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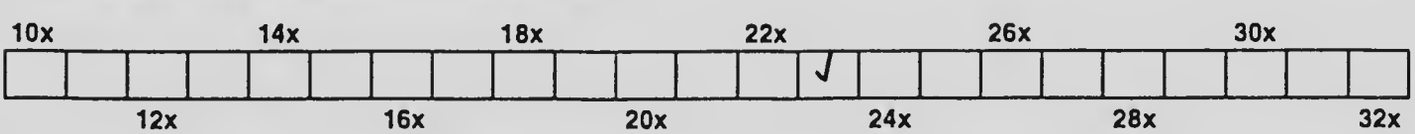

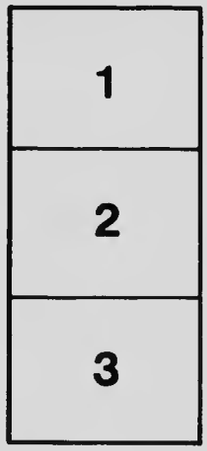

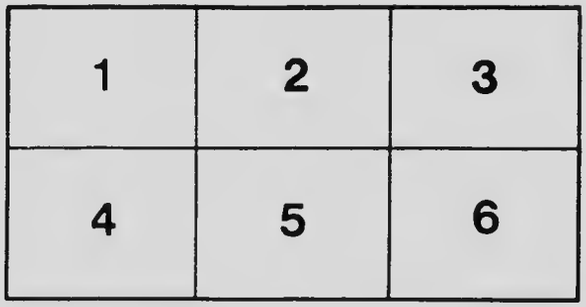

DEPARTMENT OF THE INTERIOR, CANADA

IRRIGATION BRANCH

1915

ALFALFA GROWING

Reprint of an address delivered by Mr. Don. H. Bark, at the Ninth Annual Convention of the Western Canada Irrigation Association, at Bassano, ~~B.C.~~, Alta., November ~~August~~, 1915.

MR. BARK: Alfalfa has now been grown successfully throughout Alberta for a sufficient number of years so that it may be said to have passed the experimental stage. There is no doubt but that it now occupies a permanent place among the staple forage crops of the province. This plant is easily the King of forage plants, for no other forage contains so many essentials of merit. It not only excels all other forage plants both in yield and in feeding value, but also in its beneficial effect on the soil. Alfalfa produces more food value for less cost than any other crop we can raise. Indeed, too much can hardly be said in praise of this wonderful plant, and if history repeats itself, the time is not far distant when it will become the predominating crop on every irrigated farm in the province. As one of the great benefits secured from alfalfa is its great improvement in the fertility of the soil, it seems well in discussing the subject to deal for a moment with the fundamental principles of soil fertility, in order to show more clearly the beneficial influence of alfalfa upon our arid soils.

PRINCIPLES OF SOIL FERTILITY.

Of the many elements found in the soil, four only are used to any considerable extent by the plants. These four are nitro-

gen, potash, phosphoric acid and lime. Nitrogen itself is a gas and forms a large part of the air we breathe, but plants can not utilize it in this form. It must be combined with other elements in the form of a salt (nitrate) before it becomes available as a plant food. The last three mentioned plant foods are minerals formed by the breaking up and decomposition of the parent rock, of which the soil was originally formed. These four substances are the principal or most important of the plant foods. Crops not only need far more of them than all the rest, but good yields cannot be produced upon any soil in which one or more of these elements are either deficient or entirely lacking. The plants obtain these substances from the soil in solution in the water absorbed by the plant roots. Only such of these elements or compounds therefore as are soluble in water are for the time being available as plant foods, for the plants can neither absorb solid particles of plant food into their roots nor could they utilize them in this shape if they could.

