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1964 Drought in Connecticut, The

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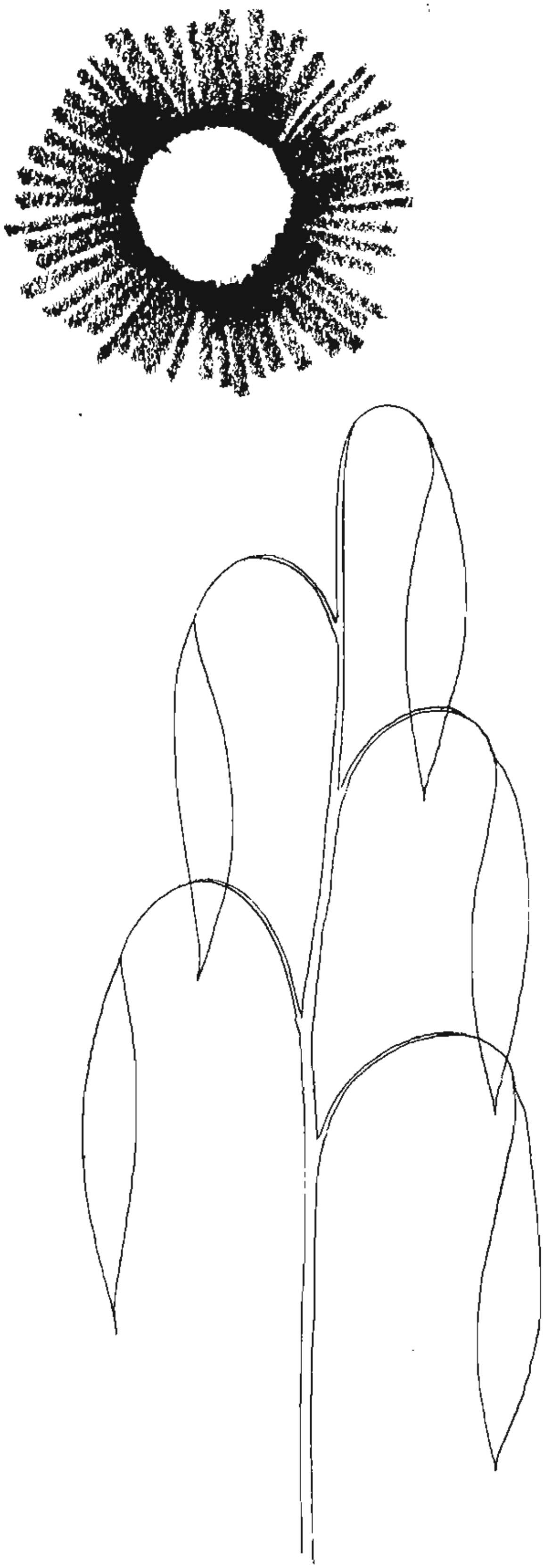

Bulletin 390, June 1965

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AGRICULTURAL EXPERIMENT STATION
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The 1964 Agricultural Drought in Connecticut

Byron E. Janes and Joseph J. Brumbach[1]

INTRODUCTION

Ample rainfall occurs in most years throughout Connecticut to supply the water needs of most plants. However, varying periods exist when raiufall is low. If they occur during the growing season and extend for more than one to two weeks, the lack of soil moisture will reduce the growth of many crops. The longer this period the more serious the damage.

From May 3 to October 31, 1964, Connecticut experienced one of the longest and most damaging periods of below average rainfall in the past 70 years. This report presents data on the extent of the drought: rainfall, evaporation, soil moisture conditions, irrigation requirements and crop response, plus some comparisons with other low-rainfall years.

RAINFALL

Although lack of moisture may affect local areas for short periods nearly every summer, Connecticut seldom experiences prolonged droughts. The records show only a few seasons of seriously deficient rainfall for more than a month.

In 1894 the three summer months were unusually dry. Less than one-fourth the normal amount (70-year average) of rain fell iu June and less than one-half as usual in July and August. For the 30-day period, June 17 to July 16, 1911, average precipitation in the state totaled only 14 percent of normal. Although this drought was not especially prolonged, its severity was increased materially by high temperatures during the first 12 days in July.

Important late summer dry spells beginning in mid-August and the first half of September occurred in most localities in 1908, 1914, and 1930. In the 59-day period, August 28 to October 25, 1908, rainfall amounted to about 25 percent of normal. In 1914, average precipitation for the 46-day period, August 31 to October 15, was less than 10 percent of normal. In 1930, after adequate precipitation in May and June, rainfall was only two-thirds of normal in July, Angust and the first 18 days of September. This was followed by nearly a month when scarcely any rain fell, except in a few localities.

Over the state as a whole the growing seasons of 1957 and 1964 were the driest during the past 70 years. Except for April, the winter and spring of 1957 were relatively arid, thus setting the stage for the summer drought which was to follow. Figure 1 shows a generalized map of the geographic distribution of precipitation based on data for 62 stations from May 3 to October 31, 1957. Of particular interest was the pronounced dryness in Windham and northern Hartford Counties. There were wide variations in precipitation deficiency from area to area, particularly in the west and south. Especially noteworthy was the much greater precipitation along the east-west line of elevated terrain which lies 5 to 15 miles inland from Long Island Sound, when compared with the Coastal Plain.

While only a dry winter preceded the summer drought in 1957, abnormally dry weather extending back through 1961 set the stage for the widespread drought of 1964. Precipitation deficits for January 1961 through October 1964 ranged from 28 to 33 inches. While summer dry spells occurred in 1960,

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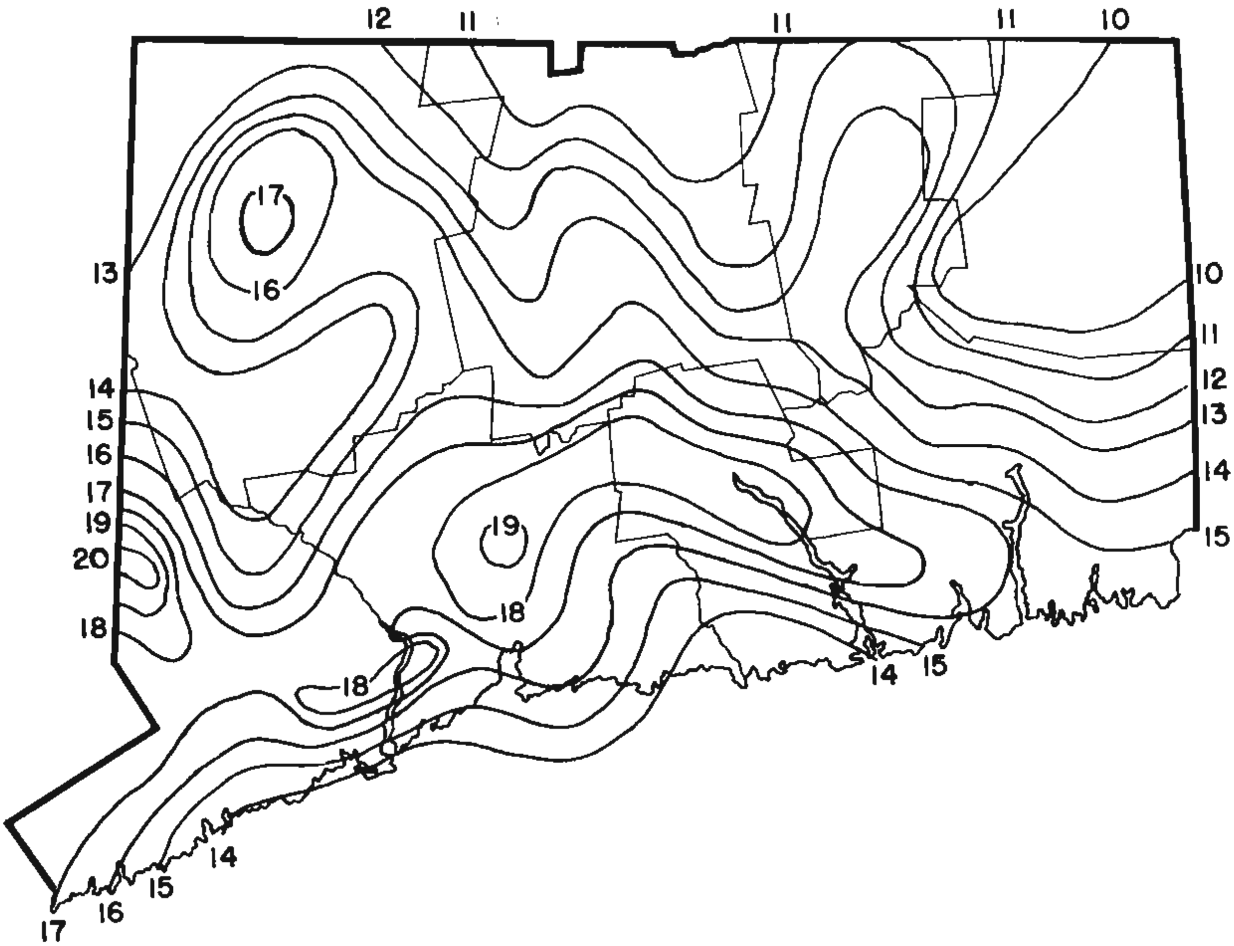

Figure 1 — Total precipitation (inches) May 3 to October 31, 1957.

1961, 1962, and 1963, resulting in droughts of mild to moderate intensity, all were short-lived. Combined with generally below normal temperatures and tempered by drought-relieving rains, none assumed major proportions.

The 1964 drought was similar in duration, severity, and areal coverage with that of 1957. In terms of lack of rainfall, the 1964 drought ranks as the driest in most areas. It continued to November 24, while there was ample precipitation in October and November of 1957. On the other hand, temperatures for May 3 through October 31 were about 2 degrees lower in 1964 than in 1957. June and September 1957 were particularly hot.

Figure 2 presents a generalized geographic rainfall map for May 3 to October 31, 1964. The isolines are drawn for data from the same 62 stations used in preparing Figure 1. Rainfall deficiences were greatest in Litchfield County, northern and eastern Hartford County, southeastern Windham and northeastern New London Counties and especially southern Fairfield and New Haven Counties.

While Figures 1 and 2 permit comparisons between the drought years of 1957 and 1964 for total precipitation received, they contain no information on the time distribution of precipitation within the two periods. Since the total precipitation was not evenly distributed throughout the two periods from May 3 through October 31, weekly amounts for the 62 stations used in the preparation of Figures 1 and 2 were computed. These were divided into the six climatological divisions of Connecticut given in University of Connecticut bulletin 369 (1). Simple arithmetic weekly averages were calculated for each division. Finally, these were accumulated for each division, beginning with week 10, May 3 to 9, and continuing through week 35, October 25 to 31. The data appear in Figures 3 and 4 for 1957 and 1964, respectively.

