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E.M. 3418
November 1970

ALFALFA IRRIGATION

COOPERATIVE EXTENSION SERVICE • COLLEGE OF AGRICULTURE • WASHINGTON STATE UNIVERSITY • PULLMAN
In cooperation with the United States Department of Agriculture
Issued in furtherance of the Acts of May 8 and June 30, 1914, by the Washington State University
Cooperative Extension Service, John P. Miller, Director

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Introduction

Most of the alfalfa produced in Washington State is irrigated. Because it is a deep rooting plant, it has the ability to survive long periods between irrigations. Maximum production of high quality alfalfa can be obtained, however, only by timely application of the proper amounts of water. Improper irrigation management is the primary cause of low yields in Washington State.

Water Requirements

Alfalfa is a high water use crop because it has a long growing season and a dense mass of vegetation.

Water use varies with such weather conditions as temperature, wind, humidity, and the amount and intensity of light. Needs vary within the State and from year to year.

The amount of water needed is governed by the above factors but irrigation requirement is influenced by rainfall and the water-holding capacities of the soils growing the crop.

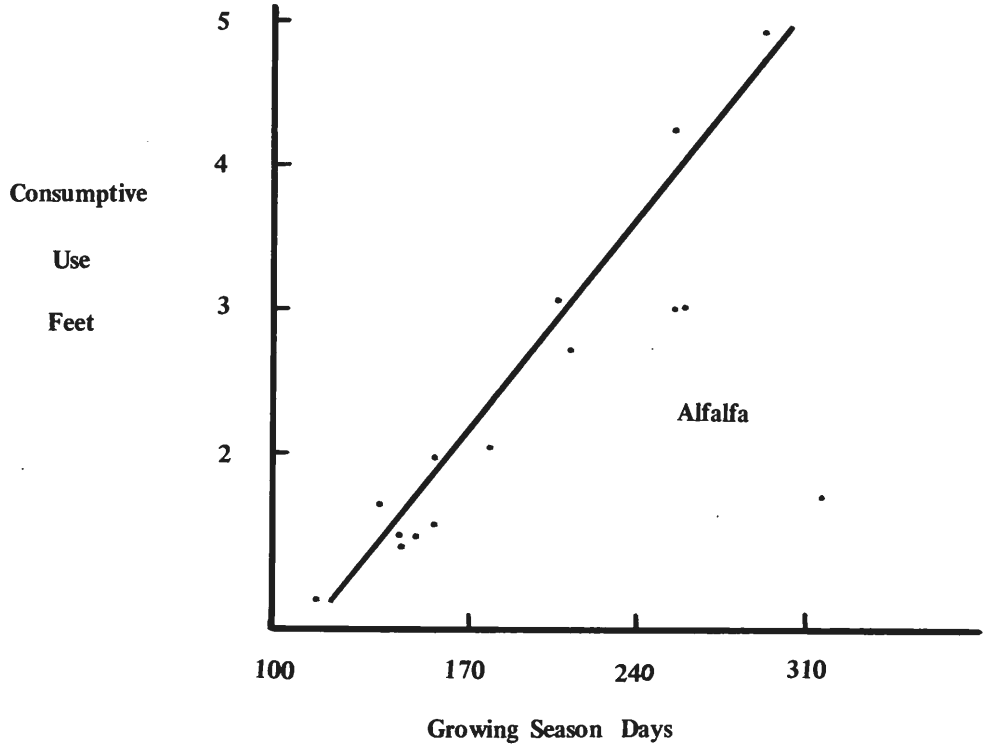

Figure 1. Water use varies with season length.

Table 1 gives ranges of irrigation requirements for several locations within the State. They are based on 30 years' weather records and are due to expected weather influences on evapotranspiration minus expected rainfall during the growing season. The maximum requirements should not be expected to occur over 1 time in 20 years. The minimums usually occur 1 out of every 2 years. Stored moisture from winter precipitation is not included, nor are allowances given for losses or inefficiences in applying water.

Table 1. Range of Irrigation Requirements for Alfalfa

Location	Inches	Location	Inches
Bellingham	19-24	Prosser	43-45
Centralia	26-30	Pullman	26-32
Colville	27-33	Puyallup	22-28
Dayton	31-37	Quincy	36-47
Ellensburg	30-36	Ritzville	32-38
Ephrata	46-50	Sequim	23-28
Goldendale	28-33	Spokane	29-37
Kennewick	44-50	Vancouver	31-35
Lacrosse	30-36	Walla Walla	39-47
Lind	36-38	Wapato	44-48
Odessa	31-38	Waterville	31-31
Omak	34-41	Wenatchee	41-46
Oroville	37-41	Wilbur	26-32
Othello	37-42		

Some moisture can be obtained from soil reserves where winter precipitation is retained in the soil profile. This source should be considered when designing irrigation systems and projects.

> Example: Water-holding capacity of Shano very fine sandy loam: 0-72 inches = 19.7 inches.

Fifty percent of the available water can be used without serious yield loss. Fifty percent x 19.7 inches = 9.8 inches can be subtracted from the irrigation requirement if this much is replenished by natural means.

Moisture Levels Affect Yield and Quality

Research has not provided specific moisture level recommendations for every soil and condition. During cool periods of low plant water demands, soil moisture levels need not be as high as during periods of high demands.

