Principles of Alfalfa Production in Central Oregon

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PRINCIPLES OF ALFALFA PRODUCTION IN CENTRAL OREGON

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INTRODUCTION

Alfalfa hay yields in Central Oregon are only about one-half of their potential level. Annual yields of 4 to 5 tons per acre have been considered to be very good, but if the best known establishment and management practices are conscientiously applied, much higher yields are possible. Studies done at the Central Oregon Experiment Station, Redmond have clearly shown that more than 8 tons of hay per acre can be produced (11). This report discusses aspects of soil conditions, seed inoculation, seeding, weed control, irrigation, cutting time, and spring and fall management that require attention to increase production.

ESTABLISHING THE STAND

Optimum alfalfa production begins with a well-established stand. Poor establishment practices result in poor stands, but cost about the same as if the job had been done right. Long-lived, high-yielding stands can be established successfully by considering several aspects of establishment and following proven procedures.

Soil Conditions

Soil Testing

Determine soil fertility levels and fertilizer and lime needs with soil tests. Have soils tested before seeding and at regular intervals during the life of the stand. Follow soil test recommendations to maintain high soil fertility levels for optimum forage production. The cost of a soil test is insignificant in comparison to the loss in yield that occurs when soil nutrient levels are too low.

Fertilizers

Alfalfa varieties with high yielding capacity reach their full potential only when growing on fertile soils. Fertilizer applied to alfalfa can return as much on investment as cultivated crops do. When alfalfa is harvested, nutrients are removed from the soil in the amounts shown in Table 1. Few soils can supply large amounts of required nutrients for very long without fertilizer applications. If maintenance fertilizers are not applied, sooner or later yields decrease, and run-down alfalfa stands full of grass and weeds result.

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Table 1. Plant nutrients removed from soils in 1 ton of alfalfa hay.

Plant nutrient	N	P	K	Ca	Mg	S
Removal, lb/acre	50	5	50	35	6	5

Adapted from Rhykerd, C. L., and C. J. Overdahl (15).

Nitrogen (N) is one of the nutrients used in greatest amounts by alfalfa. It is extremely important for both forage quality and yield. It forms a major part of proteins and chlorophyll, and is essential for photosynthesis, growth, and reproduction. Alfalfa normally obtains most of its nitrogen from air through the symbiotic relationship with rhizobia (nitrogen-fixing bacteria) that live in nodules on the plant roots. One of the main advantages of growing alfalfa is that nitrogen fertilizer should not have to be applied. If establishment and management practices are faulty, plants and rhizobia may be stressed by adverse soil and moisture conditions, and nitrogen fixation will decrease or stop completely. Under these circumstances, part or all of required nitrogen must be supplied with fertilizer.

Studies at the Central Oregon Experiment Station have shown that the practice of routinely applying nitrogen fertilizer when seeding alfalfa or on established stands interferes with normal nodulation of the plants. Table 2 shows that 50 pounds of nitrogen applied at seeding decreased already low alfalfa nodulation by 50 percent or more. Applied nitrogen replaces rather than supplements, the nitrogen that normally would be fixed from the air free of charge (27).

Table 2. Effect of nitrogen (N) fertilizer on nodulation of alfalfa seedlings grown on Deschutes sandy loam at Redmond, 1976.

Alfalfa variety	Rate of N fertilizer	
	None	50 lb/acre
	---% nodulated plants---	
Vernal	42	14
Anchor	48	24

Seeds were inoculated with Northrup King & Co. Noculator peat inoculant in a 25% sugar slurry immediately before planting. Plants were 5 weeks old when examined for nodules.

Plants require phosphorus (P) in photosynthesis, energy transfer, and in production and breakdown of carbohydrates. It is a key element in growth and cell division, and concentrates in young actively growing tissues. Since these tissues are the most palatable and nutritious, highest quality forage only results when phosphorus supply is adequate. Phosphorus is especially critical for normal root development and seedling establishment (2,23).

Phosphorus is one of the nutrients most generally deficient in soils. A soil test value of 15 ppm phosphorus is considered to be satisfactory for optimum alfalfa growth in Central Oregon. In a 1974 soil-test survey of 42 Central

Oregon alfalfa fields, only 19 had levels of 15 ppm or more. Eight ranged from 11 to 14 ppm, and 15 ranged from 5 to 10 ppm. This indicated that production on 55 percent of the alfalfa fields in the area could be increased with phosphorus fertilization (5,12).

Potassium (K) is essential for many plant processes and promotes development of winter hardiness. If sufficient potassium is not available in the soil, alfalfa stands rapidly thin out and are invaded by grasses and weeds. A soil test value of 150 ppm potassium is considered to be adequate for optimum alfalfa growth in Central Oregon. In a 1974 soil-test survey of 42 Central Oregon alfalfa fields, 12 percent had potassium levels lower than 150 ppm (17).