Note the differences in week-to-week accumulations of precipitation between the different divisions. For

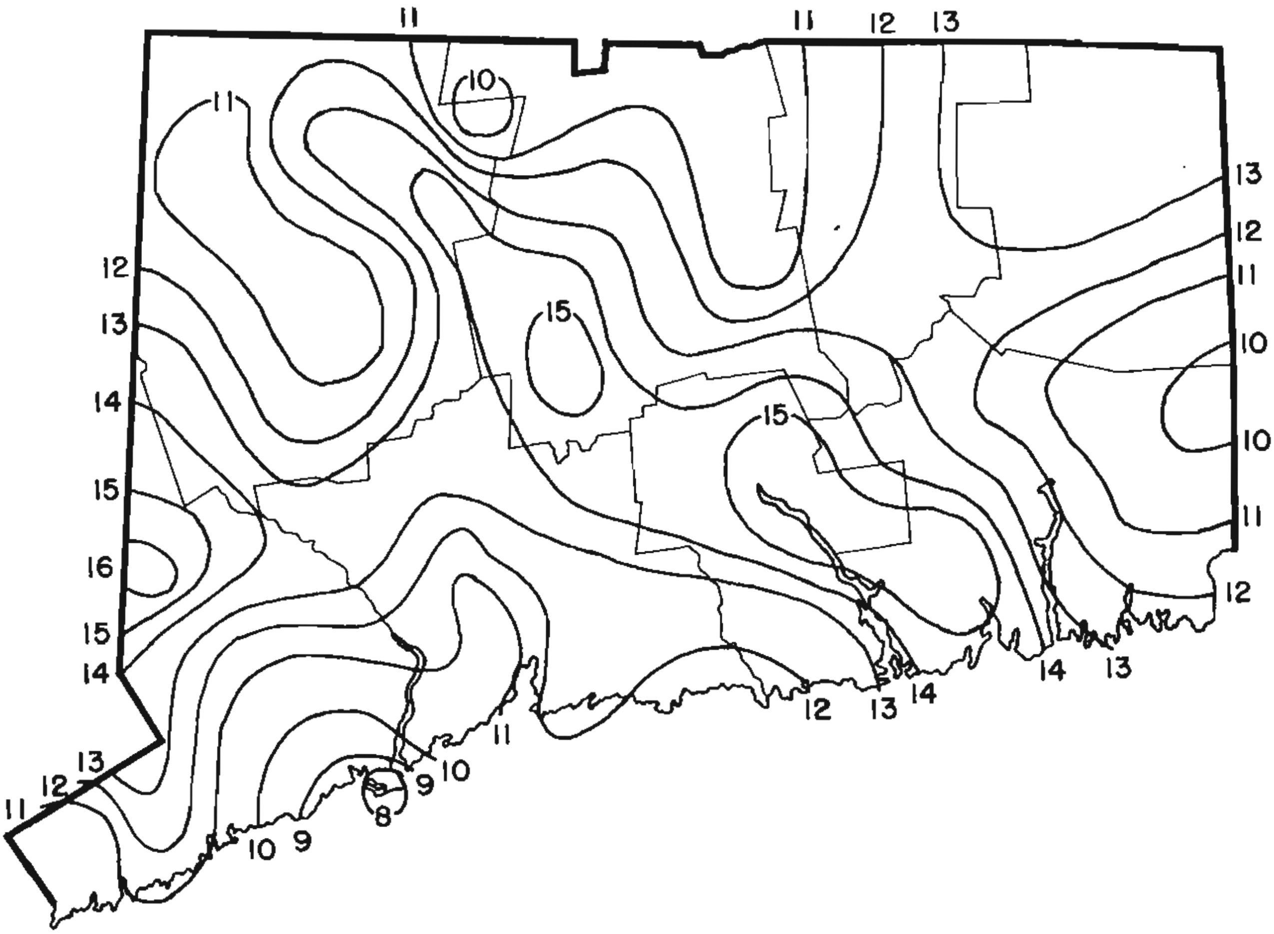

Figure 2 – Total precipitation (inches) May 3 to October 31, 1964.

example, in 1957 there was 1.3, 4.0 and 6.9 inches more accumulated rainfall in the Southwest Hills than in the Northeast by May 16, August 29 and October 31, respectively. The year 1964 lacked comparable differences. The accumulations from division to division were remarkably similar. An important exception was the Coastal Plain where precipitation averaged about 50 percent of the amounts received in each of the other divisions during August 2 through September 26. Greatest differences occurred August 2 through August 22.

Figure 5 shows the State mean precipitation accumulated weekly from May 3 to October 31 for 1957 and 1964. The weekly means are simply the arithmetic averages of the 62 stations used for preparing Figures 1 to 4. Noteworthy is the 3.6 inches of precipitation between August 23 and September 26, 1957, when compared with the 0.8 inches during the same period of 1964.

Figure 5 also furnishes information concerning the weekly mean and median for May 3 to October 31, based on the 30-year record from 1926 through 1955 (1). Data were used from the following five widely separated stations: Cream Hill, Hartford, Norwalk, Storrs and Waterbury. It was assumed that over a 30-year period each station was representative of a wide area surrounding it. Thus, the average of the five stations gives an approximation to the actual value of the state weekly mean and median. The graphs give accumulated values of these statistics. The accumulated median permits easy calculation of the median value for any desired week. It allows easy comparisons between the median and mean for individual weeks. However, the sum of the weekly median for two or more weeks is not the same as the median of the sum of the weekly totals over the same period. For example, the final value of accumulated median must not be interpreted as representing the median for the entire period, May 3 to October 31.

Attention is called to the diverging slopes of the accumulated mean and median, beginning June 20 and to the accelerating rate of separation between the two after August 22. From August 22 through October

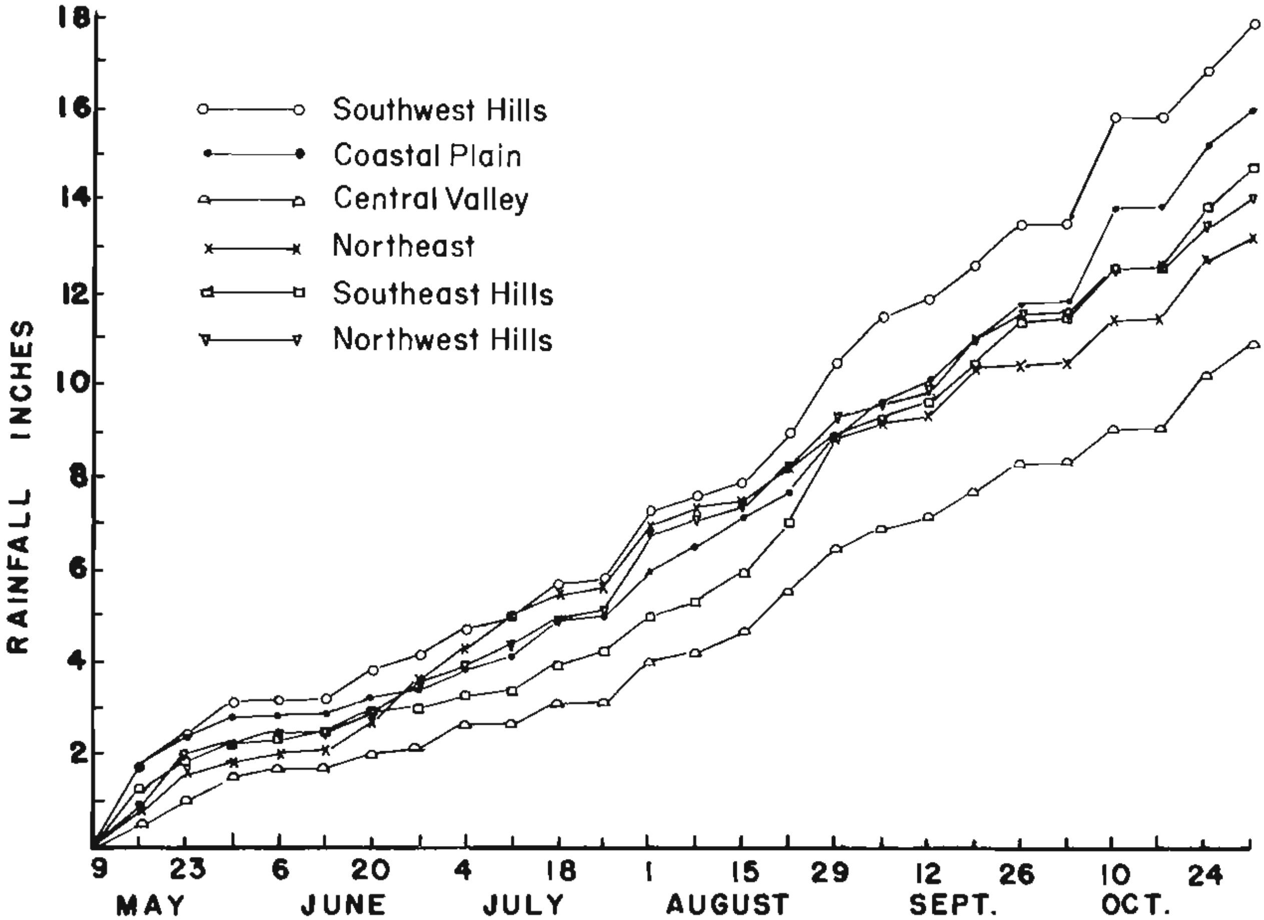

Figure 3 — Accumulated weekly precipitation at week ending May 9 through week ending October 31, 1957.

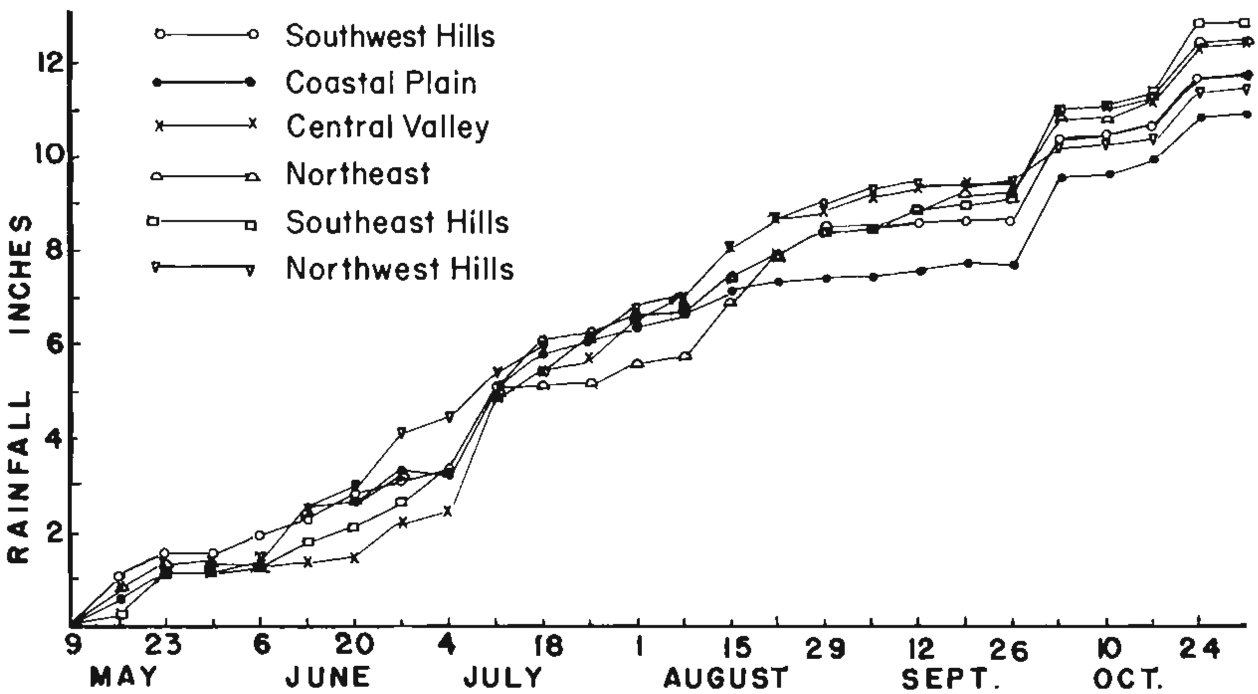

Figure 4 — Accumulated weekly precipitation at week ending May 9 through week ending October 31, 1964.

31, the average weekly median is about .45 inch, while the average weekly mean is almost double the value. Late summer and early fall are most often normally dry. The weekly means during this period are sharply influenced by large individual precipitation amounts resulting from comparatively rare meteorological events. Thus, on the average, the weekly median gives a more acceptable estimate of expected weekly precipitation than the mean. Putting it another way, in most years short periods of dry weather are common in Connecticut, especially in late summer and early fall. But extended droughts as severe as those of 1957 and 1964 are comparatively rare, occurring with a frequency of 1 year in 30.