All soil is primarily decomposed rock, the particles of which it is composed varying in size and fineness from the coarsest gravel to particles so small that sometimes forty thousand would have to be laid side by side to make an inch. Soils as we commonly know them, however, are more or less mixed with vegetable matter in various stages of decomposition. This decomposed vegetable matter is commonly called humus and is the principal source of that most important plant food, nitrogen, the mineral plant food being derived from the parent rock. Now let us stop for a moment to note the difference between the soils of a humid country and of an arid or semi-arid one. The rains of centuries in the humid belt have caused a luxuriant vegetation to grow, which dying down each year, has added a world of humus and nitrogen to these soils, but these same rains have meanwhile leached out enormous amounts of soluble mineral plant foods. The soils of humid countries are therefore rich in humus and nitrogen, but comparatively poor in the mineral plant foods, while the soils of arid and semi-arid countries are almost diametrically opposite, for it has never rained sufficiently to either grow the luxuriant vegetation or to leach out the mineral plant foods. The soils of the arid and semi-arid regions are therefore rich in mineral plant foods, for they

still have all that was originally contained in the parent rock, but they are quite liable to be deficient in nitrogen. It can be seen therefore that whenever the eastern or humid soils becomes worn out or run down, the addition of mineral plant foods is necessary. This can only be accomplished by the purchase and application of expensive commercial fertilizers. Arid and semi-arid soils, however, rarely need the addition of such fertilizers for they have more mineral plant foods than the humid soils had a million years ago, but their supply of nitrogen and humus is normally only sufficient to last for but a few crops, when it must needs be replenished. And we are indeed fortunate that this can be so easily and cheaply done through the growing of that valuable plant alfalfa.

If we take pains to keep up the supply of nitrogen in our soil, we are far better off on an irrigated farm in Alberta than any one can ever possibly be on a farm in the humid belt, for with our soil far richer in the necessary plant foods, with our longer days of sunshine, and our ability to control the supply of moisture to the crops, giving them just what they need, and above all, when they need it, we can always grow larger crops and secure larger profits than can be secured anywhere in the humid belt, for the farmers in this belt have neither the rich soil, the same amount of sunshine, nor the ability to control the amount of moisture in the soil, which is so necessary to maximum crop production. We must, however, grow alfalfa, for as I shall explain later on, it adds more nitrogen to the soil than any other crop we can grow.

TYPE OF SOIL REQUIRED.

Alfalfa has been known to grow and do well on a very large variety of soils. It, however, has its preference, and usually does better on the lighter soils consisting of the sandy loam and clay loam. Even in districts having the heavier soils most farms contain one or more classes of soil, and in such cases the alfalfa should be planted on the lighter or more sandy soil. I should not hesitate, however, in planting alfalfa even though my farm consisted of all heavy soil. The one thing that alfalfa will not stand is wet, soggy soil. Though it requires considerable

precipitation or irrigation water throughout the season, it prefers a well drained soil. If those desirous of planting alfalfa upon heavy soils will select the higher and better drained portions of their farm for this crop, but little difficulty will usually be experienced. Never plant alfalfa in the bottom of a depression that does not have surface drainage.

PREPARATION OF GROUND FOR IRRIGATION.

There are two types of irrigation systems adapted to alfalfa in this province, namely,—free flooding and flooding between borders, though the furrow or corrugation system might be used to some advantage in certain districts. Free flooding consists of flooding water between more or less parallel head ditches, spaced from fifty to two hundred feet apart. With this system, as with all others, if efficient irrigation is desired, all knolls and depressions must be removed, so that water can run uninterruptedly without pooling up from one head ditch to the next one below it. The larger knolls and depressions should be smoothed off with a Fresno scraper, as this tool, where the haul is short, will move quicker and cheaper than any other implement in common use. After the larger knolls and depressions have been smoothed off with a scraper, a rectangular leveller, with which you all should be familiar, should be run over the ground, both lengthwise and crosswise of the field.

The head ditches with free flooding should be run on a uniform of grade of from one-tenth to three-tenths of a foot fall per hundred feet. They should be installed more or less parallel to one another, the proper distance between them depending somewhat upon the topography and nature of the soil. From fifty to two hundred feet apart has been found to be the proper spacing for this section. One ditch should be used at a time for the irrigation, the water being dammed up at frequent intervals by canvas dams, and turned out into the field through notches cut with the shovel in the lower ditch bank by the irrigator. If the levelling has been carefully done, and the irrigator gives the water careful attention, very efficient irrigation can be accomplished by this system. There should not be much

waste water, but whatever water that is wasted should be caught up in the next ditch below and used for the irrigation of the next strip.

FLOODING BETWEEN BORDERS.