Almost all soils in the area require annual sulfur applications. Although only 5 pounds of sulfur are needed to produce 1 ton of alfalfa hay, sulfur (S) leaches from Central Oregon soils. Consequently, 50 to 100 pounds of sulfur per acre should be applied each year, depending on soil texture; sandy soils require larger amounts than loam soils. Apply sulfur in fall, spring, or early to midsummer, preferably in two 50-50 split applications to minimize leaching losses. Soils having pH levels of 7.5 or less should receive sulfur as gypsum or as contained in ordinary superphosphate, so that soil pH is not lowered as would happen if elemental sulfur were applied. Apply sulfur in the elemental form on soils with pH levels higher than 7.5.

Lime

Lime corrects soil acidity and supplies calcium (Ca) and magnesium (Mg). It also affects the availability of almost all essential nutrients, promotes growth of microorganisms, decreases the solubility of toxic elements (aluminum and manganese), and increases the efficiency of applied fertilizers (7,8,9,15).

Alfalfa is one of the most sensitive legumes to acid soil conditions. This is because the kind of rhizobia that nodulates alfalfa is extremely sensitive to soil pH level. Alfalfa plants can grow well under moderately acid conditions if they are supplied with nitrogen fertilizer. Nodulation and nitrogen fixation by rhizobia, however, are greatly reduced at soil pH levels below 6.0. A study done by the Central Oregon Experiment Station showed that alfalfa nodulation and yield increased greatly as a result of liming a moderately acid soil of pH 5.5. Table 3 shows that highest percentages of nodulation were observed at pH levels of 6.4 to 7.3. Highest yields resulted at pH levels of 6.8 to 7.3.

Apply rates of lime recommended by soil tests. Since lime reacts slowly in soils, apply it at least 6 months before seeding. Lime also can be topdressed on alfalfa at any time, but it is best to mix it thoroughly with soils in the rooting zone. One of the best methods of applying lime is to broadcast one-half of the required amount on the soil surface before plowing. The remaining lime is applied after plowing and is disced into the soil.

Table 3. Effects of liming a Deschutes sandy loam soil on Thor alfalfa nodulation and yield at Cloverdale, 1976.

Soil pH, nodulation, and yield	Lime, ton/acre					
	0	1	2	4	6	8
Soil ph	5.5	6.0	6.4	6.7	6.8	7.3
% nodulated plants	14	58	86	68	77	80
Dry forage yield, T/acre	0.5	0.8	0.8	0.8	1.2	1.1

Lime was applied in December 1975. Alfalfa was seeded in June 1976. Seeds were inoculated with Nitragin Co. peat inoculant in a 25% sugar slurry immediately before planting. Plants were 5 weeks old when examined for nodules. Yield is from one harvest made in August 1976.

Seedbed Preparation

Seedbeds should be moist and firm, with some looseness at the surface to cover seeds. Compact seedbeds before and after seeding; a firm seedbed maintains soil moisture for seedling roots. Sandy soils especially should be firm because they lose moisture rapidly if they are loose. If a soil crust forms over seeds, seedlings have firm soil to push against, and can break through the crust; seedlings emerging from loose soil under a crust may actually push themselves deeper into the soil. Irrigating before seeding helps to firm seedbeds and makes inoculation more effective (26).

Inoculation

As a legume, alfalfa is able to use or "fix" nitrogen from the air. Enough nitrogen may be fixed for its own growth and for other plants growing with it or following in rotation. This nitrogen would otherwise have to be applied as fertilizer.

Soon after alfalfa begins growing, bacteria called rhizobia enter tiny root hairs of the plants. The rhizobia multiply in large numbers and form growths called nodules on the roots. A partnership or symbiosis is established in which plant and rhizobia live together to their mutual advantage. Plants provide food and protection for the rhizobia, which fix atmospheric nitrogen and make it available to plants. The amount of nitrogen fixed depends on alfalfa variety,effectiveness of the rhizobia, and soil moisture and fertility conditions (10).

Failure to achieve effective nodulation is a major problem in establishing and maintaining productive alfalfa stands in Central Oregon. Without effective nodules, plants suffer from nitrogen deficiency, yields decrease, and the stand rapidly degenerates. Therefore,it is absolutely essential to inoculate seed with a vigorous and effective strain of rhizobia to nodulate the plants so that nitrogen fixation occurs at high rates.

