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DEPARTMENT OF AGRICULTURE

(Live-stock Branch)

THE CULTIVATION OF ALFALFA

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DEPARTMENT OF AGRICULTURE,

VICTORIA, B.C., January, 1914.

Hon. Price Ellison,

Minister of Agriculture.

SIR,—I have the honour to submit herewith Bulletin No. 40, dealing with the production of Alfalfa, and which has been compiled by H. Rive, B.S.A., Provincial Dairy Instructor.

I have the honour to be,

Sir,

Your obedient servant,

WM. E. SCOTT,

Deputy Minister of Agriculture.

PROVINCE OF BRITISH COLUMBIA

DEPARTMENT OF AGRICULTURE

(LIVE-STOCK BRANCH)

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THE CULTIVATION OF ALFALFA.

By H. RIVE, B.S.A., PROVINCIAL DAIRY INSTRUCTOR.

ALFALFA (*Medicago sativa*), or lucerne, is a perennial of the Legume family, hardy in nature. It produces stems of an upright, branching growth, varying in height, in mature plants, from 1 to 3½ feet. When the plant is young it possesses one single stem, but the number increases with the age of the plant and the frequency of cutting, until thirty, forty, or more stalks, rapidly becoming woody as the blossoms develop, are found growing from the one crown. The leaves are not large but numerous, and are attached by slender stems which grow very brittle with drying, and drop off easily during the process of curing. The flowers appear toward the top of the plant, and the arrangement of the bluish-purple clusters causes alfalfa to resemble the vetch rather than clover in this particular. The seeds, borne in spiral pods, are of the size of those of red clover, but are not as uniform in shape. Their colour is a light olive-green, offering a contrast to the purple and yellow of clover-seed. Long tap-roots penetrate the earth deeply where the subsoil permits, and if hindered in this they branch out more in their search for food.

Alfalfa is said to be more widely distributed over the earth's surface, to furnish more food for live-stock, and to have been cultivated for a longer period than any other legume. It thrives on soils of various kinds and elevations, in climates of different degrees of temperature and of different amounts of rainfall. In our own Province, for many years, large yields have been obtained in the neighbourhood of Ashcroft and in the Okanagan Valley. It is grown in the Boundary country, in the Upper Columbia Valley, in Chilliwack, and on Vancouver Island.

VARIETIES.

Many varieties of the plant exist. They differ from each other more in their ability to withstand heat, cold, and drought than in the quality of food product obtained from them. Of the many introduced or developed and experimented with on this Continent, the varieties known as Turkestan and Grimms seem best adapted to northern areas.

SOILS.

Alfalfa will grow in many soils, providing they are fairly fertile, sufficiently porous below to carry away water with reasonable quickness, and not underlaid with hard-pan or a subsoil so stiff that it is almost impervious. The best growth can be obtained on a deep, well-drained fertile soil, free from weeds and from acidity. A sandy loam over a loose subsoil would offer this, and is preferred by the plant, yet on a clay loam it proves prosperous if access to the subsoil is furnished the roots. A subsoil rich in plant-food is, of course, desirable, but permeability in the lower soil is still more important than fertility, and on this account a sandy subsoil deficient in plant-food may give better success than clayey subsoil under a similar surface soil. Drainage to a depth of 30 or 36 inches should readily occur, and the level of the ground-water should be several feet below the surface during the growing season, as root-growth stops on striking saturated soil. Soils naturally wet, or likely to be under water, or saturated for many hours at a time are not fitted for this purpose.

In brief, it may be said that the lands best adapted to the growing of alfalfa are the slopes and rolling lands of valleys and the deep sandy loam bottoms well above water-level. Low, flat valley lands are not suitable.

ACIDITY AND LIMING.

Alfalfa will not thrive in an acid soil. By thorough drainage, aeration of the soil, and the application of lime, acidity may be largely remedied. Liming alone will not be sufficient if the sourness be due to lack of drainage, and this should receive first attention. The soil should then be put into good physical condition by tillage, when, if lime be required, this substance can do its work thoroughly.

