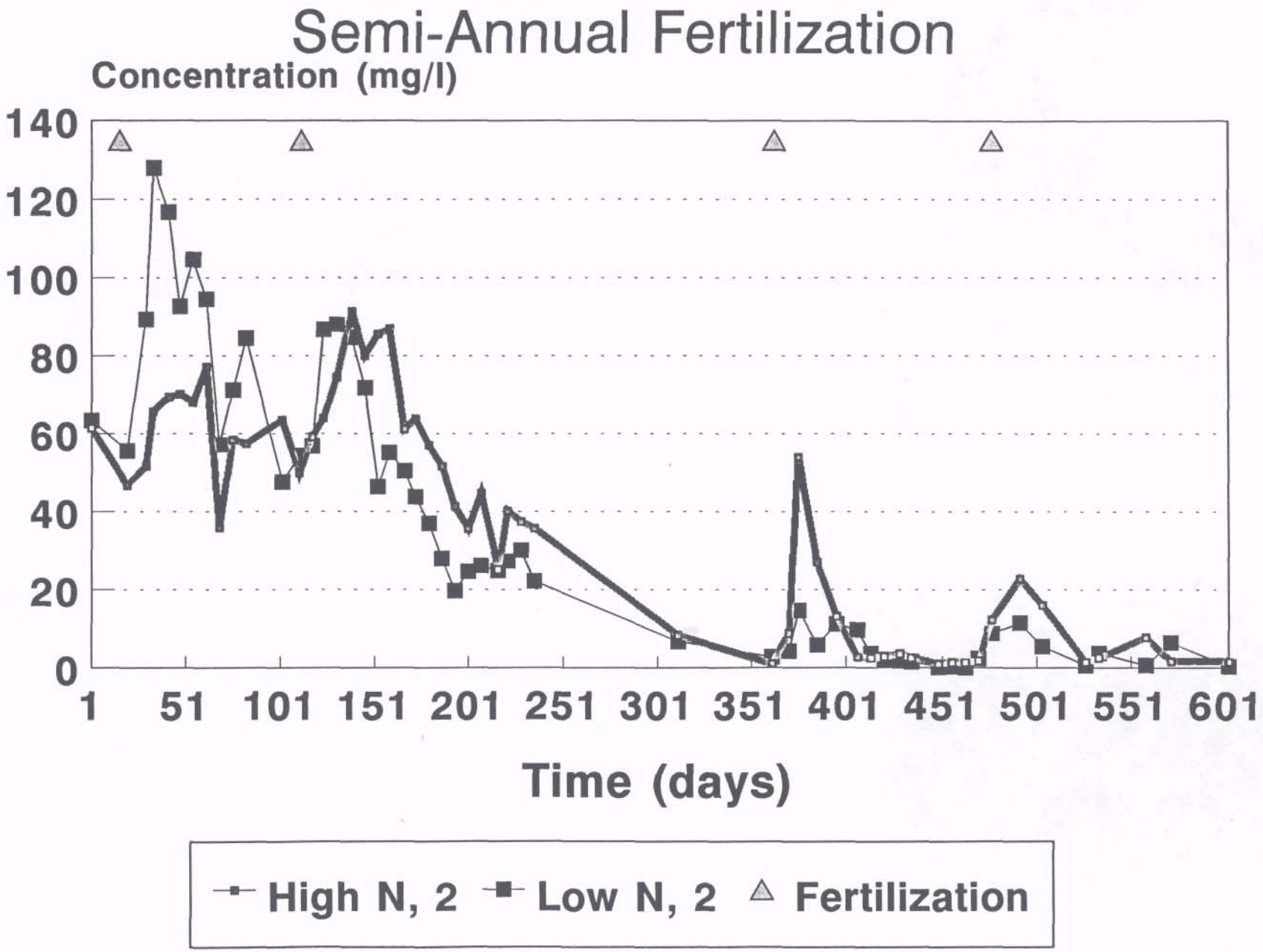

Figure 2. Nitrate-N Concentration in Soil Water Thornhill Ranch, Camarillo