SOIL MOISTURE

The previous discussion traced the extent of the rainfall deficit during the 1964 growing season. Rainfall deficit by itself does not indicate the severity of the drought. A drought occurs when there is not enough moisture in the soil to supply plant needs. Thus, the severity of a drought can be determined by measuring the water content of the soil. Since actual measurements of soil water content are expensive and time-consuming, it was not feasible to make the many needed measurements of soil water content by sampling the soil. Estimates of available soil moisture had to be based on easily obtainable data to give a reason-

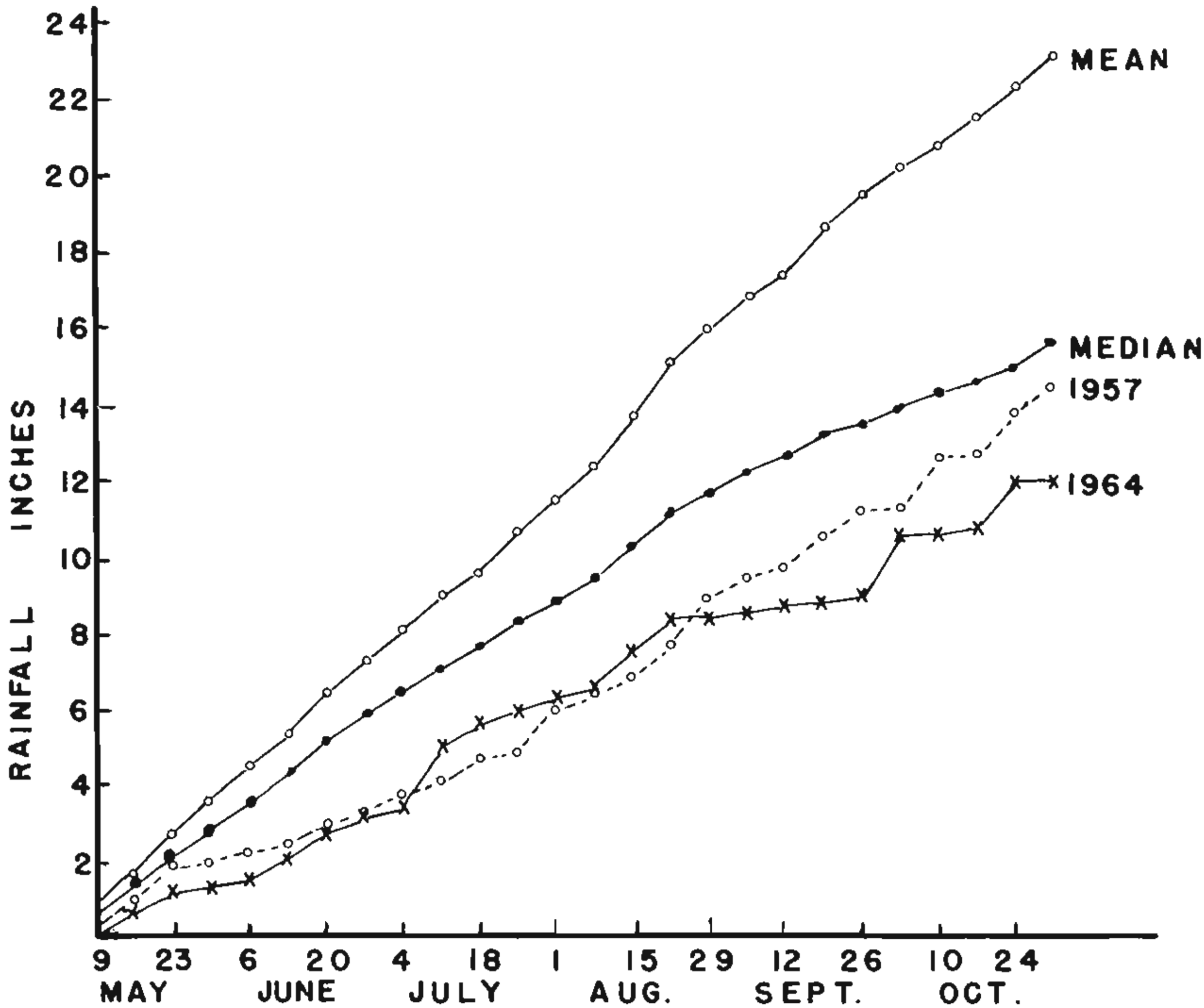

Figure 5 — Accumulated weekly precipitation averaged over the state for 1957 and 1964 compared with the accumulated weekly state mean and median precipitation for the 30-year period 1926-1955.

ably accurate value. Factors influencing the rate at which plants remove water from the soil can be classified into two groups: plants and soil and meteorological parameters. Soil and plant factors, such as age and type of plant and depth and type of soil, influence the amount of water available to plants. However, the temperatures, hours and intensity of sunshine and wind speed determine the amount of water plants remove from the soil. The rate of evaporation from a free water surface gives an integrated value of these three factors. This value was used to estimate water evaporated from the soil and transpired from the leaves (evapotranspiration).

If it is assumed that all healthy green plants will lose water at the same rate and that this rate is dependent on the meteorological factors, it is possible to estimate changes in soil moisture by measuring free water evaporation. Research at the Vegetable Research Farm in Coventry (3) (4) as well as other studies (5) (6) have shown that these are reasonable assumptions. Moreover, they give information for use in making comparisons of drought severity from season to season or location to location.

The amount of water in the soil available for plant growth during the 1964 growing season was estimated on a daily bookkeeping basis, with rainfall the input and evaporation the withdrawal. As long as there is an abundant supply of water, healthy green plants completely covering the soil surface will remove an amount of water from the soil equal to that lost by evaporation from a free water surface. As soil dries and less water becomes available to plants, the rate of evapotranspiration declines. Field and laboratory studies have shown that the ease with which water can be removed from soil varies from soil to soil. The percentages in Table 1 give average values which are approximations valid for many soils in the state. There is little or no effect on the rate of evapotranspiration as long as between 75 and 100 percent of the water available at field capacity remains in the soil. When the amount of soil water is between 62 and 74 percent of that available at field capacity, evapotranspiration is about 95 percent of free water evaporation. As the water content of the soil decreases further, the rate of evapotranspiration declines rapidly. It is only 15 percent of free water evaporation when all but 25 percent of the water available at field capacity has been removed. Specific data on water holding capacity of Connecticut soils appear in bulletin 627 of the Connecticut Agricultural Experiment Station (2).

In making estimates of daily changes in soil moisture, it was assumed that in the top 2 feet of soil the maximum amount of water available to plants was equal to that which would cover the surface to a depth of 4 inches (4 inches of available water). This value would be close to a maximum value; a few soils hold more than this amount of water but many have a lower water holding capacity. In addition, water available to plants may be less than the maximum in the top 2 feet because of shallow root systems. It was also assumed that winter and early spring rain had wet the soil and that it was at field capacity on May 3. For each day during the growing season after May 3, the gain or loss of water from the soil was determined by subtracting the estimated evapotranspiration and then adding the amount of rain that fell during the day. The total soil moisture was never more than 4 inches. Rainfall raising soil moisture above this amount was assumed lost by runoff or percolation.

Table 1 — Effect of amount of available water in the soil on the loss of water as evapotranspiration from a vegetative cover.

Available soil moisture in top 2 feet of soil inches	Available soil moisture as percentage of maximum available	Percentage of free water evaporation lost as evapotranspiration
4.00-3.01	100-75	100
3.00-2.51	74-62	95
2.50-2.26	61-56	85
2.25-2.01	55-50	77
2.00-1.76	49-44	70
1.75-1.51	43-38	65
1.50-1.26	37-32	56
1.25-1.01	31-25	50
1.00- .76	24-19	36
.75- .51	18-13	25
.50- .26	13- 7	15
.25- .00	6- 0	0

Table 2 gives a sample of the daily calculations of soil moisture content for Coventry. When the soil water content was between 3.0 and 4.0 inches, or 75 to 100 percent of available, the total amount of measured evaporation was subtracted each day. When soil moisture dropped below 3 inches or 75 percent of available, the percentage of evaporation subtracted was reduced as indicated in Table 1.

The evaporation from a free water surface measured at the Vegetable Research Farm in Coventry was used to make calculations at all locations in the state. The evaporation from a circular tank 4 feet in diameter located in the center of a bluegrass lawn was used as a measure of free water evaporation. Over a period of five years there was a close correlation between loss of water from this tank and evapotranspiration from a bluegrass sod (3). There are minor variations in the evaporation rate from location to location, but studies (3) showed that these variations tend to

Table 2 — Estimation of daily changes in available soil water.

Date		Rainfall	Free Water Evaporation	Estimated Evapotranspiration	Available Soil Water
May	3				4.00
	4		.18	.18	3.82
	5		.21	.21	3.61
	6		.17	.17	3.44
	7		.22	.22	3.22
	8		.19	.19	3.03
	9		.17	.17	2.86
	10		.30	.28	2.58
	11		.19	.18	2.40
	12		.24	.20	2.20
	13		.20	.15	2.05
	14	.03	.09	.07	2.01
	15	.61	.05	.04	2.58
	16	.10	.13	.12	2.56
July	1		.29	.04	.32
	2	.09	.28	.04	.37
	3	T	.19	.03	.34
	4	.04	.19	.03	.35
	5	.07	.14	.02	.40
	6		.20	.03	.37
	7	.02	.21	.03	.36
	8		.25	.04	.32
	9	.35	.06	.01	.66
	10	1.01	.00	.00	1.67
	11	.01	.10	.06	1.62
	12		.15	.08	1.54
	13		.11	.07	1.47
	14	.42	.01	.01	1.88
	15	.01	.11	.08	1.81
	16		.24	.17	1.61

average out, with evaporation measured at Coventry being a good approximation of that experienced in other parts of the state. Measurements of evaporation were very similar at Coventry, Brooklyn and Norwich during July and August 1964. This indicated that, throughout eastern Connecticut and presumably in the rest of the state, evapotranspiration rates were similar during the 1964 season. Rainfall records also were obtained weekly from official cooperative Weather Bureau observers at Cockaponset State Forest, Mount Carmel, Norwich, Danbury, Putnam, Falls Village and the U. S. Weather Bureau Station, Bradley Field, Windsor Locks.

Estimates of available soil moisture for May 3 to October 3, 1964, indicate that it was below the critical level in much of the state during most of the 19-week period, May 23 to October 3 (Figures 6 to 13). There were brief periods when soil moisture was above the critical 2.0 inch level at five of the eight locations. Several heavy showers in the Danbury area during June increased the available soil water to above 3 inches. At Cockaponset, Norwich and Mount Carmel July rains raised soil moisture above 2 inches for a brief period. During August and early September the heavier showers occurred in the Falls Village area.

There is usually some growth of plants if 25 to 50 percent of the available water (1 to 2 inches) remains in the soil. However, when soil water drops below 25 percent of available crops will grow very little. Should this condition last for more than a week, a serious drought occurs. During the 1964 season in all parts of Connecticut, estimated soil moisture was below 1 inch for at least eight weeks. In three locations, Coventry, Windsor Locks and Norwich, available soil moisture was less than 1 inch for 12 weeks.

The actual soil water content under a grass sod was measured at Coventry several times during the season. These periodic measurements showed that after June 1 the major portion of soil water was removed to a depth of 2 feet or more. Throughout the remainder of the season infrequent light showers wetted only the top several inches of soil. It was estimated that the rains during the last of September and first of October should have penetrated to a depth of 1 foot. Samples taken after October 3 from those areas covered with a crop most of the season showed a sharp line of demarcation between wet and dry soil at approximately the 1-foot level.