Ground limestone is the most economical form in which to apply lime to the soil, but in other forms it is used with good results. Water-slaked lime most quickly corrects acidity; ground unburned limestone more slowly, but less expensively. If ground limestone be used, at least 2,000 lb. per acre should be applied very early in the spring, or during the year preceding the sowing of alfalfa, which is better. Water-slaked lime is preferred to the air-slaked, as a larger percentage is at once effective. It may be applied at the rate of about 1,200 lb. per acre. A half-peck heap to every two square rods will give a dressing of 1,000 lb. Add water to each heap sparingly, and cover with a couple of inches of earth. Then, later, mix the dry powder that results with earth; spread evenly and harrow in.

Ground limestone is best suited for liming light lands; the caustic lime for heavy ones. Too frequent application of caustic lime to a soil may exhaust the nitrogenous matter contained in the humus.

Lime may be added by means of light annual dressings of gypsum or land-plaster. This attacks insoluble compounds in the soil, particularly those of potash, setting free the constituents. To apply about 50 lb. per acre in the spring is recommended.

Besides correcting acidity, lime exerts a favourable effect upon the physical condition of soils. It helps to separate the adhesive particles of clay, makes heavy soils loose and friable, and increases the absorbing and retaining power of sandy soils. It may occur, in cases where acidity is present, that the unfavourable conditions are due, not to it solely, but to compact texture or lack of aeration, which the incorporation of lime and the accompanying tillage will remedy.

PREPARATION OF THE SOIL.

Preparation of the soil for alfalfa should begin with the preceding crop, applying lime, if necessary, at that time. To obtain a successful growth, the land must be clean, fertile, and in good physical condition. The young alfalfa-plant is delicate and unable to cope with weeds, which deprive it of food, moisture, and sunlight. Thoroughly cultivated crops, such as kale, corn, potatoes, or roots, assist greatly in removing weeds and, being generally well manured, leave the ground clean and fertile. Summer fallowing is excellent, but a complete or bare fallow is not necessary. Clover-sod, pasture land, or a green crop ploughed under in early fall, cultivated and rolled frequently, then ploughed again, stirring the subsoil if thought advisable, brings good results. By this addition of humus the amount of plant-food is increased and the texture of the soil improved. Leaving the soil in ridges for winter allows access to the air and facilitates drainage.

A sandy or loose soil demands both humus and available plant-food. These can be supplied by means of either green crops or farmyard manure, and, if the latter be used, it will best serve its purpose applied heavily to the crop preceding alfalfa. This allows time for it to become incorporated with the soil and for the germination and destruction of weed-seeds that may be in it. One authority appears to consider that the successful inoculation of soil occurs in sufficiently direct proportion to the supply of barnyard manure to demand careful attention to this point.

Where a heavy rainfall prevails during the winter, followed by a vigorous weed-growth in the early spring, fall sowing of alfalfa is not successful. As early as possible in the spring the land should be cultivated and harrowed, until a seed-bed, fine, smooth, and mellow, is secured, and all weed-seeds near to the surface will have sprouted and are killed. Spring ploughing, where possible, should be avoided, as a deep, loose seed-bed is not desirable.

Upon the fertility and physical condition of the surface soil the success of the crop during the first year largely depends, while the state of the subsoil, in great measure, is responsible for its welfare in succeeding years.

INOCULATION.

It is a well-known fact that crops such as alfalfa, clover, peas, beans, vetches, and others of the same sub-order of the Legumes thrive best only when certain bacteria are present in the soil in which they are grown. These bacteria form enlargements or nodules on the plant-roots, and make use of the free nitrogen of the air, transferring it to the plants. Each of these legumes appears to require bacteria peculiarly suited to itself, though the idea is advanced that certain closely related groups of this sub-order, including cultivated plants and weeds, possess bacteria which adapt themselves to different plants within these groups. If nitrogen be well supplied in a soil, alfalfa, for a time, may grow fairly well without this bacterial assistance, but its presence undoubtedly increases both the quantity and quality of the crop, and ultimately must be secured. In most cases, therefore, where alfalfa is sown for the first time, inoculation by some artificial means is necessary to secure good plant-development.

The surest and most practical method is, before sowing the seed, to scatter broadcast over the seed-bed, and harrow in, soil from the surface foot of an old alfalfa-field. About 200 lb. of soil per acre should be used, and care taken to obtain it from a clean spot to prevent the introduction of weed-seeds. Avoid exposing this soil to the direct sunlight before scattering and harrowing it in, as such exposure is detrimental to the bacteria.