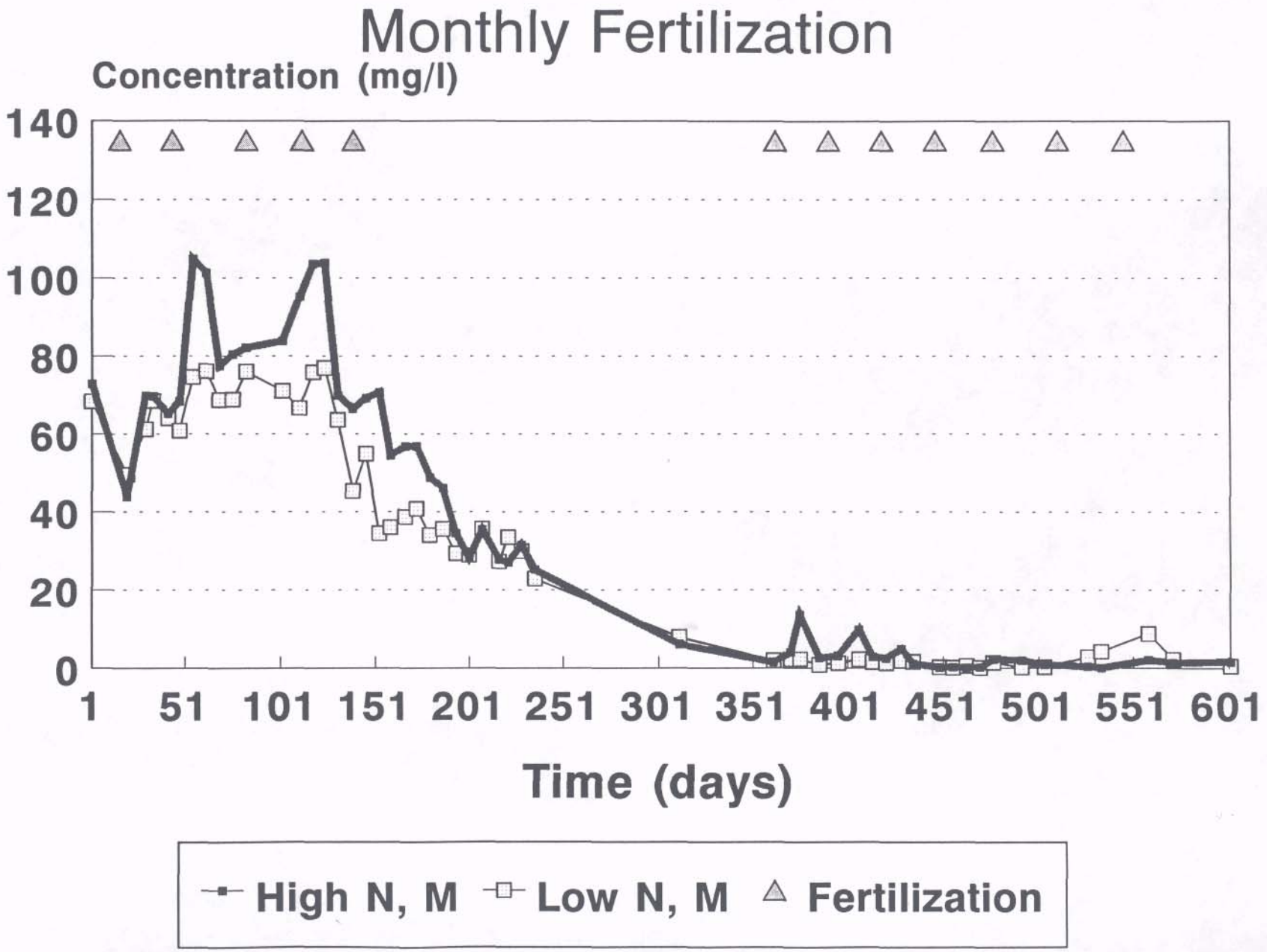

Figure 3. Nitrate-N Concentration in Soil Water Thornhill