Estimated soil water content at Coventry during the three growing seasous of 1957, 1958 and 1964 were compared with each other. Growing season rainfall was much below normal in both 1957 and 1964 and about 4 inches better than average in 1958. The most striking difference between 1957 and 1964 season was in the amount of free water evaporation as seen in Figure 14. Total seasonal evaporation measured at Coventry was 32.3, 24.2 and 27.7 inches for 1957, 1958 and 1964, respectively. In 18 of the 24 weeks, May 3 to October 17, evaporation was higher in 1957 than in either of the other two years. Evaporation was higher in 1964 than in 1958 in 17 of the 24 weeks.

Figure 15 shows estimates of day-to-day changes in soil moisture for soils having a 4-inch water holding capacity. As would be expected the soil moisture was adequate for most of the 1958 season. There was appreciable drying of the soil only during June. From May 3 to October 3, available water in the soil was less than 2 inches for 19 weeks in 1957 and 1964. There was less than 1 inch of available soil moisture for 10 weeks in 1957 and 12 weeks in 1964.

IRRIGATION REQUIREMENTS

An estimate was made of the amount of irrigation water needed to maintain available water in the root zone soil above 50 percent of water holding capacity. Changes in soil water content were estimated, assum-

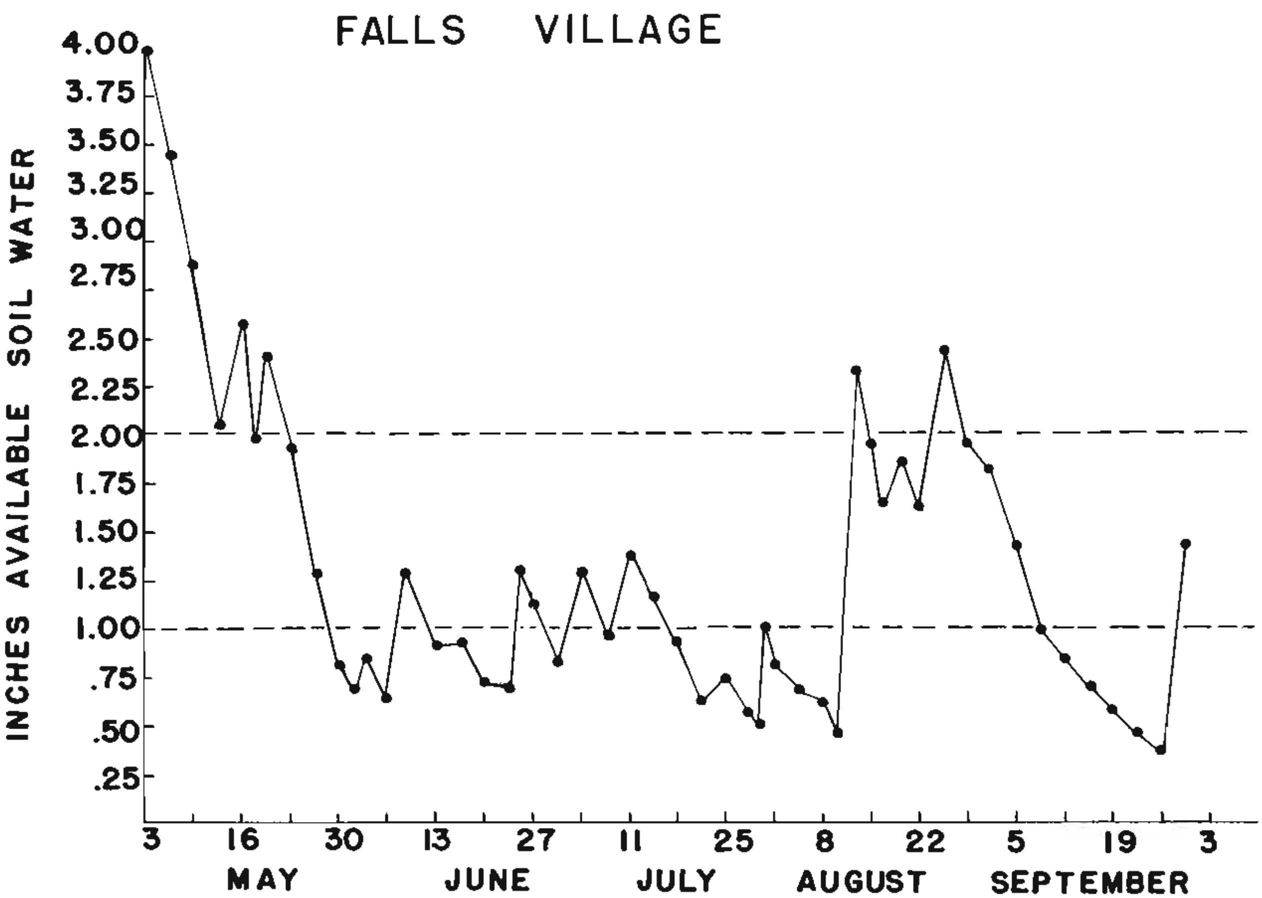

Figure 6 — Daily course of estimated available soil water in soils holding 4 inches of available water in the root zone at Falls Village.

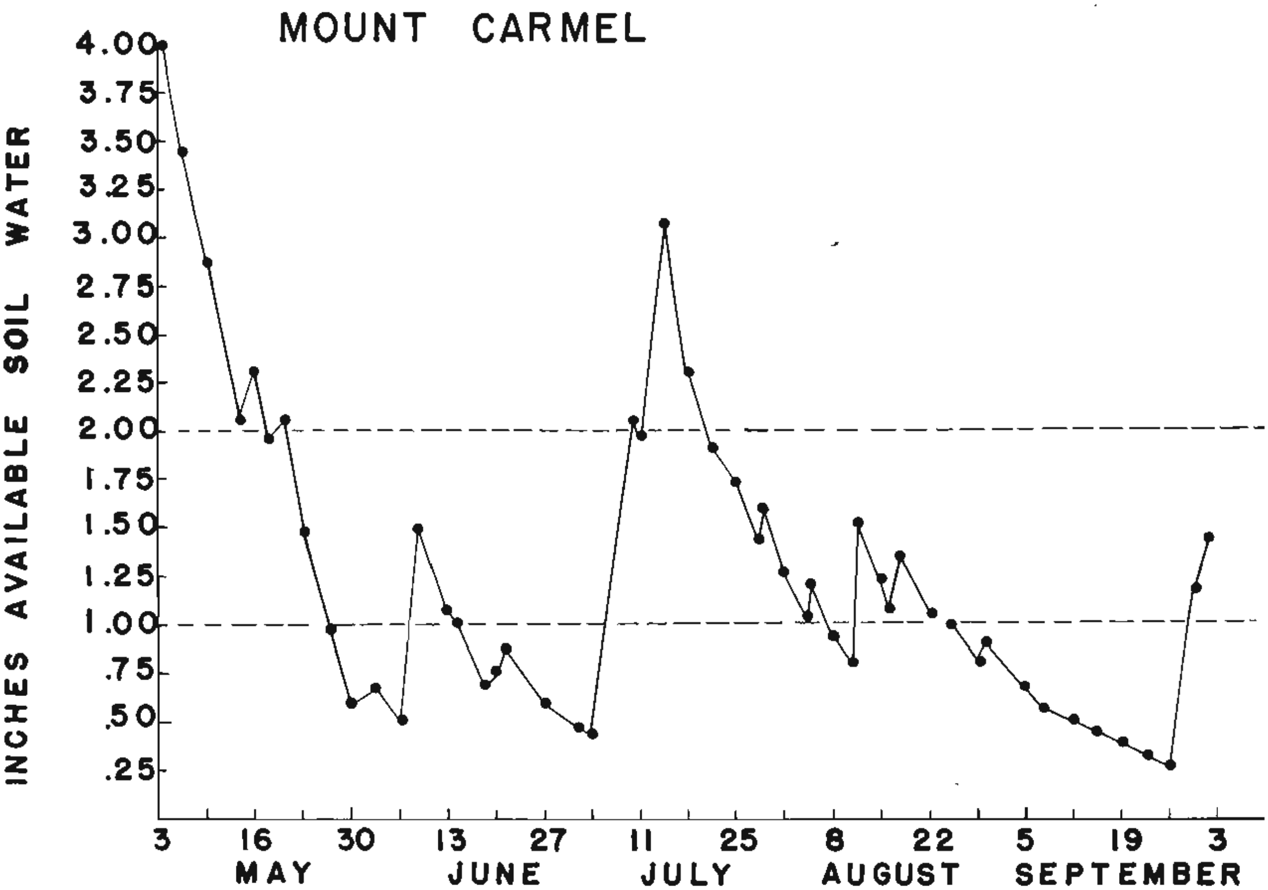

Figure 7 – Daily course of estimated available soil water in soils holding 4 inches of available water in the root zone at Mount Carmel.

ing that the application of irrigation water was enough to return the soil to near field capacity each time available soil water was less than 50 percent of capacity. These calculations were made for soils capable of holding 4, 3 or 2 inches of water in the root zone when at field capacity. The data appear as dotted lines in Figures 11, 16 and 17. To maintain soil water content above the critical 50 percent level in soils completely covered with a rapidly growing crop, it would have required 7 irrigations of 2.0 inches each, 9 irrigations of 1.5 inches each and 13 irrigations of 1.0 inches each to soils which held 4, 3 and 2 inches of available water in the root zone, respectively.

Either because it was not economically profitable or necessary to keep any commercial crop continuously supplied with optimum water for May 3 to October 3, 1964, the maximum amount of water was not used. Given the availability of water and equipment, decisions on using irrigation depended on soil moisture content, crop value and irrigation cost. Delay in applying irrigation water nntil the soil dries well below the 50 percent level results in reduced plant growth. On the other hand, less frequent irrigation reduces production costs.

The important perennial crops in Connecticut agriculture are pastures, ornamentals and fruits. In contrast to high value crops, which show an economic return from irrigation in many seasons, irrigating pastures proves beneficial only in years of extreme drought (7). For this reason most dairy farmers consider it a better practice to sustain the occasional loss from drought than to maintain costly irrigation systems and develop necessary water supplies for pasture irrigation. A few pastures were irrigated but none received the maximum number of irrigations required to maintain a high soil moisture content throughout the season. The cost of such an operation would have been greater than the return from increased growth.

Nursery and perennial ornamental crops with their relatively deep root systems have large volumes of soil from which to extract water. This extra water supply, plus the fact that some retardation in growth is beneficial to nursery crops, reduces the number of irrigations needed. Reports from Hartford County indicate that two irrigations of at least 2 inches each were used for nursery crops. Nursery stock or other ornamental plants grown in containers in the open had a very limited volume of soil and required almost daily irrigation.

Since fruit trees are deep rooted, one or two heavy irrigations during July and August were sufficient to maintain an adequate water supply. Orchards on shallow, sandy soils required more frequent irrigation than those on deeper, heavy soils.

The frequency of application of irrigation and amount of water applied to annual crops depends on their type, planting time, length of growing period and water holding capacity of the soil. Crops with relatively shallow root systems, such as tobacco, celery, cabbage and potatoes, were irrigated at frequent intervals. These crops must be kept growing at all times for best quality. For example, celery planted in Hartford County the last of May required an application of 1 inch of water seven times during June, July and August as shown in Figure 17. Beans and cabbage mature in about two months. Two to four irrigations of 1.0 to 1.5 inches each were required to maintain an adequate supply of water for these crops.

Potatoes were planted in late April or May and harvested in Septemher or October. They were small in May and early June, and needed no irrigation until late June. During June, July and August a number of Hartford County growers applied three irrigations of 2.0 inches each. Figure 11 charts the approximate times of application.