This system is probably best adapted for alfalfa on practically all of the various types of soil found in the province.

So far as topography is concerned, it can be used on all but the steeper grades, approximately one hundred feet per mile being the maximum slope with which it should be used for alfalfa. The head ditches with this system are constructed in about the same manner and about the same or a little greater distance apart as with the free flooding system. The only essential difference between this system and the free flooding system is that more or less parallel border guiding dykes are constructed 30 to 60 feet apart between the head ditches, and more or less at right angles to them. The water is checked up in the ditch with canvas dams as before, and is flooded between the border guiding dykes to the next head ditch below, the dykes guiding and controlling the water in a much more efficient manner than with the free flooding, where the water is unconfined, and requires careful attention from the irrigator. To be ideally laid out for irrigation by this system the side fall should be taken out of each strip—in other words it should be made approximately level crosswise throughout its length. It is not necessary, however, to make the lengthwise slope uniform, it simply being necessary, the same as with the free flooding system, to smooth off the knolls and depressions sufficiently so that water may run uninterruptedly from one head ditch to the next one below. In actual practice where the land is not too steep these parallel border guiding dykes usually run down the greatest slope, for this is the direction the water will naturally run with the least attention. There will also be less side fall in each strip than as if the border dykes angled down the slope. The dykes are usually constructed at the time the levelling is done, the dirt being deposited on the location of the dykes by the Fresno. Where but little Fresno work is necessary the dykes are made by ploughing a back furrow consisting of two or four

furrows on the proposed location of each dyke. The dykes are afterwards gone over by a ridger, which is run lengthwise of the back furrow. This ridger consists essentially of two 2x12 planks, 16 to 18 feet long, placed on edge with a spread in front of from 12 to 14 feet and only approximately 3 feet behind. The wide end is pulled ahead, thus gathering a shallow layer of dirt from quite a wide area on each side of the back furrow, the dirt being pulled against the side of the back furrow by the sloping sides of the ridger. These ridges are afterwards smoothed down and rounded over by harrowing them lightly, the alfalfa being planted across the top of the ridges in the same way and at the same rate as between. If these ridges are constructed in this manner they will be high enough to control the water, yet broad and low enough so that alfalfa will grow on the tops of them, and the wagons and hay tools can cross them with no inconvenience whatever. The ridges when completed should be from 6 to 9 inches high in the centre and from 2 to 3 feet broad at the base.

In practice the water is turned into the head of each strip at two or more places and spreads quite uniformly between the two guiding dykes, as it advances across the strip. The irrigator should cut it off and turn it into the next strip below as soon as the water has advanced far enough so that the quantity in the strip will advance to the lower end and thoroughly irrigate the bottom portion.

This system is a very efficient one, for not only alfalfa but all other grasses, and provided the ground is properly prepared for it at the start, will be found that the water will actually require less attention and that more acres can be irrigated in a day with less work than by means of any other system.

PREPARATION OF SEED BED.

The preparation of a proper seed bed for alfalfa is very important. Alfalfa has a small seed, and the plant for the first two or three months is rather weak and puny. It therefore requires a well cultivated seed bed, for a good stand cannot be secured if it is planted in rough, cloddy ground. Alfalfa plants

are quite spindling and grow so slowly during the first two or three months of their growth that the weeds in a very weedy field will sometimes either entirely crowd out the alfalfa or be the means of securing a very thin stand. It is best therefore to plant alfalfa on a tract of land that is as free from weeds as possible. Land that has been summer-fallowed the previous year, or that has produced potatoes or other rowed crops is best adapted for alfalfa, as it will be the freest from weeds. Grain land that is fairly free from weeds is also well adapted for alfalfa provided it has been in cultivation long enough to disintegrate the sod. Do not plant alfalfa on new breaking, as the prairie and other grasses will not let the alfalfa secure a good quick start.

INOCULATION.

