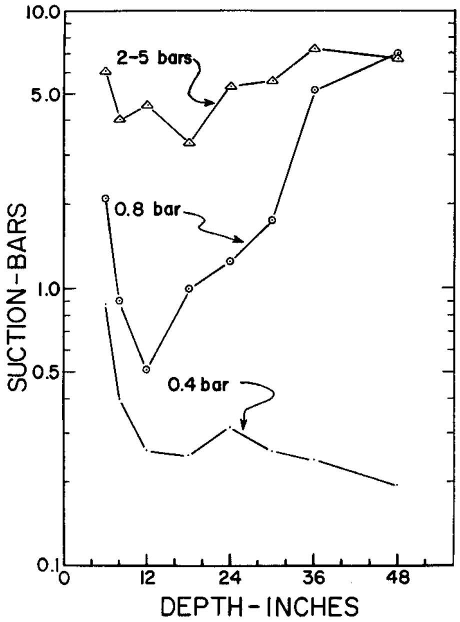
Effects of soil moisture asparagus at two



GRAPH 1. AVERAGE SOIL SUCTION WITH DEPTH FOR IRRIGATION TREATMENTS DURING ONE SEASON.

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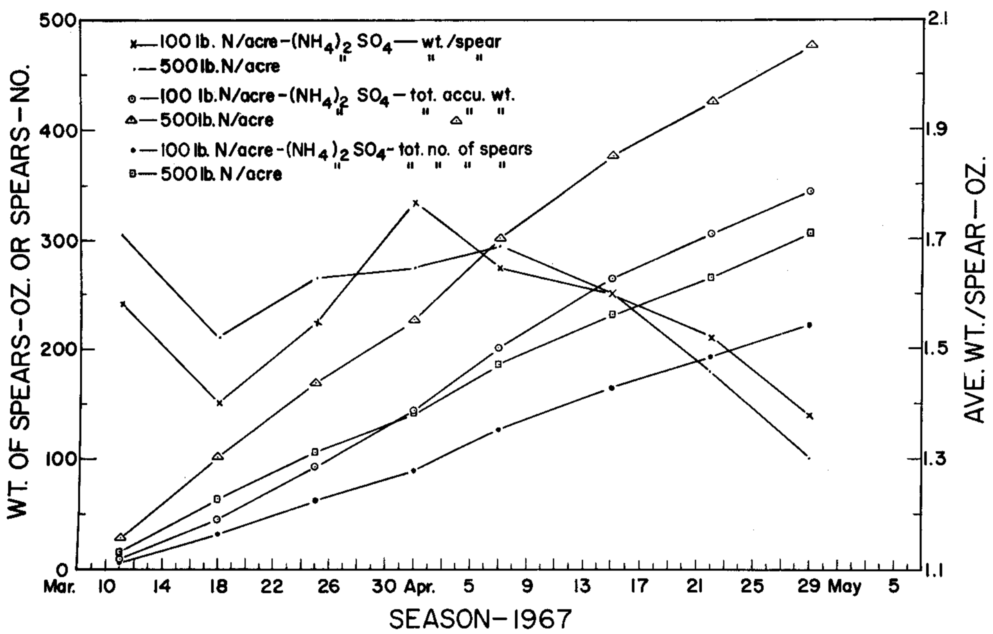
Southern California asparagus growers operate under diverse climatic conditions and soil types, and have many questions on such problems as frequency of irrigation, rates of nitrogen fertilizer, and the total quantity of water to apply. This study was initiated to obtain information on the relationship of yield responses to various soil moisture conditions on one soil type under one set of growing conditions with the possibility of then extrapolating water requirements under different growing conditions.

The asparagus research reported here was conducted at the South Coast Field Station (Orange County), on Moreno sandy loam with two varieties, at two nitrogen levels and three soil moisture conditions. The experimental design was a randomized block replicated four times. Each block contained 12 treatments derived factorially from three irrigation treatments of 0.4, 0.8 and 2 to 5 bars suction; two nitrogen levels of 100 and 500 lbs per acre; and two asparagus varieties, 309 and 500W.

Each plot had seven 40-ft-long rows of asparagus with the plants spaced 18 inches apart in the row and a 5-ft space separation between rows. The center row and one adjacent in each plot were used for collecting harvest data. A soil dike was formed along the lower end of each plot to prevent runoff and movement of water between plots. In addition, a buffer space of 5 ft between plots and 8 ft between blocks was used to prevent interaction of roots between treatments.

Irrigation was applied when soil suction measured 9 inches from center of bed and at the 8-inch depth reached 0.4, 0.8, or 2 to 5 bars suction as indicated by a tensiometer or resistance unit calibrated in terms of suction. At each irrigation, the furrows were rapidly filled and the water level maintained until the soil suction on the instruments, showed zero. The nitrogen fertilizer was placed along the sides of each bed just prior to the first irrigation.



GRAPH 2. CHANGE IN WEIGHT PER SPEAR, AND ACCUMULATED WEIGHT AND NUMBER OF SPEARS IN DIFFERENT N LEVELS, DURING THE 1967 CUTTING SEASON.