Field grown tobacco, usually planted in heavier soils, required five irrigations of 1.5 inches each at the approximate times given in Figure 16. Few of these crops were irrigated more than once or twice, if at all, because of the comparatively low economic value of the crop. On the other hand, soils for shade tobacco would have required the seven 1-inch irrigations as indicated in Figure 17 for a crop grown iu the open. Shade tenting reduces transpiration and, consequently, lengthens the time interval between required irrigations. Thus, high value shade grown tobacco generally

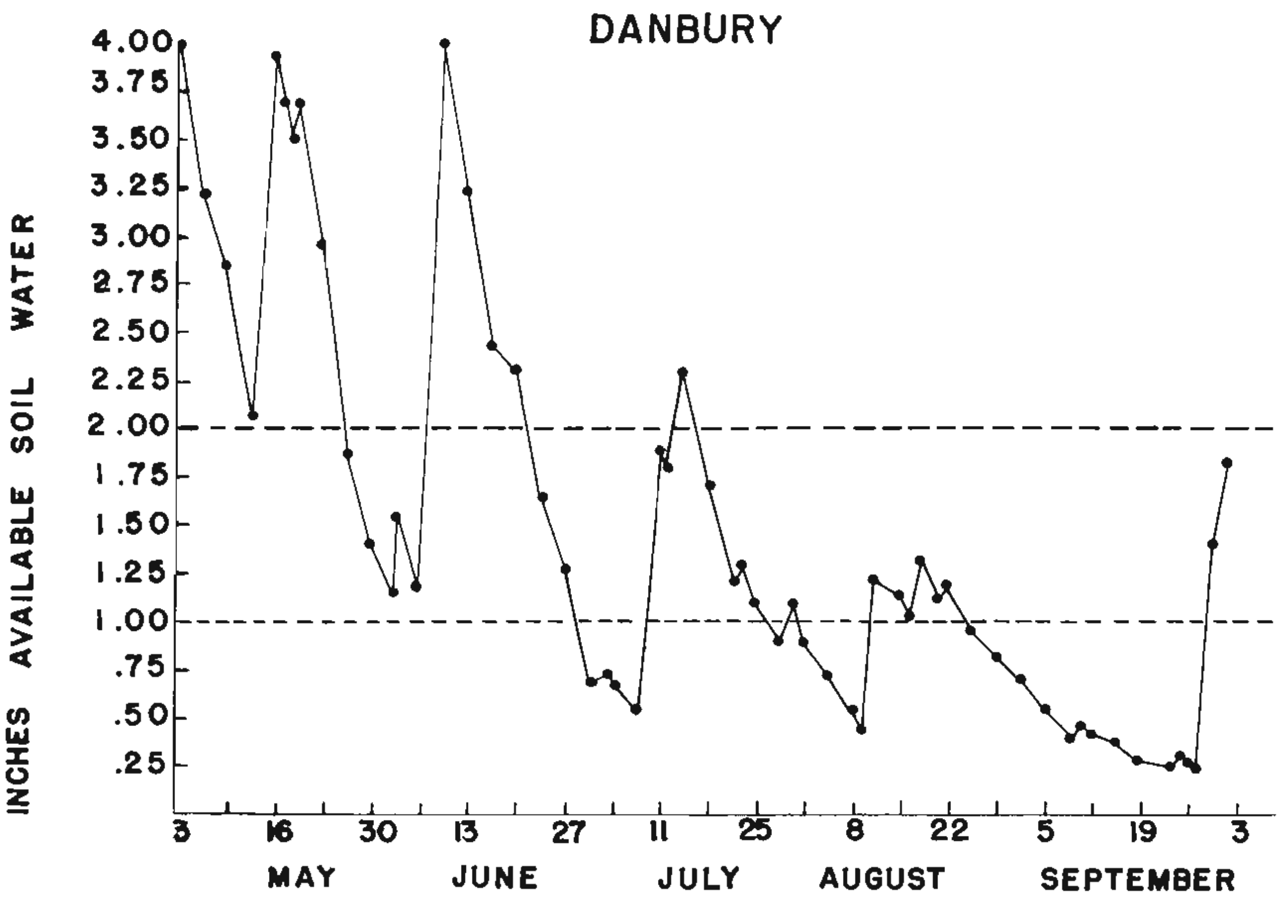

Figure 8 — Daily course of estimated available soil water in soils holding 4 inches of available water in the root zone at Danbury.

received only the five irrigations suggested by the schedule given in Figure 16. One inch of water was applied at each irrigation.

CROP RESPONSE

It was impossible to obtain an accurate evaluation of the effect of dry weather on crop response that could be summarized in numerical terms. Necessary historical records of yields are not readily available for comparisons. However, agricultural agents in each county of the state and Extension Service specialists at the University of Connecticut's College of Agriculture, supplied the authors with information for making estimates. In estimating the economic losses resulting from the drought, it is necessary to consider both the loss of yield resulting from lack of water in the soil and the cost of applying irrigation water. The latter depends on many factors, such as efficiency of equipment, closeness and type of water supply and the number of required irrigations.

Pasture and Forage Crops

The greatest losses were sustained in forage production, with hay and pasture yields estimated at 60 percent of normal. This is an average value; yields varied from 30 to 90 percent of normal.

Corn silage yields were estimated between 80 and 85 percent of normal. A small percentage of acreage planted in this crop was irrigated with good results. Silage yields were better than hay and pasture, probably because corn is usually grown on better soils in more suitable locations, with good fertilization and weed control.

The drought conditions during the 1964 season were so severe that many farmers had to feed hay normally used during winter in late summer and fall. The federal government declared the entire state a drought disaster area, making it possible for farmers to obtain low interest credit for buying feeds for winter use. Feed at reduced prices was made available through the Agricultural Stabilization and Conservation Service. The most serious losses occurred in Fairfield

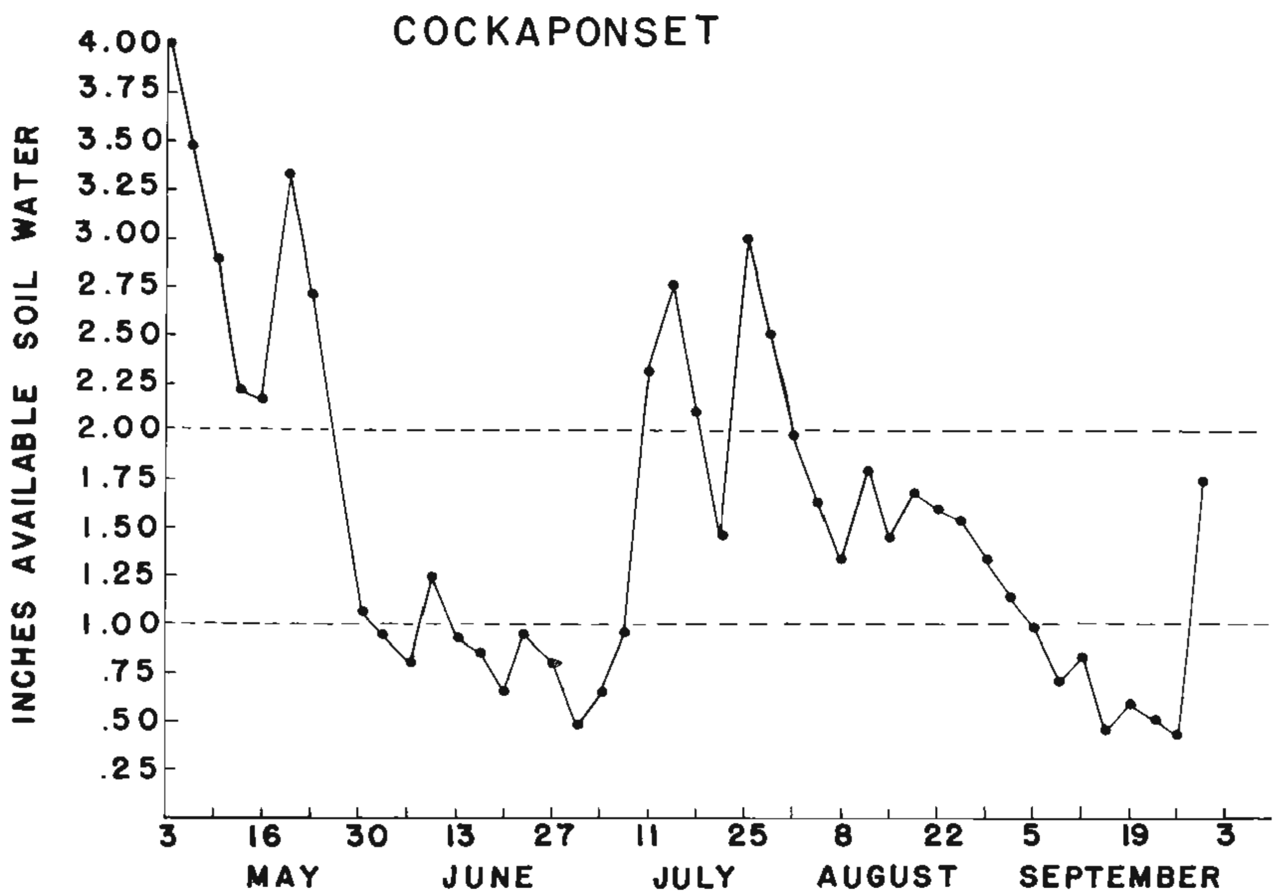

Figure 9 – Daily course of estimated available soil water in soils holding 4 inches of available water in the root zone at Cockaponset State Forest.

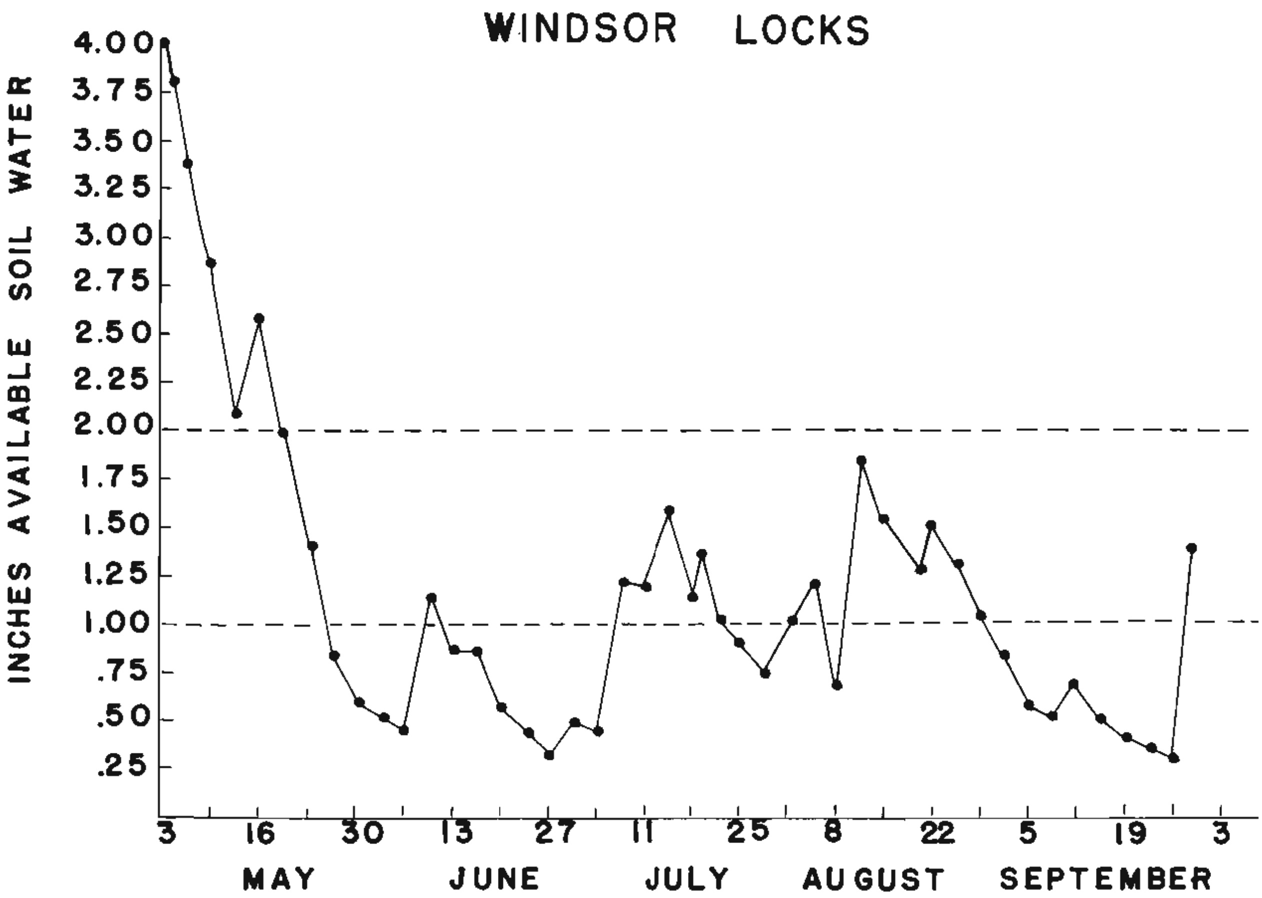

Figure 10 – Daily course of estimated available soil water in soils holding 4 inches of available water in the root zone at Windsor Locks.