Inoculation may be effected by mixing and drilling in with the seed a quantity of dry soil, rich in the required germs, and this way is recommended by some stations, as it offers a vehicle for the small amount of seed used, ensuring thorough distribution. Pure cultures of the bacteria sent out by agricultural stations may be used, but they cannot be said to have given quite as good results as the inoculated soil. Where this is not available, however, the cultures prove of immense value. Immediately after inoculation the seeding should take place.

SEED AND SOWING.

The quality of the seed is of vital importance. It should be large, uniform, bright, of good vitality, and free from impurities. Brown and discoloured seeds should be avoided; they are usually dead. It is wise to secure a sample before the bulk of the seed is purchased, to test its germinating quality by placing a number of the seeds between sheets of moist blotting-paper and keeping them warm. The percentage of poor seed can be estimated as germination occurs, and should not be over 10 per cent. From 16 to 20 lb. of seed per acre will be found suitable. The seed may be broadcasted and harrowed in, but a far more even and vigorous stand will be secured by drilling.

If a nurse crop be used, the alfalfa-seed can be put into the grass-seed attachment and dropped ahead. A nurse crop for alfalfa in British Columbia is of doubtful benefit, especially in the drier non-irrigated sections. If used, it should be either of wheat or barley, or a mixture of both sown quite thinly, not much more than one bushel per acre being used. Oats have a greater tendency to smother the young alfalfa-plants.

Without a nurse crop, the drill set fairly shallow with the sprouts pointing backwards is probably best. It is not advisable to place the seed at a depth of more than an inch and a half. If difficulty is experienced in adjusting the drill to small amounts, mixing the seed with twice its bulk of meal of some kind will assist. It will be found that drilling in half of the seed at a time, crosswise, will give a more even and a better catch. Roll the ground after seeding, and harrow lightly. A brush harrow is very good for this purpose.

The date of seeding will depend upon the locality. It is well to delay this operation until several sproutings of weeds have been destroyed by cultivation, but in districts where the summer months are very dry the seed must be sown sufficiently early to permit good growth on the part of the young plant, that it may withstand the drought of later on.

AFTER-TREATMENT.

The first two seasons are critical ones in the life of the plant. The field must be mown as often as the crop reaches a height of 8 or 10 inches, and blooms must not be allowed to appear. Cutting keeps weeds in check, aids root-development, and encourages growth. When growth comes to a standstill, or when plants turn yellow, the mower is needed. The cutter-bar should be kept 5 inches away from the ground during the first year, and the clippings, unless exceedingly heavy, must be left to serve as a mulch. Do not mow too late, that the crop may enter upon the winter with a growth of several inches for its protection. A very heavy growth left at this time, however, is undesirable.

If a nurse crop is present, no attention is necessary during its growing period, but as harvest approaches the grain must not be allowed to smother the young alfalfa-plants by lodging. Cut the grain at least 5 inches from the ground, and remove the shocks as quickly as possible, in no case allowing them to stand on the same spot for more than two days at one time.

When the second year arrives, mow early to keep down the weeds. If a good stand is obtained this season, hereafter the plant usually does well.

YIELD.

The yield that may reasonably be expected from alfalfa will depend upon the locality, the season, and the variety used. Sixteen tons of green fodder per acre, or 4 tons of hay, should, at least, be secured when the field is well established. The average obtained for eight years at the Oregon Agricultural Station has been: Of green fodder, 26.3 tons per acre; or of hay, 6.2 tons.

FERTILIZING REQUIREMENTS.

Professor J. H. Grisdale, of Ottawa, says: "Just as when sown to clovers and other legumes, both the physical condition and the average plant-food content of a soil are improved and increased rather than injured or depleted by being under alfalfa for a time. Certain amounts of the chief elements of plant-food are, however, removed by each crop, and the application of farmyard manure in the fall, at the rate of, say, 10 tons per acre, every four years, will prove profitable. If it is desired to supplement an insufficient supply of farmyard manure, the following dressing of commercial fertilizer per acre will most likely be found valuable: 30 lb. nitrate of soda, 300 lb. bone-meal, and 50 lb. muriate of potash. Experiments at Guelph show good results from the use of superphosphate and Thomas phosphate."