Additional instruments

Additional instruments were used to measure moisture changes in the soil profile with irrigation. These were placed at 6-inch intervals to a depth of 42 inches. Neutron access tubes were inserted to a depth of 8 ft at the center of the bed and furrow and halfway between the bed and furrow. Two replications of resistance units and neutron tubes were located in each soil moisture treatment, but were limited to treatments involving variety 500W at high fertility levels.

The number of irrigations and the total amount of water applied in 1967 are shown in table 1. The relationship be-

conditions on nitrogen levels

TABLE 1. TOTAL WATER APPLIED FOR EACH IRRIGATION TREATMENT, N-LEVEL, AND VARIETY, IN 1967

	Irrigations per plot	Water per irrigation	Surface water applied per year
Moisture	no.	inches	inches
0.4 bar (wet)	11.4	2.3	29.9
0.8 bar (med)	6.4	2.7	20.8
2–5 bar (dry)	5.7	3.4	18.6
Fertility level			
100# N/A	7.5		21.9
500# N/A	8.2		23.3
Varieties			
309	7.9		22.9
500W	7.7		22.3

tween the frequency of irrigation and the amount of water applied in 1967 was typical for the four seasons in which harvest data were collected. The frequency of irrigation was nearly doubled for the wet (0.4 bar) treatment when compared with the medium (0.8 bar) or dry (2 to 5 bar) treatments. The quantity of water applied for the wet treatment during the year was 50 per cent greater than for the medium or dry moisture treatment. The difference, in the amount of water applied, between the medium and dry moisture treatments was small, and can be accounted for by the larger amounts of water required to saturate the beds at each irrigation.

Depth

The depth of wetting varied with the irrigation treatment as indicated by the position of measurements taken in the soil profile. In general, the greatest depth of percolation occurred halfway between the furrow and the center of the beds—suggesting that some soil compaction may have occurred in the furrows. In all treatments, the depth of wetting ranged from 35.7 to 71.5 inches which rules out loss of water by deep percolation. However, below these depths a relatively uniform loss of water with time occurred and the data (shape of the soil moisture-depth curves with time) suggest that water was removed from below the 8-ft deep instrumentation point.

Spear yield

In all years except the second, yields significantly higher by weight were obtained in the medium moisture treatment than for the wet or dry moisture treatments. Similar trends were obtained when yields were measured by the number of spears harvested. The difference in yields (weight and number) between the medium and dry moisture treatments was small but statistically significant (table 2).

The large difference in weight yield between the wet- and medium-moisture treatments can be accounted for largely by the increase in the number of spears produced in the medium moisture treatment as compared with the wet moisture treatment. The difference in weight per spear between the two treatments was about 2 per cent.

Although soil temperature data were not taken during the test it is believed that lower soil temperatures during the wet moisture treatments early in the harvest season, as well as during the cutting period, depressed the production of spears in these plots.

The number of canes produced was fairly constant among the various moisture treatments; however, the weight of brush (fern) was largest for the wet treatment and decreased progressively with decreases in soil moisture. This effect was highly significant and the response was linear (table 3).

The difference in brush weight for moisture treatments may be partially explained by the soil water stress imposed on the plants by each moisture treatment. As shown in graph 1, the average suction value below the 8-inch soil depth in the wet moisture treatment was always less than 0.4 bar, whereas the average suction value for the dry treatment ranged between 3.4 and 7.2 bars.

The differences in response between the yield of spears with moisture treatments and the yield of brush with moisture treatments was not surprising since previous studies in California have not shown a consistent positive correlation between spear production yields and brush yields. However, this does not preclude the possibility that a positive correlation between production yields and

TABLE 2. EFFECT OF SOIL MOISTURE, N, AND VARIETY, ON TOTAL WEIGHT AND NUMBER OF SPEARS

Treatments	Spear weight				Spear yield			
	1964	1965	1966	1967	1964	1965	1966	1967
Moisture	pounds per acre				spears per acre			
0.4 bar (wet)	626	4,436	6,834	5,810	10,355	55,699	73,139	71,504
0.8 bar (med)	713	4,752	7,630	6,431	12,535	61,476	77,935	77,063
2–5 bar (dry)	708	4,850	7,565	6,126	12,317	61,149	77,935	76,191
	**Q	NS	**Q	**Q	*Q	*Q	NS	*Q
Fertility level								
100 lbs N/A	614	3,957	6,289	5,254	10,573	53,955	65,291	63,983
500 lbs N/A	730	5,374	8,404	6,965	12,862	64,855	87,418	85,783
	**	**	**	**	**	**	**	**
Varieties								
309	643	4,491	7,129	5,853	11,118	57,116	73,466	70,523
500W	708	4,850	7,565	6,333	12,317	61,694	79,134	79,243
	NS	NS	*	*	*	*	*	*