County, where 127 dairy farmers lost an estimated 80 percent of pasture, 30 percent of hay and 25 percent of silage corn. Some lost as much as 50 percent of hay and silage. These losses were much greater than in other parts of the state. Wells on these dairy farms began to fail in early September; 30 percent of the dairy farmers were without water or nearly so by November 1.

Shade Tobacco

Shade tobacco is a high value crop with high production costs. Experience over the years has shown the importance of maintaining a proper water supply in the soil for productive yields. Most acreage in shade tobacco is equipped for irrigation. In Hartford County, approximately 90 percent of the acreage was irrigated in 1964. Consequently, there was little or no reduction in total yield.

Nursery Plants

Where irrigation was properly applied and water supplies were adequate, little damage occurred to newly planted or well established nursery stock. Approximately 50 percent of the nursery crop was irrigated. Without irrigation, many young seedlings and tender plants were lost. Some established plants, such as azalea and rhododendron, died or were severely damaged by the dry weather.

A small reduction in the rate of growth results in high quality nursery plants. On the other hand, prolonged periods of dry weather result in the loss of anticipated value because of the failure of the plants to reach their expected size. Estimates iudicate that the growth of much of the non-irrigated nursery stock was reduced by one-half in 1964.

In some areas losses resulted from the difficulty in carrying out customary digging operations in the fall.

Vegetables

A continuous supply of readily available water is necessary to produce high quality vegetable crops (7). Since many vegetables are relatively shallow rooted, the required soil moisture content can only be maintained by frequent rains or irrigation. Irrigation is not

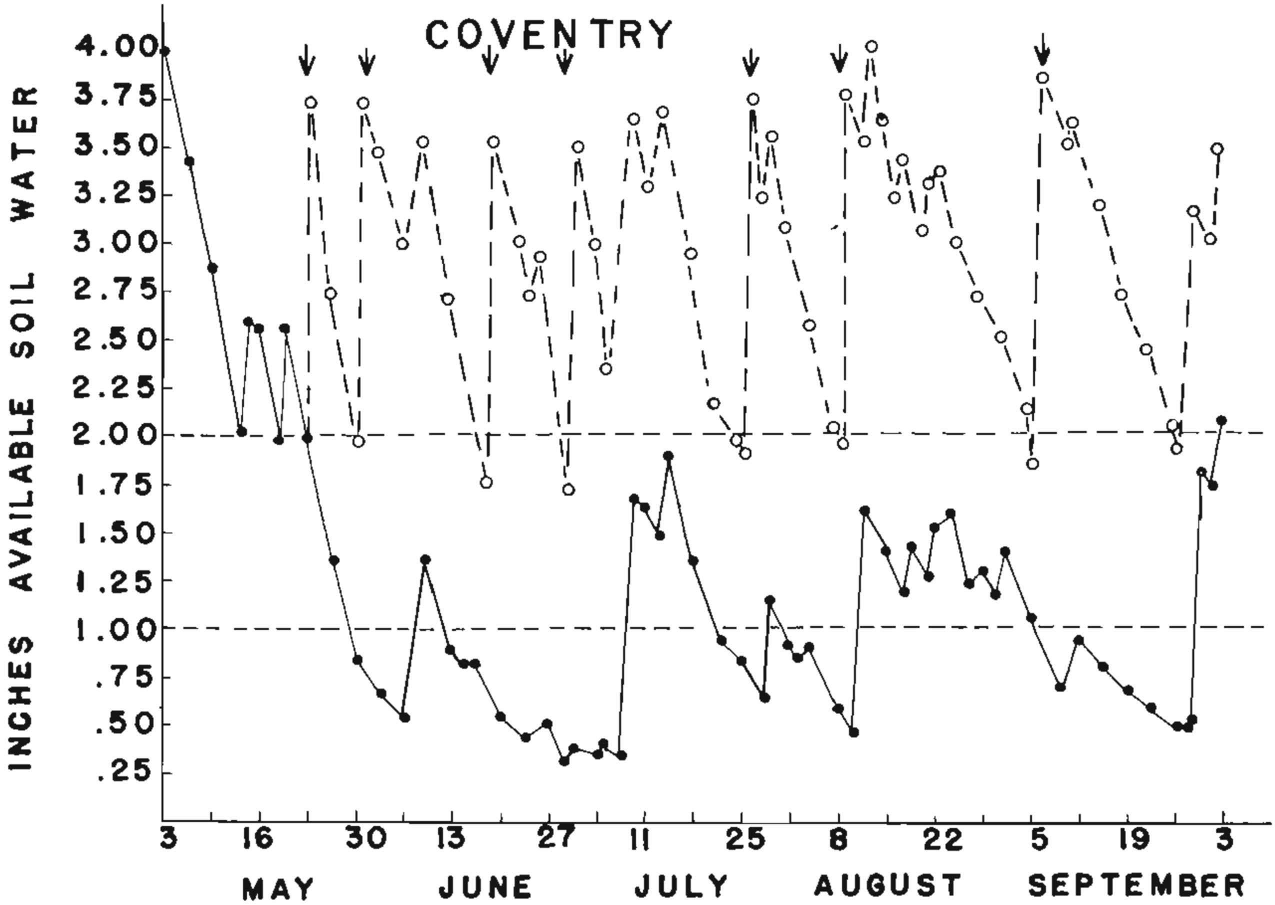

Figure 11 – Daily course of estimated available soil moisture in soils holding 4 inches of available water at Coventry. The solid line is for soils which were not irrigated. The dotted line is for soils which were irrigated with 2 inehes of water eaeh time the available water dropped below 2 inches. Arrows indicate estimated dates of irrigation.

necessary every year. However, many growers have found that periods of dry weather occur often enough to warrant the use of irrigation systems as a normal part of their cultural practices. Those having adequate water supplies and using irrigation produced good crops during the 1964 season. Where irrigation was not used both yield and quality were reduced. For example, in Hartford County an estimated several hundred acres of sweet corn that could not be irrigated were a complete loss.

The percentage of vegetable growers using irrigation varied throughout the state. In Hartford, Tolland and New Haven Counties where the greatest number of vegetable farms are found, a large percentage of vegetable growers used irrigation. In the vegetable growing area of Fairfield County only 3 of the 28 farms were irrigated.

Tree Fruits

The major damage to the fruit crop was smaller size apples and peaches in orchards not irrigated. Approximately 25 percent of the orchards was irrigated. One report revealed that the dry weather caused such a rapid maturity of peaches that many dropped before they could be harvested. There may be some latent injury or winter damage that cannot be appraised until another growing season has passed.

Apple orchards in Connecticut have in the past suffered from lack of boron in the soil. This harmful effect is much more serious during periods of dry weather. Some orchards suffered from boron injury in 1957 but there was no evidence of injury in 1964.

Strawberries

Many growers know that strawberries are susceptible to injury from dry weather and have planted them where irrigation is available. Losses in size of fruit and injury to new plants were heavy on non-irrigated fields.

Lawns and Shrubs

Lawn grasses have the remarkable ability to rapidly return to normal growth when water becomes available after a prolonged dry spell. Many lawns turned brown and were completely dormant during much of July and August. However, the few fall rains revived most lawns, turning them green again. Newly planted lawns suffered damage and some, which could not be watered, were a complete loss.

No estimate is available of damage to shrubs and landscape plantings, but these plants showed responses similar to nursery stock. Without water, newly planted ornamentals died or were severely injured and growth of established plants was retarded.

Forests and Woodlands

It was very difficult to estimate the damage to trees. Undoubtedly, the rate of growth was slowed and many weak trees died or will die as a result of the dry weather. The injury to ailing trees was quite evident in many roadside plantings. Of particular interest was the injury and death of many famous dogwoods on Greenfield Hill in Fairfield. Many spring plantings of evergreen seedling trees were lost. For example, 200,000 seedlings in a single spring planting in Windham County died during the summer.

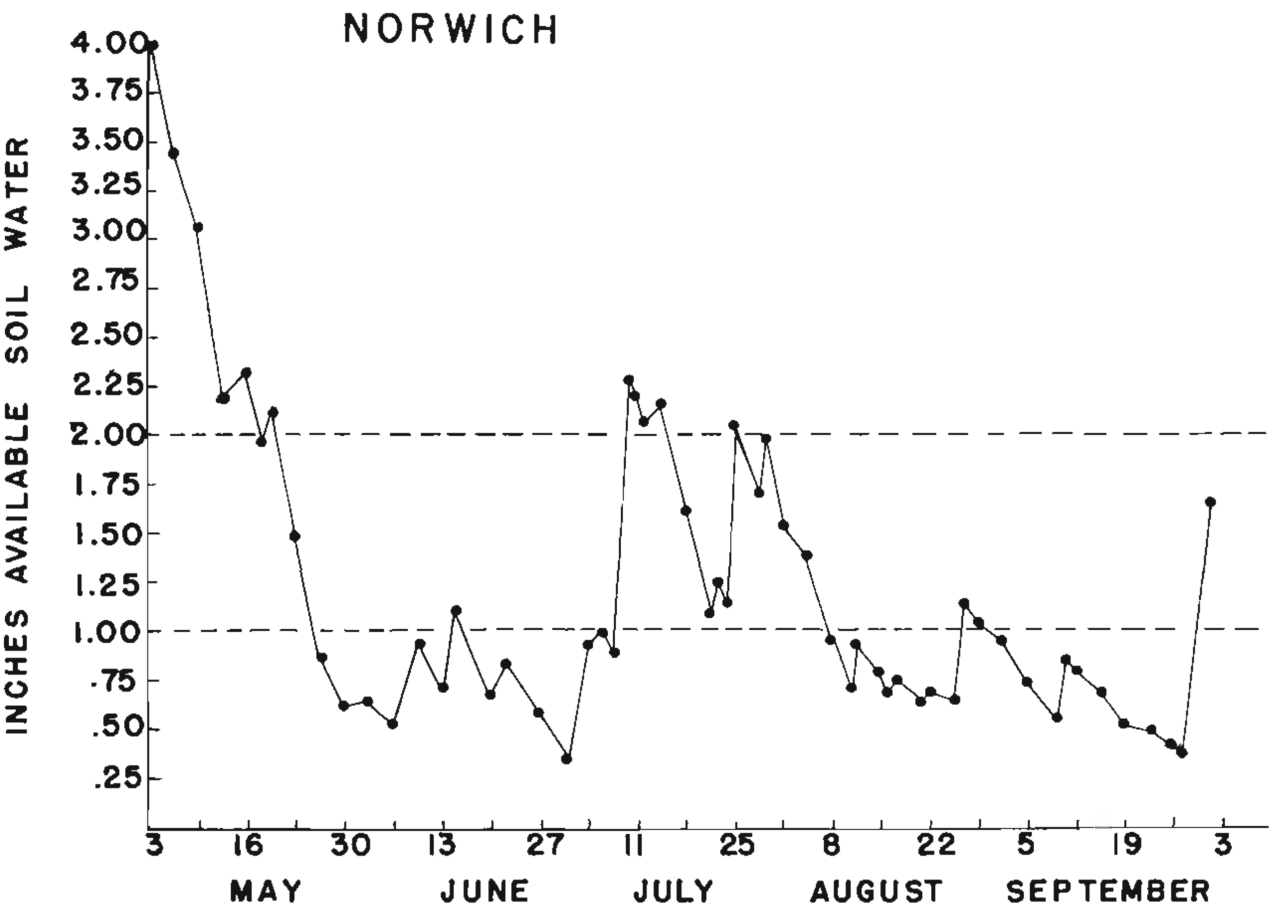

Figure 12 — Daily course of estimated available soil water in soils holding 4 inches of available water in the root zone at Norwich.