Seed either can be preinoculated before it is sold or can be inoculated on the farm just before planting. Preinoculated seed must be fresh and stored under cool conditions from time of manufacture until planting. Preinoculated seed that is not fresh or that has been exposed to warm temperatures may carry low numbers of live rhizobia and may be worthless as far as nodulation is concerned. If seed will be inoculated on the farm do not buy preinoculated seed, because preinoculation increases the price of the seed.

Follow these steps to successful nodulation:

1. Inoculants are cultures of live rhizobia and must be treated as perishable living things that die rapidly when exposed to warm temperatures. Use only fresh inoculants that have been kept under refrigeration until planting time. If the inoculant has not been stored under refrigeration where it is sold, do not buy it. Insist that managers of businesses selling inoculants refuse delivery of inoculants if they have not been maintained under refrigeration from time of manufacture until delivery for sale.

   Do not use inoculants after the expiration date of the package. Sufficient numbers of live rhizobia are present in packages for about 4 months from time of packaging if kept under refrigeration, and for only 3 to 4 weeks without refrigeration.

2. In spite of directions usually found on inoculant packages, dry application of inoculant does not work. Only about 20 percent of the dry material sticks to seeds, and survival of rhizobia on seeds decreases when applied dry. Apply inoculants either as Pelinoc or in a 25 percent sugar slurry. The Pelinoc system (developed by The Nitragin Company, 3101 W. Custer Ave., Milwaukee, WI 53209) applies large numbers of rhizobia per seed in an adhesive compound that provides nutrients and prevents drying of the rhizobia to insure their maximum survival. Apply it according to instructions furnished with the Pelinoc materials.

   Use of a sugar slurry also increases survival of rhizobia on seeds. Suspend the inoculant in about a quart of 25 percent sugar solution (one cup of sugar per quart of water) for each 100 pounds of seed. Use two or three times the amount of inoculant specified on the package; it is not possible to over-inoculate. Just before planting, mix the slurry and seed together thoroughly, before placing it in the seeder box. Add the slurry to the seed slowly so it does not get too wet. If the seed becomes too moist for planting, add small amounts of finely ground limestone to soak up the excess moisture. With this method of inoculation, it is best to recalibrate the seeder to be certain the desired amount of seed is being sown.

3. Inoculate in the shade--never in direct sunlight--because ultraviolet rays in sunlight kill rhizobia.

4. Plant the seeds as soon as possible after inoculation (3,4,6,16,25).

Seeding Rate

Twelve to 15 pounds of seed per acre are sufficient to obtain a dense stand. Use only good seed, having high percentages of purity and germination (2,19,22,28).

Seeding Depth

Alfalfa is best sown ¼ to ½ inch deep on heavy soils and ½ to 1 inch deep on sandy soils. Sowing deeper than 1 inch is fatal to seed as small as alfalfa unless covered by loose soil. Even when seedlings emerge from deeper planting, they are so weakened that survival decreases. Sometimes certain conditions, such as in sandy soils, require that seed be sown deeper, but the hazard is always greater. Compact the seedbed before and after seeding, expecially on sandy soils (26).

Irrigation

Dry soil conditions kill more alfalfa seedlings than any other cause. Alfalfa seeds are small and must be sown near the soil surface, which may dry out rapidly. Soil moisture may be sufficient to germinate seeds, but seedlings may die if the soil surface dries before they root enough to become established. Irrigate as frequently as necessary to keep the soil moist during establishment (13,21).

Seeding Time

The best times for seeding alfalfa in Central Oregon are in spring and late summer. Spring seedings made during the first week of June usually are not damaged by late spring frosts and become established well enough to survive the high temperatures of July and August. Late summer seedings made before August 15 usually become established well enough to resist heaving by frost in the following fall and winter.

Weed Control

Spring seedings must be made either with a herbicide or a companion crop to control weeds. EPTC (Eptam) herbicide provides good control of annual grass and broadleaf weeds. Apply it according to instructions on the container label at rates of 2 pounds per acre on light sandy soils and 3 pounds per acre on heavier soils (1). Spring seedings made with a herbicide may be harvested in late summer; yields usually range between 1 and 2 tons of hay per acre. If an oat companion crop is used, seed only about 50 pounds of oats per acre and remove the oats as soon as possible as oat hay. If companion crops are seeded too thickly, fertilized heavily with nitrogen, or allowed to remain on the field too long, they may compete so severly with alfalfa seedlings for water, nutrients, light, and space that the stand would be reduced.