As was mentioned in the introduction, alfalfa has the power of supplying nitrogren to the soil, and it is a good thing Providence provided this plant with this power, for if it did not have it there would be but few soils sufficiently rich in nitrogen to grow the crop for any length of time. This same thing would probably hold true to a somewhat lesser extent with the other leguminous crops, for they all contain a large amount of nitrogen or protein. They therefore must be able to secure a large amount of it from the soil. The manner in which alfalfa and the other legumes supply nitrogen to the soil is through the bacteria which live in and upon their roots. These bacteria are not originally present in all soils, for these particular bacteria cannot live without legumes, nor can the legumes live for any length of time without the bacteria, the principal reason being that the legume is such a greedy feeder upon the nitrogen in the soil that unless the bacteria are present, it soon exhausts the available nitrogen in almost any soil. While all legumes harbour bacteria of much the same nature, it has been found that there are certain kinds that prefer each particular leguminous plant. This is probably due to the fact that these particular bacteria have adapted themselves to this plant. These bacteria are so small that they can scarcely be seen with even a microscope of the highest power. It is believed that they are absorbed by the minute root hairs along with the water, and after being absorbed irritate the roots

to such an extent that plant juices are automatically thrown out at the spot, thus forming the little appendages called nodules in which the bacteria live. These nodules vary with alfalfa from small whitish lobes the size of a pin head to clusters of these lobes one half inch in diameter arranged somewhat like a bunch of grapes. These bacteria after becoming domiciled in the nodules attached to the roots multiply at an extremely rapid rate, and are able to absorb the free nitrogen found in the air spaces of the soil, and work it over into nitrates, a definite chemical compound and a plant food of the highest value, in which shape the alfalfa itself or any other plant can utilize it. These bacteria therefore are very essential to alfalfa, no matter where it is grown. In the soils of certain districts throughout the West it seems there are enough of these alfalfa bacteria or other bacteria of a similar nature that can readily adapt themselves to the alfalfa plant, so that it is unnecessary to inoculate the alfalfa at the time of planting. Such is not the case here, however. though the continued planting of alfalfa on our irrigation projects may in time develop these bacteria so that they will become so widely scattered throughout the soil that it will be found unnecessary to supply them artificially.

The best method found to date of supplying these bacteria to our alfalfa fields is to secure surface soil to a depth of nine or twelve inches from an old, well-established alfalfa field that has become well inoculated, and to scatter this soil evenly at the rate of from 200 to 400 pounds per acre upon the field after it has been prepared for alfalfa, and immediately before seeding. Failure to do this and take the proper precautions after it has been done has probably been the cause of a greater number of failures with alfalfa in this part of Alberta than all other causes taken together. These bacteria can stand very low temperatures, even 20 or 30 degrees below zero will not kill them, but either bright sunlight for a few moments or a continued temperature for a few hours of 100 or more degrees Fahrenheit will kill them very readily. It is therefore very necessary to secure the original soil in a fresh condition, to keep it in a comparatively cool place free from sunlight and to spread it promptly and evenly upon the field to be planted, after which it should be immediately harrowed in so as to cover the bacteria deep enough and

quiek enough so that they cannot be killed by sunlight. If these preeautions are taken, but little trouble will be experienced with the soil transfer method of inoculation.

There is one other methiod of inoculation that is coming into quite general use. This is inoculation by pure cultures, which are purchased from laboratories which make a business of growing and preparing these cultures for this use. These cultures cost from one to five dollars per acre, are put up by the laboratories, and delivered to the consumer in small bottles, each bottle containing millions of the proper kind of bacteria. The directions for using these cultures differ slightly, but should be strictly followed. They usually state that the contents of the bottle should be emptied into a gallon of water that has previously been boiled and cooled, to which is added a little sugar or beef broth, after which the mixture is placed for forty-eight hours in a moderately warm place to enable the bacteria to grow and multiply, about the same as a house-wife sets her yeast. After these bacteria have been developed a little more water is added, after which the alfalfa seed itself is thoroughly sprinkled with the solution containing the bacteria. The seeds are then allowed to dry in a moderately cool, dark place, after wiheh they should be immediately planted. If the culture is good when secured and directions are followed out, a sufficient number of bacteria are usually attached to the alfalfa seed to thoroughly inoculate the whole field. After the small plants start to grow the bacteria are absorbed by the roots, and the process previously described is carried out, the baeteria not only furnishing sufficient nitrogen in an available form for the growth of the plant, but an excess supply for the crops which will follow, after the alfalfa is ploughed up.