COMPARISON OF CROP DAMAGE IN 1964 WITH 1957

Soil moisture conditions were similar in both 1957 and 1964 as seen in Figure 15. However, many reports indicated more plant damage in 1957 than in 1964 over a large part of the state. As might be expected the areas of greatest damage each year also had the lowest rainfall for that year. In 1957 losses were greatest in the northeastern part of the state including Tolland, Windham and part of Hartford Counties. In 1964 the rainfall, except in one area, was evenly distributed over the state. There was about 2 inches less rainfall in the southwest coastal area where the greatest losses occurred than in the rest of the state. The extreme northwestern part of the state had the second lowest rainfall and plant damage was considerable.

In both 1957 and 1964 the least damage occurred in the central hilly section where isolated heavier showers proved beneficial.

The greater losses in 1957 were no doubt due to higher rates of evaporation and somewhat higher temperatures. These two factors caused a faster removal of water from the soil in 1957 than in 1964. Far more important was the extra stress to which plants were subjected. Plants growing in water deficient soils will survive and grow better when the weather is hazy and cool than when it is clear and hot. There was a lower average temperature and 14 percent less radiant energy, measured at plant height with Livingston Atmometers (3), in 1964 than in 1957. Less sunshine and cooler temperatures undoubtedly caused less stress on the plants in 1964 than in 1957. This partly accounts for the somewhat lower crop damage during the 1964 season.

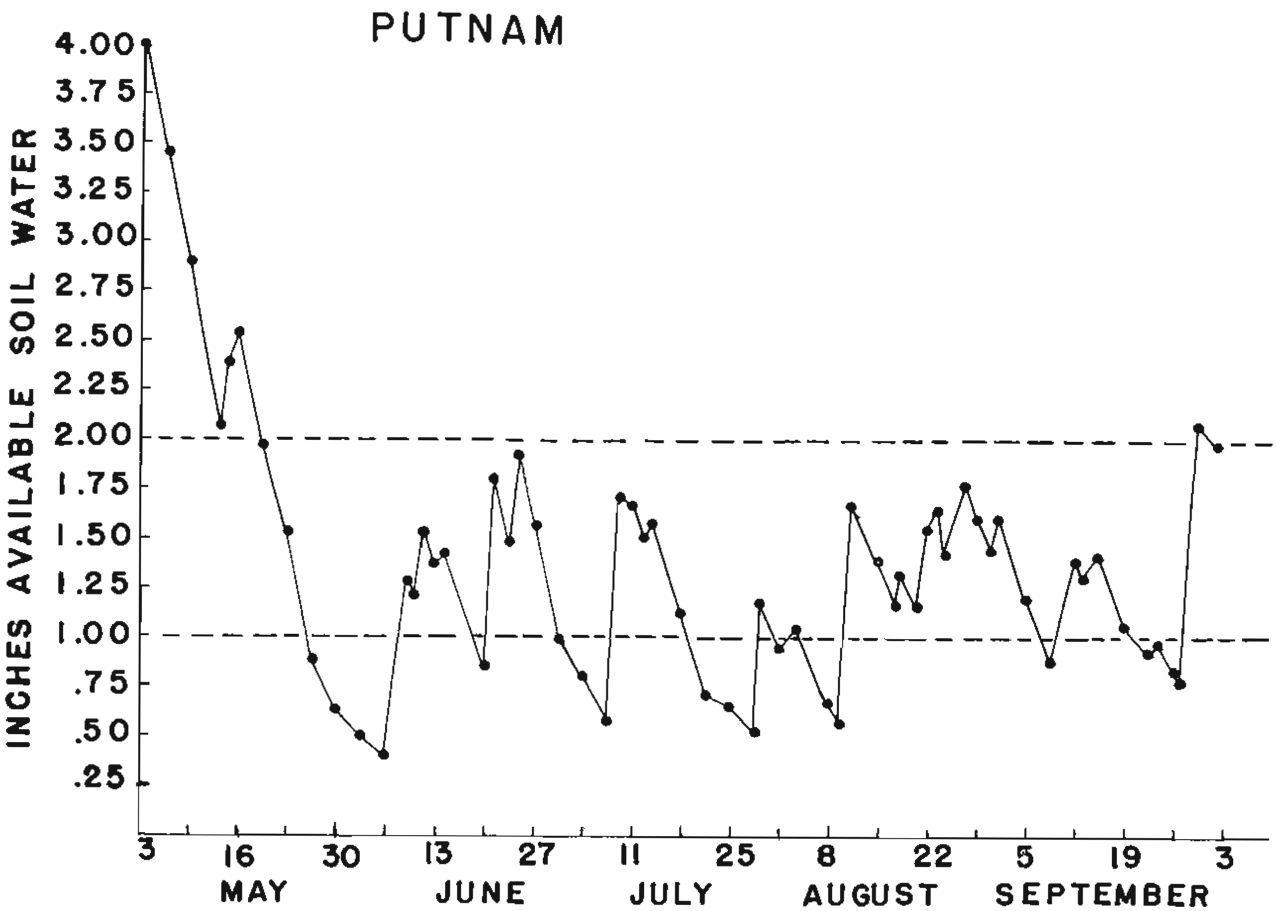

Figure 13 – Daily course of estimated available soil water in soils holding 4 inches of available water in the root zone at Putnam.

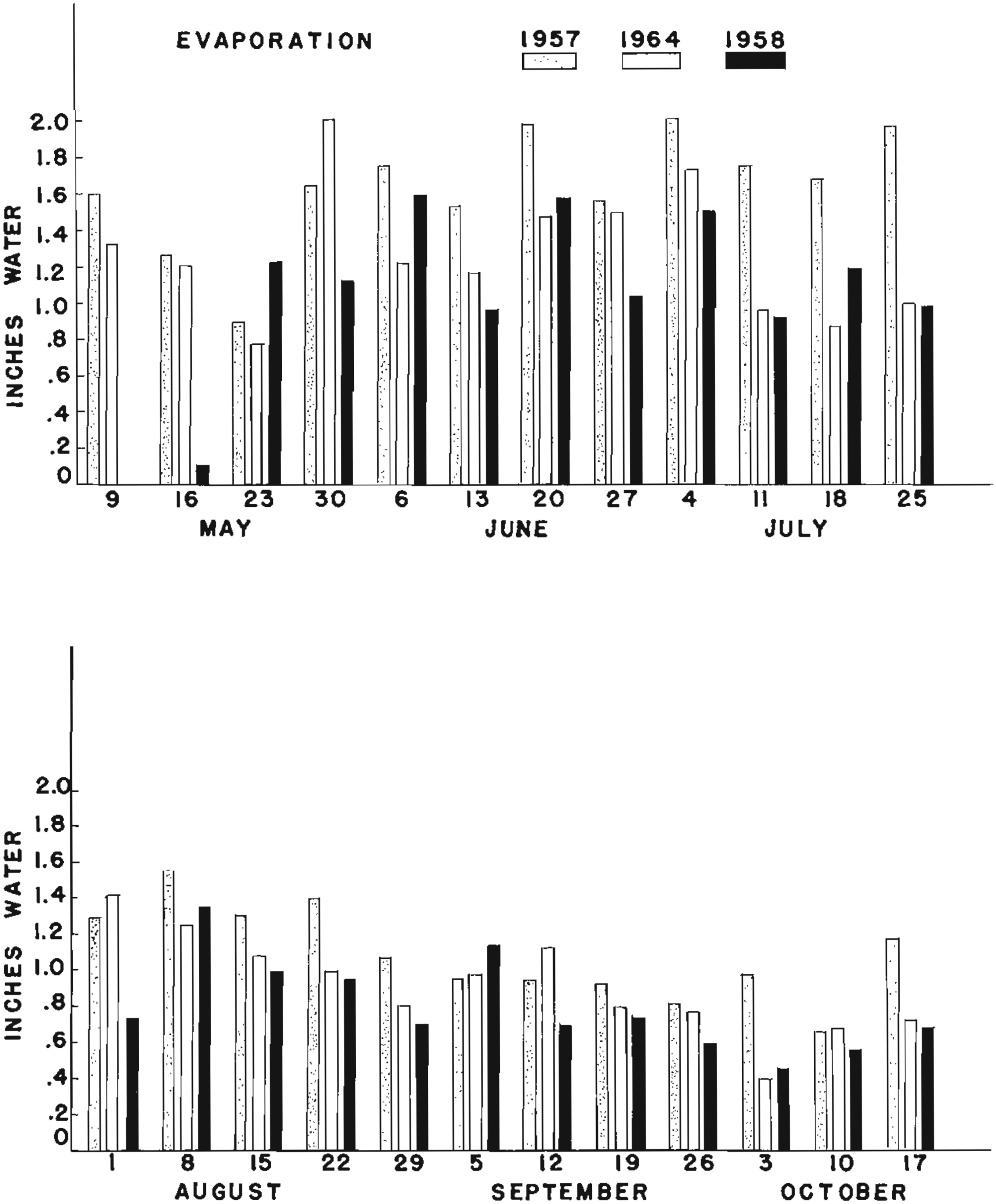

Figure 14 – Weekly free water evaporation measured at Coventry in 1957, 1958 and 1964.