Ranch, Camarillo

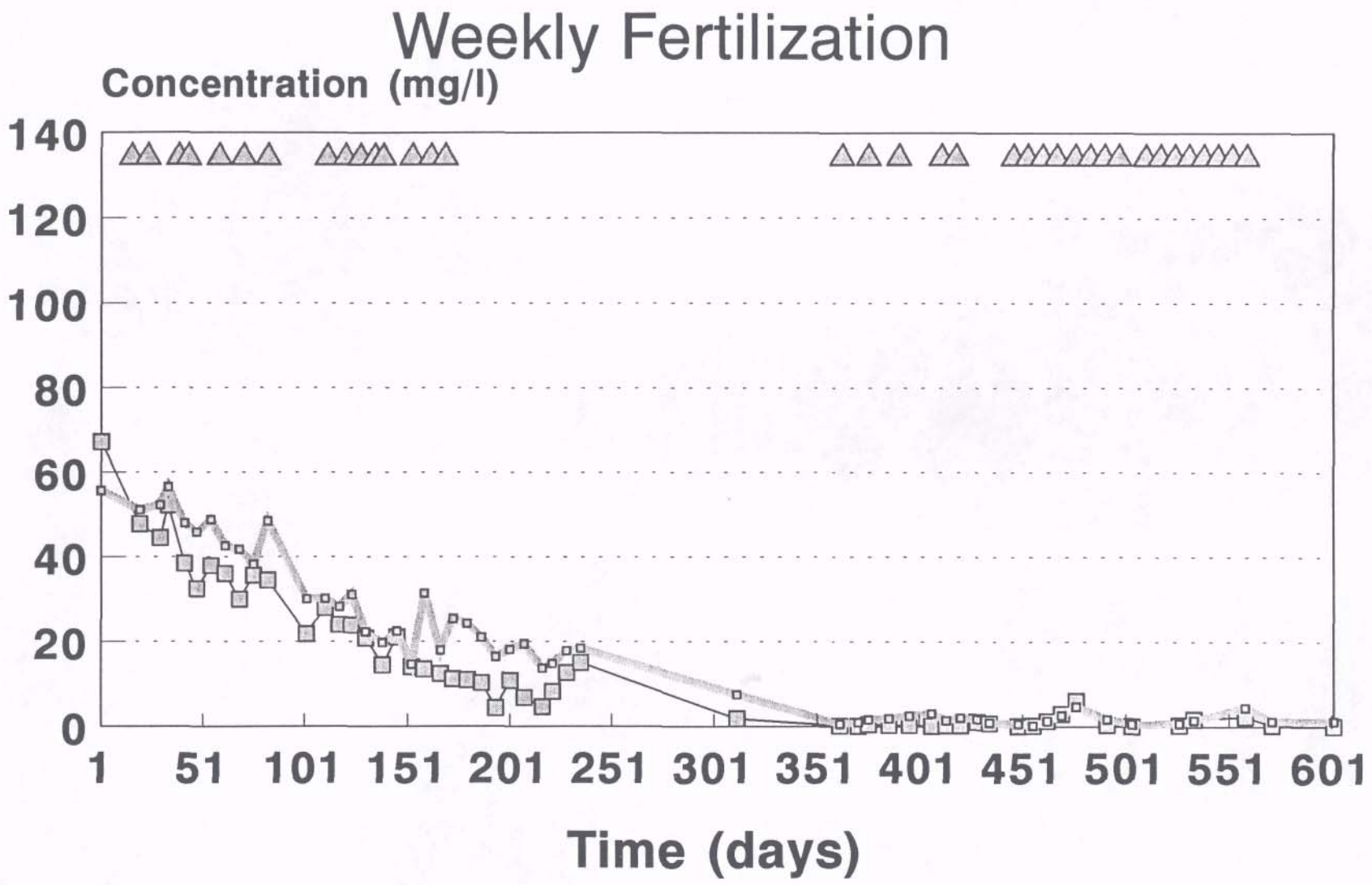

Figure 4. Harvest Data Summary

Thornhill Ranch