TABLE 3. THE EFFECT OF SOIL MOISTURE, N, AND VARIETY, ON TOTAL DRY WEIGHT OF FERN AND NUMBER OF CANES

Treatments	Fern weight				Cane yield			
	1964	1965	1966	1967	1964	1965	1966	1967
Moisture	pounds per acre				canes per acre			
0.4 bar (wet)	3,815	4,469	3,030	3,139	58,097	42,510	56,789	55.699
0.8 bar (med)	3,477	4,251	2,714	2,496	59,623	43,491	54,391	50,903
2–5 bar (dry)	3,139	3,575	2,289	2,289	58,315	42,619	59,405	55,263
	**	**	**	**	NS	NS	NS	NS
Fertility level								
100 lbs N/A	3,270	3,139	2,289	2,278	56,244	33,354	43,709	42,292
500 lbs N/A	3,815	5,112	3,139	3,052	60,495	52,429	69,978	65,618
	**	**	**	**	**	**	**	**
Variety								
309	3,379	3,913	2,714	2,496	55,808	39,131	53,410	48,396
500W	3,575	4,349	2,834	2,834	60,931	46,652	57,225	59,514
	NS	NS	NS	NS	**	**	**	**

* *Differences significant at 5% level.*
** Differences significant at 1% level.
NS—Differences not significant.

fall fern yields may exist under conditions of external stress such as the limiting of the period of fern growth by disease, or frost, or an extension of the harvest season.

The higher nitrogen applications increased the production of both spear and brush yields during the four-year study (tables 2 and 3). The change in yields for weight of spears, number of spears, and the accumulated weight yields for the two nitrogen levels are shown in graph 2.

The weight per spear varied considerably during the harvest period and decreased progressively after mid-season until the harvest was terminated. The high nitrogen treatment produced larger spears than the low nitrogen treatment but the differences became progressively smaller during the final two weeks of the harvest period.

The number of spears harvested in the high nitrogen treatment increased significantly over the low nitrogen treatment as the harvest season progressed, which may account for the increased loss in spear size for the high nitrogen treatment during the latter part of the cutting season. The larger number of spears produced in the high nitrogen treatment suggests that the development of the crown and buds was enhanced by the higher nitrogen treatment.

Since a zero nitrogen treatment was not included in this test the relationship between no fertilization and the 100-lb-per-acre nitrogen application could not be determined. However, a comparison of the yields between the two nitrogen levels indicates that nitrogen fertilization at levels greater than 100 lbs per acre would be useful in the production of asparagus on mineral soils.

The yield by weight of spears for variety 500W was greater than for variety 309 for the four harvest seasons. The difference in yield was significant for the 1966 and 1967 seasons. The total number of spears harvested each year was significantly greater for variety 500W than 309. In a variety study at Riverside, 500W did not outyield 309—suggesting that the production capability of a variety in a particular location is strongly influenced by adaptability. However, trends show that both varieties responded similarly to a given set of treatments.

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BULLS VS.

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Two significant findings of this experiment were: (1) Russian castrates were intermediate between steers and bulls in all phases of production (preweaning and postweaning), although these differences were not significant; (2) nursing steer calves implanted with 30 mg stilbestrol, and again as they entered the feedlot for finishing, performed just as well as those that were implanted first upon entering the feedlot—however, the double-implant animals produced carcasses that were 33 lbs heavier (cold weight) than those that were implanted only once (indicating that the cow-calf operator, as well as the cattle feeder, can secure benefits from stilbestrol implantation). Bulls again outperformed steers and Russian castrates (substantiating recent reports by other researchers) in daily gain, carcass index, and cutability as well as feed efficiency.

CASTRATION OF ANIMALS originated with the discovery that male animals with their testicles removed were milder and easier to handle. The practice was increased in comparatively recent years to meet the demand for fatter, more tender carcasses than those produced from aged bulls. The testicles produce sex cells for reproduction, and they also secrete a hormone (testosterone) within the animal that aids and regulates the development of the skeleton, muscles, and organs as well as intensifying the sex drive. Castration affects the parts of the body that develop later—the untrimmed loin, for example, is proportionately heavier in castrates. The proportion of hindquarter to forequarter is also larger in the altered animal though this difference is smaller at younger ages.

Foreign bulls

For many years, foreign countries have been utilizing bulls for beef without discriminating between them and steers in marketing; in fact, bull carcasses often bring a premium. The following research emphasizes the need for some revision of our thinking on this subject. Investigations have been conducted on the use of testosterone to increase meat production. In one experiment, steers treated with testosterone gained about one-half pound more per day than controls, but animals must be given liquid injections three times a week, which is impractical.

A Russian scientist has developed a procedure for castrating to make use of testosterone for increased meat production. The part of the testicles that produces spermatozoa is removed, leaving some of the hormone-producing part intact. To do this, a scalpel is inserted through the scrotum in the middle third of the large curve of the testicle and opposite the epididymis (a coiled tube running up the inner margin of the testicles). The scalpel is rotated 180° and then withdrawn. This loosens the glandular central core of the testicles which then can be pressed out through the puncture wound.

Russian researcher

The Russian researcher reported that the operation could be performed at any time of the year, and postoperative management should be normal. The animals required exercise and the wounds should be protected against flies by a chemical repellent. The cattle were reported to