The soil transfer methiod of inoculation where soil free from weeds can be secured is, however, probably the cheapest, surest and best method for the farmers of this section, and if directions are carefully carried out there will be but few failures. The principal precautions that are necessary are (1) to procure fresh soil from a field that you are sure is well inoculated, (2) to apply it immediately, and (3) harrow it in without delay.

When alfalfa is well inoculated it will be noticed that the plants are vigorous and of a dark colour, while the plants

not inoculated are liable to be spindling and of a light or yellowish green colour. The lack of inoculation, however, should be determined by a careful examination of the roots for nodules, as too much soil moisture also causes alfalfa to be light or yellowish green in colour. The inoculation frequently takes well only on a portion of the field. If these spots are well scattered over the field they will probably spread over the entire area during the second year. If they show up only on part of the field it would be well the second spring to put more inoculated soil on that portion about the time the plant starts to grow, and to disc it in lightly at once. Irrigation water spreads the inoculation much better than rainfall, as some of the bacteria seem to be carried in suspension in the water. Some have inoculated their fields by spreading a strip of inoculated dirt below the ditch and irrigating immediately the water carrying sufficient bacteria from this dirt to inoculate the field. This method is not recommended, however, except during the second year, and then only in cases where the inoculation hasn't become well established from the original inoculation.

TIME OF PLANTING.

A study of the rainfall records of this section shows that there is usually sufficient rain during May and June to start alfalfa, and these are the best months to start it, not only because of the rainfall, but as the plants are not particularly hardy until they attain a height of at least six inches, it is desirable to secure as much growth as possible before winter sets in. It is considered of considerable advantage to have rainfall enough to start the alfalfa, for the seeds are so small that if one were compelled to irrigate freshly harrowed soil to start the seeds, some of them would be bound to be washed away. This section is especially fortunate in this regard, for in most alfalfa growing districts it is necessary to irrigate the seed up.

VARIETY OF SEED.

Though there are between 50 and 100 species of alfalfa, not over six of these are of much economic importance and these are

all much alike. The chief difference between the American varieties is in hardiness or ability to resist cold winters, the two best strains for this locality probably being Grimm and Turkestan. Both of these strains have done very well here and should be recommended for planting, though almost any Northern grown Montana seed should give good results.

RATE OF SEEDING.

Alfalfa seeds are quite small but usually have very good vitality. It has been found by actual count that if ten pounds of seed are scattered uniformly over an acre, fifty-two seeds would be placed upon each and every square foot. As it is indeed a poor farmer who cannot make at least half the seeds planted grow, it can be seen that planting at the rate of twenty pounds per acre is unnecessary, for this would put one hundred and four seeds upon every square foot or nearly one to each square inch. From carefully conducted experiments on a Government Experiment station in southern Idaho, where all conditions were ideal, including a very fine seed bed, it was found there was no difference in the yield during a three year period from alfalfa seeded at the rate of 4, 8, 12, 16 and 20 pounds per acre. It is not possible nor practicable, however, for the farmer to manufacture such a good seed bed upon large areas, as was secured on this Government Experiment station, and it is therefore recommended that from 12 to 20 pounds and no more of good alfalfa seed be planted. Do not make the mistake of planting too deep. Alfalfa seed is small and cannot, like peas, wheat or potatoes come up through three or four inches of soil. During fairly moist weather one half inch in depth is sufficient, while in drier weather from one to one and a half inches would be somewhat better. Do not plant alfalfa deeper than one and one half inches. It does not matter much whether alfalfa be planted in drills or whether it be sown broadcast, so long as the proper distribution and depth of planting is secured. In planting it broadcast on top of well prepared ground, a fairly light harrowing after seeding usually places most of the seeds at about the right depth. Drilling the seed is probably preferable in this section for if careful attention is given to the drill all of the seeds may be placed at the proper depth.

NURSE CROP.

There is no question but that a better stand of hardier alfalfa will be secured if it is planted alone, without a nurse crop. Alfalfa prefers lots of sun, which cannot be secured when it is planted with oats, wheat or barley. There is no possible advantage in planting a nurse crop with alfalfa, except that a year's use of the ground is not lost. Taking the extra hardiness of the plant and the thicker stand that is secured without a nurse crop into consideration, however, it is hardly probable that it will pay in the long run to plant alfalfa with a nurse crop.