Late summer seedings usually are not bothered by annual weeds, because weather and light conditions at this time discourage their growth. Seedings may be made in the stubble of oat-hay crops; the production and income during the alfalfa seeding year resulting from this method may be considerably more than that obtained by spring seeding. Table 4 presents first-year results of a study on the effects of seeding time and method on forage production during the alfalfa seeding year at the Central Oregon Experiment Station. Although total forage yields were similar from alfalfa sown in spring with a companion crop or with herbicide, a denser stand formed with the herbicide treatment. Alfalfa sown in late summer in the stubble of an oat-hay crop became well established by the end of the season. The amount of forage produced by this method, however, was about twice that produced using a companion crop or herbicide. Consequently, income during the establishment year from the sale of hay produced by this method, would be almost double that from spring seedings.

Table 4. Effects of alfalfa seeding time and method on forage production during the alfalfa seeding year at Redmond, 1976.

	Spring seeding with				Late summer seeding in oat-hay stubble
	Oat companion crop			Eptam herbicide	
Variety	Alfalfa	Oat hay	Total	Alfalfa	Oat hay
	dry forage yield, tons/acre				
Vernal alfalfa	0.5*	1.8	2.4	1.8	
Anchor alfalfa	0.6	1.7	2.3	2.4	
Park oats					4.3**

*Totals of two harvests made August 10 and September 21; no nitrogen fertilizer applied; alfalfa and Park oats seeded on June 3.

**Harvested July 20; oats seeded at 90 pounds per acre on April 16; 100 pounds of nitrogen applied per acre; treated with 2, 4-D herbicide to control broadleaf weeds; alfalfa seeded in oat-hay stubble on August 4.

MANAGING THE STAND

Managing alfalfa for maximum production and persistence in Central Oregon is more difficult than in other northern areas of the United States. Dry, hot summer conditions require careful and correct irrigation practices. Cold winters, without continual snow cover and with freezing and thawing conditions, make fall management especially critical. Soils vary widely in depth, drainage, texture, water-holding capacity, and fertility; this makes it very difficult to achieve and maintain correct soil conditions for alfalfa. If the best known management practices are carefully followed, however, environmental effects can be minimized.

Irrigation

A major problem of alfalfa management in Central Oregon is achieving proper irrigation. Much of the alfalfa grown in the area is not irrigated properly. On a given summer day many fields or parts of fields can be found in which alfalfa plants are at or near the wilting points. After each cutting, bales of hay are left on fields for excessive lengths of time, during which no irrigation can be applied. This practice not only slows plant regrowth, but also kills plants by smothering and lack of sunlight beneath the bales. Plants require adequate moisture for normal growth; water deficiency for any length of time reduces yield and promotes early maturity. Central Oregon soils generally are shallow and have low water-holding capacities; moisture conditions in such soils change rapidly. Consequently, irrigations should be made when available mositure reaches 50 percent of the soil's water-holding capacity (18).

If soil water-storage capacity and effective rooting depth of the plants are known, pan evaporation rates obtained at the Central Oregon Experiment Station (Figure 1) can be used to predict irrigation needs. Available water-storage capacities for major soils in Central Oregon are shown in Table 7. Effective rooting depth of alfalfa varies with soil depth, but alfalfa obtains most of its moisture from the top 2 feet of soil.

Table 7. Available water-storage capacities of major soils in Central Oregon.

Soil type	Avg. available water-storage capacity	Location, county
	in/ft	
Agency sandy loam	2.2	Crook, Deschutes, Jefferson
Agency loam	2.2	Crook, Deschutes, Jefferson
Deschutes loamy sand	1.5	Crook, Deschutes
Deschutes sandy loam	1.7	Crook, Deschutes
Lamonta loam	1.7	Crook, Deschutes, Jefferson
Madras sandy loam	2.2	Deschutes, Jefferson
Madras loam	2.3	Deschutes, Jefferson
Metolius sandy loam	2.4	Crook, Deschutes, Jefferson
Ochoco sandy loam	2.4	Crook
Prineville sandy loam	1.6	Crook
Willowdale loam	2.9	Jefferson, Wasco

Adapted from Simonson, G. H., and M. N. Shearer (18).

As an example of how to calculate irrigation needs, a Deschutes loamy sand stores 1.5 inches of water in each foot of soil profile. If the soil is 2 feet deep, the most it can hold is 3 inches of water. In a shallow, light-textured soil such as this, it is necessary to irrigate when soil moisture reaches 50 percent of field capacity, or 1.5 inches of available water. The pan evaporation rate between July 22 to 31 is about 0.31 inches of water per day. At this rate, evapotranspiration would remove 50 percent of the water from the profile in 5 days. Therefore, the maximum interval between irrigation sets would be 5 days--as long as the pan evaporation rate remained at 0.31 inches per day. With longer intervals between sets, the plants would be under moisture stress after 5 days, and yields would be reduced. Each irrigation set should apply 1.5 inches of water to fill the soil up to its water-storage capacity.