It appears that 50-65% of the available soil moisture can be removed between irrigations early and late in the season, but only 35-50% removal will give better results during high water use periods. Maintaining higher levels, especially with slow draining soils, may cause loss of stand and competition from grass invasion.

Texture and depth of soil have little influence on water requirements of alfalfa but these factors affect the amount of moisture which can be stored. Amount of moisture stored affects frequency of irrigation and the amount to apply at each irrigation.

Table 2. Examples of Typical Soils in Central Washington

Soil Type	Depth	Available Water	Allowable Use to 50% Depletion	No. of Irrigations Required to Apply 46" of Water
Shano vfsl	72"	19.7"	9.8"	5
Timmerman lfs	72"	9.4"	4.7"	10
Taunton vfsl	48"	12.2"	6.1"	8

Rooting Depth

Individual alfalfa taproots may exceed 20 feet in length but the active feeder roots are located closer to the surface. The effective rooting depth is about 6 feet where no restrictive layers or conditions exist. When provided with a satisfactory level of moisture, an alfalfa plant will extract moisture in approximately the following manner:

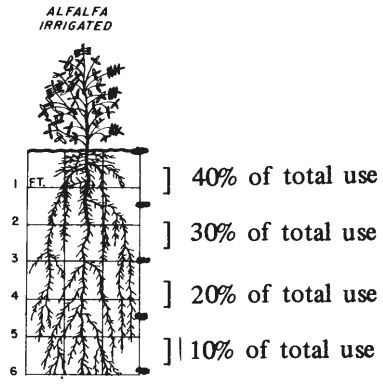

Figure 2.

Irrigation Management

Scheduled irrigations involve some systematic method to determine when and how much water to apply. Irrigating a predetermined number of times per cutting and with the same amount of water or on certain dates regardless of weather conditions will not usually produce maximum yields.

One of the most practical methods of scheduling involves estimating plant use by measuring evaporation from standard U.S. Weather Bureau evaporation pans. Alfalfa water use and evaporation is approximately on a 1:1 ratio (one inch is used by the crop while one inch evaporates from the pan). Under surface irrigation the water-holding capacity of the soil must be known to use this method. This system works particularly well with well-designed sprinkler systems since it is easy to compute the amount of water being applied. Evaporation stations for irrigation scheduling are operating at 15 locations in Washington. Many newspapers and radio stations report evaporation data during the irrigation season. Ask your Extension Agent for details and for a copy of Ext. Cir. 341, "Scheduling Irrigations from Evaporation Reports."

Soil moisture tensiometers are reliable and practical instruments but must be used with care for alfalfa irrigation scheduling. Tensiometers are not reliable at levels drier than .7-.8 bars (70-80 centibars, which is the unit used on most tensiometers with 0 being wet). Two tensiometers should be located at each site with one at about 18 inches and the other at 36 inches. When the 18-inch tensiometer reaches 70 centibars, it is time to irrigate most soils. Figure 3 shows relationship of available water and soil suction. When 70 centibars' suction has been reached on a fine sandy loam, about 70% of the available water has been depleted. E.M. 3078, "Making and Using Soil Moisture Tensiometers," provides more detail on use of this method.

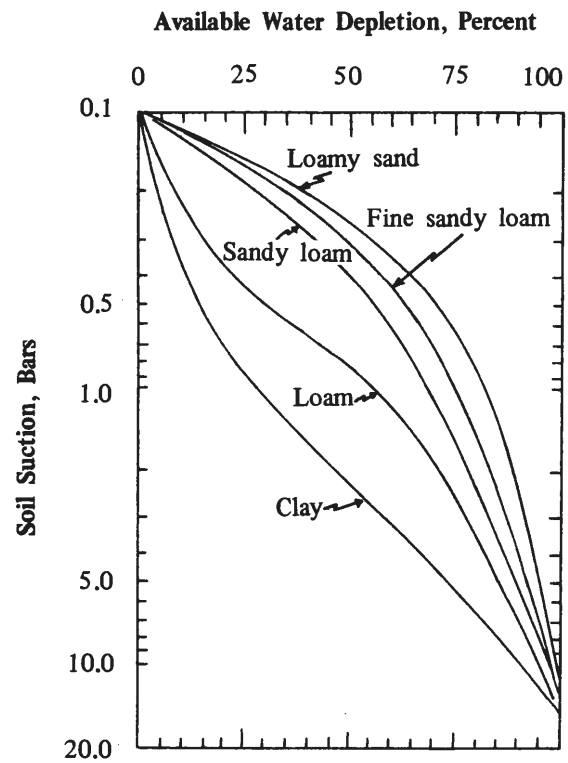

Figure 3. Water retention curves for several soils plotted in terms of percent available water removed.

On low water-holding soils, hay cutting periods and irrigation scheduling take extra planning. Quick hay removal is needed because most sprinkler systems are not designed to allow many days' shutdown. Water use is some less immediately after cutting but quickly reaches normal levels.

Under most conditions, an irrigation just prior to cutting will increase tonnage for the succeeding crops by allowing a faster regrowth. Under surface methods of irrigation, good furrows are needed for efficient irrigation when applying water at this stage.

Late fall irrigation may be desirable on low water-holding soils. Dry soils during winter months cause stand declines.

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