If alfalfa is intended as hay for either hogs or cattle or a pasture for hogs, it is preferable to plant it alone. It is, however, much improved as a horse hay, both in yield and feeding value if some other grass is planted with it. A grass to form the best mixture with alfalfa should do well in the shade, mature at about the same time as the alfalfa, and be comparatively rich in carbo-hydrates, instead of protein, in order to form a more nearly balanced ration. The very best grass that can be planted with alfalfa to accomplish this purpose is orchard grass. It is perfectly hardy in this climate, it does well in the shade, matures more nearly at the same time as the alfalfa than any other grass, is relished by stock, and has a good feeding value. Liverymen that have once fed this type of hay to their horses will pay from $1 to $2 per ton more for it than straight alfalfa. Where orchard grass will grow and do as well as it does here, never plant timothy as a mixture with alfalfa.

IRRIGATION OF ALFALFA.

The irrigation of alfalfa or any other plant is easy and simple, providing the land is sufficiently and properly prepared at the outset. Too much emphasis can hardly be placed upon the preparation of the land for the irrigation of alfalfa. Water cannot be made to run up hill, and it is absolutely imperative if good success is to be obtained with alfalfa that all knolls and hollows be so levelled down at the outset before the alfalfa is planted that the water can be made to run uninterruptedly from one head ditch to the next one below it. There is much more

reason for careful levelling of the ground before planting alfalfa, pasture or other permanent crops, than there is with grain, for the same trouble will be experienced with every little hill and hollow every time the alfalfa is irrigated every year, while where grain is planted there is an additional opportunity of doing more levelling on the land each spring.

WHEN TO IRRIGATE ALFALFA.

Careful experiments have been made during the past few years to determine at what stage of growth alfalfa needs irrigation, and it has been found that it needs a practically constant uniform supply of moisture throughout the season.

This condition can only be brought about where irrigation is possible, yet owing to the variation in the precipitation in this section, no hard and fast rule can be laid down, either as to the number of irrigations required or the stage of growth at which they should be applied. Much will depend upon the type of soil and the amount of rainfall received during the season. Every irrigator should learn to study the needs of his own particular soil and crops, and then apply his irrigation water at such times and in such amounts as will maintain the necessary constant uniform moisture supply in the soil. Alfalfa should never be allowed to become too dry, and above all, water should never be allowed to stand on it during irrigation for over twelve hours at a time. Neither should it go into winter quarters in a very wet, muddy condition, as winter killing may result. During normal years in this section alfalfa will probably require from two to three irrigations during the season.

AMOUNT OF WATER REQUIRED.

Alfalfa is a gross feeder, and grows luxuriantly throughout the season, there being a very large amount of leaf surface exposed to the sun and wind, from which an unusual amount of transpiration takes place. Alfalfa therefore requires considerably more water than almost any other crop we can produce, all other conditions being uniform. A long series of careful, exhaustive experiments were conducted under my super-

vision by the United States Government for this purpose, and demonstrated that where all other conditions are similar, alfalfa requires twice as much irrigation water during a season as grain. Where grain does best with one acre-foot per acre, alfalfa requires two acre-feet, and where grain requires one and one half acre-feet, alfalfa requires three feet, and has a tendency to produce the most crop where the most water is supplied, though care must be used not to over-saturate or waterlog the soil, for alfalfa will not stand "wet feet."

TIME TO CUT.

Alfalfa is pre-eminently adapted as a hay crop, for no other forage recuperates so quickly after cutting. Parts of southern Arizona and the Imperial Valley, California, cut alfalfa as often as nine times a year. In order to secure the largest possible crop of the highest possible feeding value, however, alfalfa must be cut at the proper stage. This is at the time that the little basal shoots or the sprouts of the next crop start, which is usually when the crop is about one-tenth in bloom. If the crop is left until one-half or in full bloom these basal shoots will have grown so long that the mower will clip their tops, thus retarding the start of the second crop, while if it is cut at the proper time just as there basal shoots start up around the crowns near the ground the next crop will come on and begin growth immediately, provided the necessary amount of moisture is available in the soil at the time.

GENERAL TREATMENT, FIRST AND SUCCEEDING YEARS.