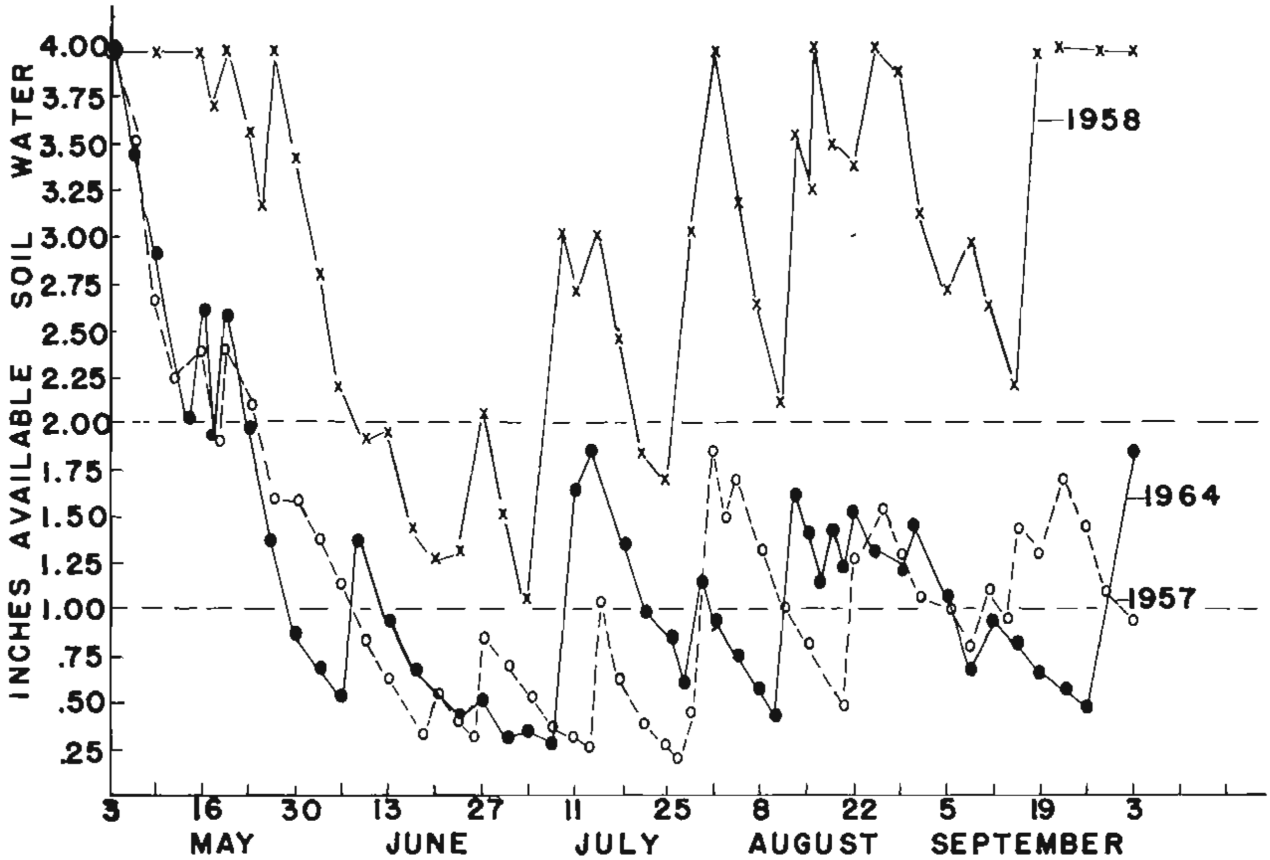

Figure 15 – Daily course of estimated available soil water in soils holding 4 inches of available water in root zone at Coventry for 1957, 1958 and 1964.

SUMMARY

In most years short periods of dry weather are common in Connecticut, especially in late summer and early fall. In only eight growing seasons since 1894 were there extended dry periods. The most prolonged were in 1957 and 1964. Over the state as a whole precipitation for May 3 to October 31 was below average in all but three of the weeks of both years. Droughts as severe as those of 1957 and 1964 can be expected with a frequency of 1 year in 30.

In 1957 there were wide variations in precipitation deficiency from area to area. The least rainfall occurred in Windham and northern Hartford Counties. In 1964 precipitation deficiencies were uniform throughout the state, except in the Central Plain. There, precipitation averaged only 50 percent of the amounts received in each of the other five climatological divisions from August 2 to September 26.

Soil water available for plant use at eight locations in the state was estimated by a daily bookkeeping system, with rainfall the deposit and evapotranspiration the withdrawal. Three assumptions were made: the soil was at field capacity on May 3, 1964; the rate of evaporation from a free water surface measured at Coventry was a measure of potential evapotranspiration for the entire state; and the actual evapotranspiration became progressively less than potential evapotranspiration as the water in the soil available for plant use decreased. Rainfall was measured at each of the eight locations.

These estimates of available soil water indicated that drought conditions existed in most of the state from May 23 to October 3. All locations had at least eight weeks of severe drought; and three had severe drought for 12 weeks. The driest weather occurred in coastal Fairfield County.

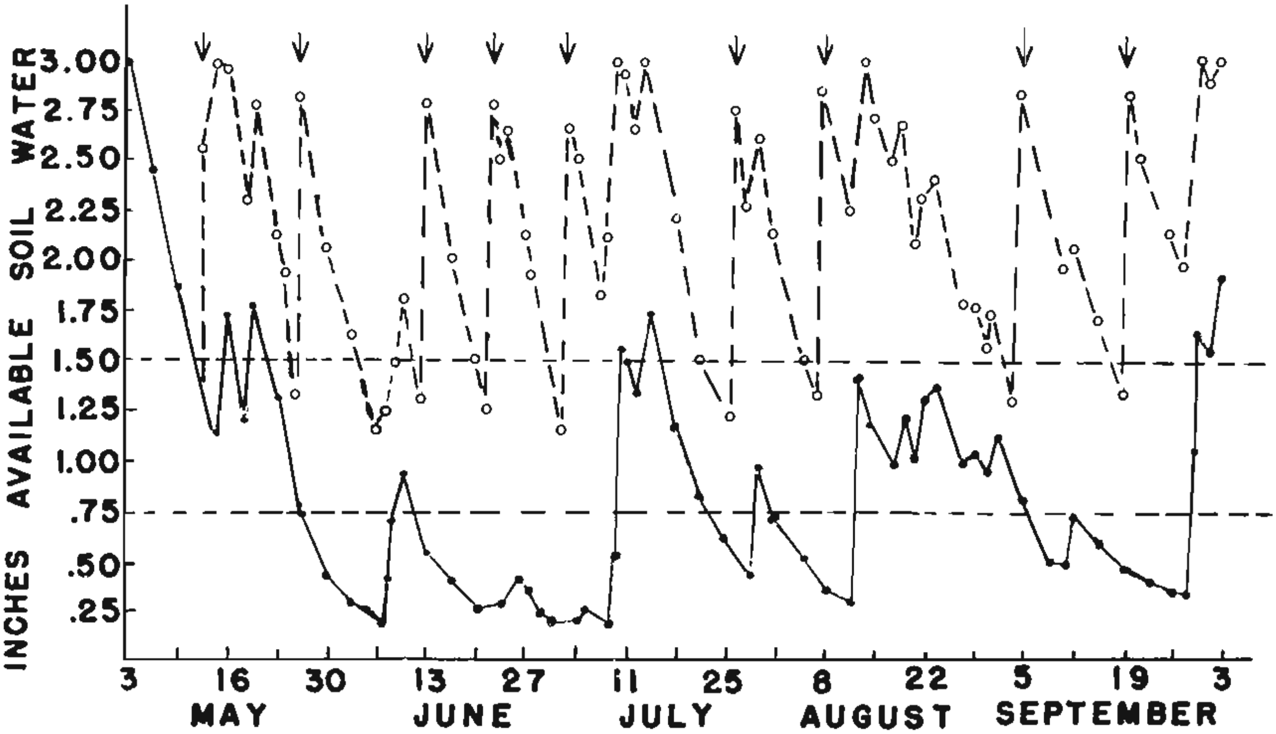

Figure 16 — Daily course of estimated available soil moisture in soils holding 3 inches of available water at Coventry. The solid line is for soils which were not irrigated. The dotted line is for soils which were irrigated with 1.5 inches of water each time the available water dropped below 2 inches. Arrows indicate estimated dates of irrigation.

It was possible to predict when different crops needed irrigation through the use of a daily bookkeeping system.

A large percentage of the high value crops, such as tobacco, vegetables, and potatoes, were irrigated and yields were near normal. However, frequent irrigation increased the cost of production. Where no or inadequate irrigation was used, crop damage was heavy. Dairy farmers suffered heavy losses—as much as 40 percent lower pasture and hay yields. Non-irrigated nursery and ornamental plants failed to make the expected increase in size and related value.

A comparison of the soil moisture conditions during the two drought years, 1957 and 1964, indicated similar lengths of dry periods for both years. However, the more severe crop damage in 1957 over 1964 was attributed to higher rates of evaporation and higher temperatures.

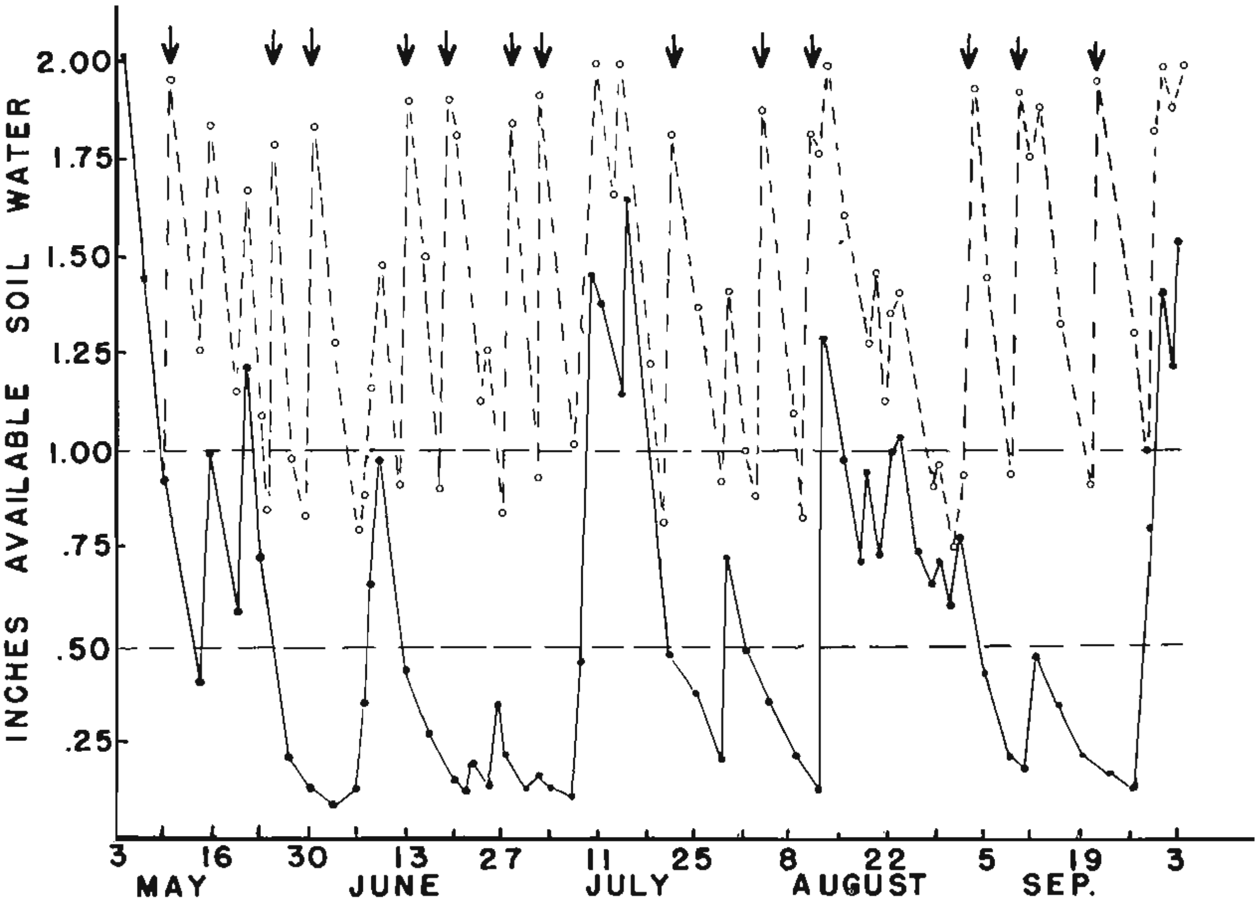

Figure 17 — Daily course of estimated available soil moisture in soils holding 2 inches of available water at Coventry. The solid line is for soils which were not irrigated. The dotted line is for soils which were irrigated with 1.0 inches of water each time the available water dropped below 2 inches. Arrows indicate estimated dates of irrigation.

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Progress Report 42—*Predicting Need for Irrigation by Measuring Loss of Water from Atmometers,* July 1960—B. E. Janes.

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