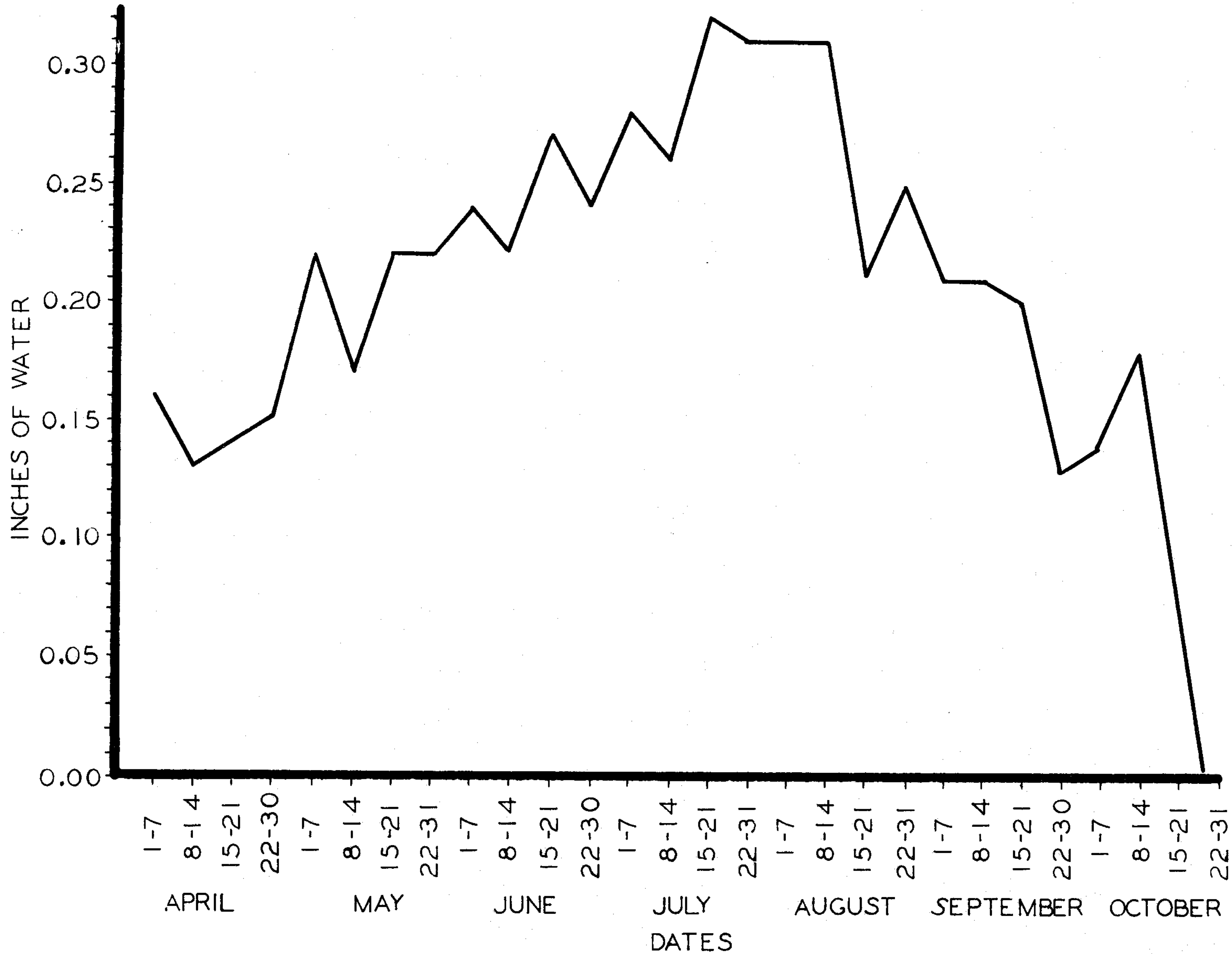

Figure 1. Average (1970-1975) pan evaporation rates at Central Oregon Experiment Station, Redmond.

From Figure 1 it is clear that intervals between irrigation sets should vary as the pan evaporation rates change during the growing season. It should be noted that pan evaporation rates are closely related to water loss from complete crop cover. Obviously, water loss is less from a developing crop such as in early spring or after alfalfa has been cut. Consequently, the pan evaporation values used to schedule irrigations during such periods of growth should be adjusted downward by using an estimated factor of 0.85. For example, the pan evaporation rate for June 1 to 7 is 0.24 inches per day. Since the alfalfa crop is developing during this period, the actual water loss would be less than that from a complete crop cover. The adjusted pan evaporation rate for this growth period would be 0.85 x 0.24 = 0.20 inches per day. At this rate, the Deschutes loamy sand soil used in the example above, would lose 50 percent of its available water in 7.5 days (1.5/0.20= 7.5). Irrigations during this growth period would be scheduled every 7.5 days and would apply 1.5 inches of water per irrigations set (8).