There is insufficient time and space at my disposal to make a general discussion of alfalfa in all its phases. These other phases will be taken up by other papers. I wish, however, to dwell slightly on the general treatment of alfalfa. After planting alfafa, there is nothing to be done with it until it is from six to ten inches high, except to see that it has the proper supply of moisture. At from six to ten inches in height, no matter whether the field is weedy or not, it should be clipped in order to strengthen the crowns and thicken up the growth. If the

season has been favourable enough and the initial planting early there may yet be time to secure one crop during that season, though in the majority of cases even in much milder climates no crop at all is expected the first year. Mr. H. Lausen of Carseland during the past season has secured about as large a yield from alfalfa for the first season as I have ever seen, even in the mild climates of Colorado, Utah or Idaho. Mr. Lausen planted two acres during the latter part of May, 1915, and in August harvested one and one-third tons of cured hay per acre from the plot. This I consider to be phenomenal. If the initial planting of alfalfa has been done so late in the season that clipping when it has reached from six to ten inches in height will force it to go into winter quarters with less than four inches of growth, I would not clip it the first year at all, for alfalfa, in order to be able to withstand the winter in the best possible shape, should have some amount of growth at the time the ground freezes up. This holds particularly true for the first season. In the subsequent years alfalfa requires no unusual treatment, except that care must be used that it has a proper supply of moisture, that water does not stand upon it, and that the crops are cut and cured properly. Discing and loosening up of the surface each spring, after about the third year has been found to be beneficial in many localities, particularly if weeds or grass have a tendency to creep in. Under these conditions discing every spring will be advised here.

HARDINESS AND VITALITY OF ALFALFA

There is no doubt in regard to the hardiness and long life of the alfalfa plant in this section. If planted on the proper class of well-drained soil it will positively do as well here as in any similar climate on earth. It has been my pleasure during the past season to find alfalfa stems seven feet nine inches in length, and to dig five roots of alfalfa that totalled seven feet across the crowns when hung side by side. Neither southern California nor Asia herself, the original home of alfalfa, can beat this, so have no fear in regard to the strength and hardiness of afalfa grown in this part of Alberta.

Conclusion: Before closing I wish to again emphasize the following facts:

1. That alfalfa growing is no experiment in this part of Alberta.

2. That alfalfa has a greater food value and produces more of it at less cost than any other forage that can be raised in this section.

3. That there is no other crop that will improve one's soil so much as the growing of alfalfa. It has been known to double and even treble the yield of cereals after having been grown for but three years.

4. That the lighter soils are best adapted to alfalfa and that only well-drained soils should be selected for this crop.

5. That ground planted to alfalfa should be carefully prepared for irrigation—that money spent on levelling pays larger returns on the investment than the expenditure of any other like amount.

6. That alfalfa seeds are so small that the manufacture of a finely pulverized seed bed is absolutely imperative if good results are to be secured.

7. That alfalfa ground must be inoculated in this section; that soil transfer is probably the preferable method; and that great pains must be used in securing fresh soil, in spreading it evenly, and in harrowing it in immediately if good results are to be secured.

8. That from 12 to 15 pounds of seed per acre planted not over 1½ inches in depth is proper.

9. That planting without a nurse crop will give better success nine times out of ten and be more profitable than planting with a nurse crop.

10. That alfalfa requires more water than grain, and that the soil should have a uniform moisture content from early spring until late fall.

11. That alfalfa should be clipped the first year about the time it reaches 6 to 10 inches in height.

12. That the crops should be cut whenever the basel shoots or the beginning of the next crop's growth starts, which is when approximately one-tenth of the crop is in bloom.

13. That alfalfa should be diseed every spring after the second year, particularly if weeds and grass have begun to grow with the crop. This not only kills the weeds and grass, but actually causes the alfalfa to become thicker on the ground.

14. That alfalfa has a broader use, and is more profitable and more certain than any other crop that can be raised in this district, and that when alfalfa is once planted on a farm and given a fair trial not only as a horse feed, a cattle feed and a pig pasture, but as a soil rejuvenator, that this farmer will never again be willing to farm without an alfalfa field on any irrigation project in Sunny Southern Alberta. Applause).