Be careful to apply only the amount of water that a soil can hold. Not only is it inefficient to over-irrigate, but it harms alfalfa growth (Figure 2) and leaches plant nutrients from the soil. A common practice is to use long sprinkler irrigation sets of 12 to 24 hours and long intervals of 10 to 12 days between sets; depending on the soil, this can severly damage alfalfa. During and shortly after irrigation, the soil may reach the saturation point. By the time of the next irrigation, available soil moisture may be depleted to the wilting point. Any time wilting or saturation points are reached, hay quality and yield decrease (14).

Irrigate alfalfa fields to their water-holding capacities in the fall, so the plants have enough moisture to live on over winter.

Fertilizing Established Stands

Have soil tested periodically during the life of stands to maintain soil fertility at optimum levels for maximum yields. Topdress annually with sulfur, phosphorus, and potassium as needed. Oregon State University publishes Fertilizer Guides that are revised as research refines information. Guides are available at county Extension offices for use in determining maintenance fertilizer needs.

Cutting Time

An understanding of the trend of available carbohydrate root reserves in alfalfa is essential for its correct cutting management. Plants use reserves to produce new growth and for energy for many life processes. Storage and use of reserves follows a cyclical pattern. When growth begins in spring or after the plant has been cut or grazed, root reserves are used to produce new top growth. Reserves continue to be drawn upon until the plant has produced about 8 inches of top growth. Enough carbohydrates are then formed by photosynthesis so that reserves begin to be replenished. Maximum storage of carbohydrates in the roots is reached at about the full bloom stage.

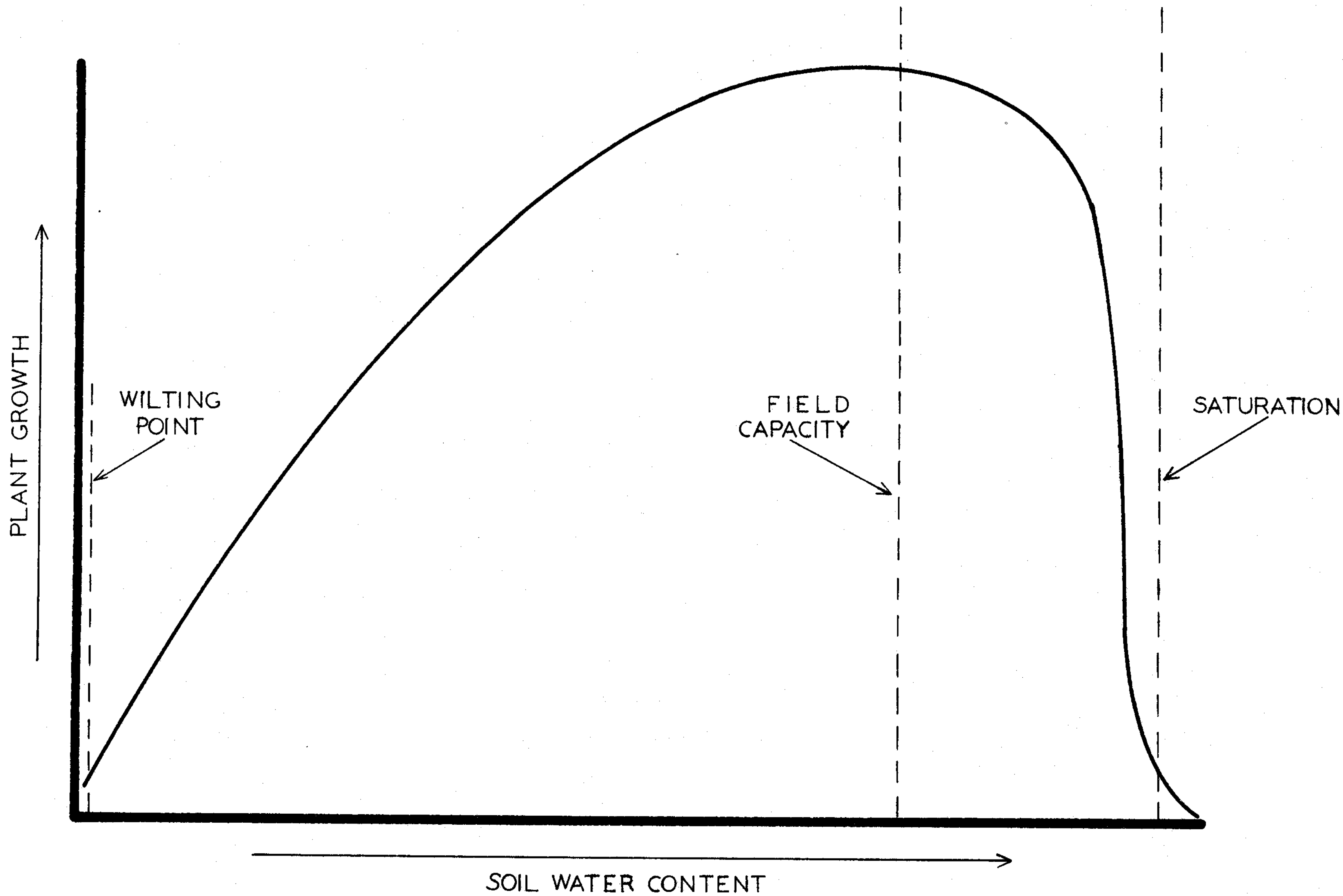

Figure 2. The relation of alfalfa growth and soil water content. Adapted from Peterson, H. B. (14).

When alfalfa is cut at full bloom regrowth is rapid and productivity and persistence of plants are more easily maintained. Cutting at full bloom permits plants to recover from effects of stress due to over-wintering, improper irrigation, or disease.

Although delaying cutting until full bloom is best for plants, the resulting hay has lower quality than that from earlier cutting. If winter hardy, bacterial wilt-resistant varieties are used, it is possible to cut early for better hay quality without reducing productivity and persistence of the stand. The 10 percent bloom or first-flower stage is the optimum time to cut alfalfa for highest yields of nutrients, protein and minerals (Figure 3). Even though root reserves are not at a maximum level, they are high enough so that plants are not damaged.

Cutting according to plant maturity takes into account differences due to varieties, locations, and years. In this sense, it is more satisfactory than cutting according to calendar date or time interval. Growth of new crown shoots also should be considered in deciding when to cut. In Central Oregon, frosts can occur at any time that would stop the flowering process and eliminate it as an indicator of when to cut. If crown shoots begin to elongate to the point where they would be cut off if cutting were to be delayed further, the stand should be harvested. No matter when a cut is made, the hay should be removed from the field as soon as possible and irrigation should begin (Figure 3).

Spring Management

Early spring management is very important in maintaining productivity and persistence, especially if the stand has been damaged during the winter. Stands may be injured during winter when warm periods are followed by below freezing temperatures. If an injured stand is cut too early in spring, yields of subsequent harvests will be reduced and the stand will rapidly degenerate. Disease-resistant varieties usually recover from winter injury if the first cut is delayed until full bloom. Subsequent cuts may be made at 10 percent bloom. If the stand has not been damaged during the winter, all cuts should be made at 10 percent bloom, unless crown shoots elongate excessively before that time. Injured stands that must be cut at first flower every cutting to meet hay quality requirements, probably will need to be reseeded every 5 years.

Fall Management

Four to 6 weeks before the first killing frost of autumn is a critical period in the alfalfa management; alfalfa should not be cut during this time. Eight to 10 inches of top growth are needed during the entire period to produce enough carbohydrates for storage in crowns and roots. Stored reserves are used to develop cold resistance, to live on during the winter dormant period, and to begin regrowth in spring; about 50 percent of the stored reserves are used during the winter. If alfalfa begins the winter with low levels of reserves, winter survival decreases and the number of crown buds and rhizomes that produce spring regrowth declines.

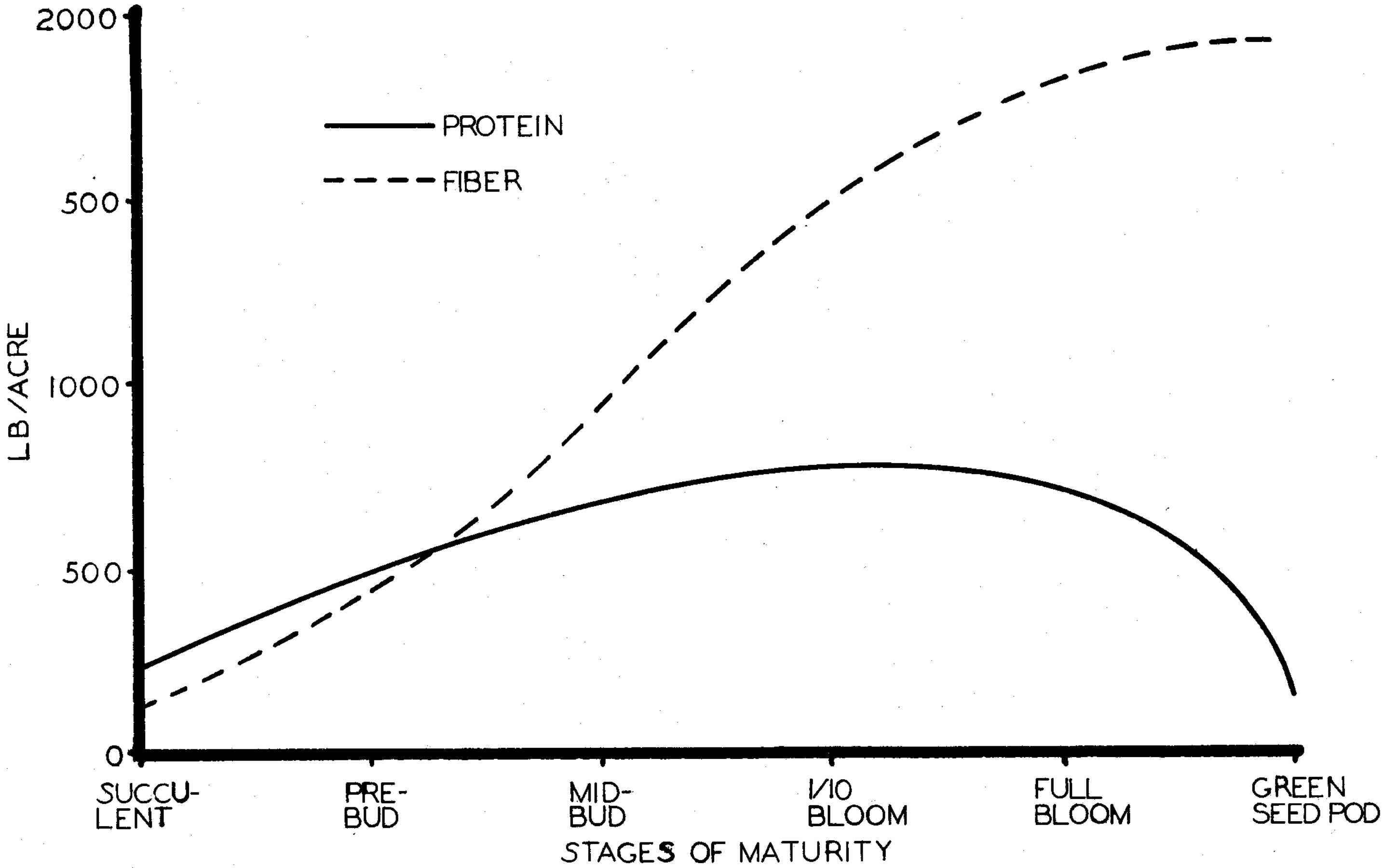

Figure 3. Yields of protein and fiber in alfalfa at different stages of maturity. Adapted from Van Riper, G. E., and Dale Smith (24).

The first killing frost usually occurs in Central Oregon about September 15. Cutting after the first killing frost is not as hazardous as cutting before it; reserves are usually at a high level by this time. If a stand is cut in the fall, a tall stubble should be left to catch and hold snow for insulation during the winter. Continual grazing by cattle or sheep during fall and winter is not advisable (19,20).

SUMMARY

Central Oregon alfalfa yields are only about 50 percent of their potential level. This is due mainly to inadequate establishment and management practices. Improving these practices could double hay yields. This report discusses the following production aspects that require attention to increase yields:

Soil Conditions. Have soils tested before seeding alfalfa and throughout the life of the stand. Follow fertilizer and lime recommendations.

Seedbeds should be moist and firm, with some looseness at the surface for seed coverage. Optimum seed coverage ranges from ¼ to ½ inch on heavy soils and ½ to 1 inch on sandy soils. Compact soils before and after seeding.

Inoculation. It is absolutely essential to inoculate alfalfa seed with a fresh inoculant that has been refrigerated until planting time. This increases the chances that plants will be nodulated with an effective strain of rhizobia that will fix nitrogen at high rates.

Seeding Rate. Use 12 to 15 pounds per acre of good seed, having high percentages of purity and germination.

Seeding Time and Weed Control. Plant either during the first week of June with an herbicide, or companion crop, or in late summer before August 15 in the stubble of an oat-hay crop.

Irrigation. A major problem in establishing and managing alfalfa in Central Oregon is achieving proper irrigation. If irrigations are applied according to crop needs and soil water-holding capacities, the problem may be minimized. If irrigations are applied according to convenient time schedules, the problem will continue.

Cutting Time. Usually alfalfa should be cut at 10 percent bloom.

Spring Management. Delay first harvest of the season until full bloom if stands have been injured during the preceeding winter.

Fall Management. Do not cut alfalfa during the 4- to 6-week period before the first killing frost of autumn.

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