VALUE OF THE SOIL.

Alfalfa-growing is often recommended for the purpose of improving the soil. Good condition and fertility of soil are certainly necessary to start the crop, but, once started, it is of great value in this connection. Available plant-food is added to the soil by the bacteria, and by the long roots that bring up, from great depths, material which is left in the uppermost layers.

The physical improvement in a soil that has grown alfalfa for some time is also very marked. Compared with the ordinary grass and clover sods, that of alfalfa is the most difficult to plough, but the inverted sod is far more mellow and friable than are those of the others. The sod of red clover ploughs easily, and the soil is found in good condition. The same may be said of Mammoth clover. Alsike clover-sod ploughs more easily, and benefits the soil rather more than these, while timothy-sod is relatively troublesome to break up, and results in very little improvement in the mechanical condition below.

FEEDING VALUE.

The feeding value of alfalfa not only as hay, but for soiling and pasturing purposes, entitles it to rank exceedingly high. Under proper condition it also yields a good quality of silage.

DRY MATTER AND DIGESTIBLE NUTRIENTS IN 100 LB.

	Dry Matter.	Protein.	Carbohydrates.	Fatty Matters.	Nutritive Ratio.
Green fodder	28.2	3.9	12.7	0.5	1:3.5
Hay	91.6	11.0	39.6	1.2	1:3.8

It is as a soiling crop for dairy cattle that alfalfa is particularly valuable. It makes a good spring growth and is ready to cut before most green feeds. It may be cut for this purpose before blossoms appear, and will admit of cutting two or more times during the season, depending on the locality. No soiling crop approaches it in value as a food for milk-production.

As a soiling crop for swine, it may be expected to reduce the cost of producing pork 40 per cent. in comparison with swine fed on grain alone. When used for this, it should be cut even earlier than when for feeding to cows. It is also well suited, in this form, for horses and sheep.

All classes of live-stock thrive upon alfalfa pasture, but before the third season it is not advisable to allow animals upon it to any extent, and close cropping at any time is dangerous to the catch. The trampling of stock also hardens the soil, and eventually kills the crowns. Cattle and sheep sometimes bloat if allowed to eat alfalfa when wet with rain or dew.

Mixed with corn or red clover, alfalfa appears to give better results in the silo than when alone, though by itself it has, in some hands, made good ensilage. Professor Henry states, with regard to clovers in general: "It would appear that the best quality of silage is secured by cutting at the usual time for haymaking, and allowing the plants to lose a part of their moisture by wilting before they are placed in the silo."

HAY.

Alfalfa hay well made has no equal as a dry feed for live-stock, but it demands, in the making, more care and skill than does any other kind.

As the plants blossom, their stems become woody and, if far advanced in the flowering stage, lose their leaves easily, producing indigestible and inferior hay. They should, therefore, be cut when blossoms commence to appear. If the field is uniform, the proper stage may be said to be reached when about one-tenth of the plants are in bloom.

In the curing and housing, the crop should be handled as little as possible, to avoid the loss of leaves, which are by far the most valuable part. If exposed to rain during curing, alfalfa hay loses probably half its value. When the crop is well wilted after cutting, rake into windrows, and finish the curing process in the windrow and in the cocks into which it should soon be put. A cap for covering the cocks during the curing will be found of service.

The following is taken from Bulletin No. 313 of the Geneva Agricultural Station, N.Y., on "Inoculation and Lime as Factors in growing Alfalfa," and may be of interest:—

" SUMMARY.

"1. The results from more than 100 co-operative experiments in growing alfalfa indicate that where neither lime nor inoculation is applied, the chance of a successful crop is not more than 20 per cent., or one chance in five.

"2. Where lime is added to the land at the rate of 1,500 lb. per acre, the chance of success is raised to 40 per cent., or two out of five.

"3. Where inoculation soil is applied alone, at the rate of 200 to 300 lb. per acre, the chance of success is raised to about 60 per cent., or three chances out of five.

"4. Where both lime and inoculation are applied as above indicated, the chance of a successful crop is raised to about four out of five.

"5. Each farmer intending to try the growing of alfalfa should at first restrict his seeding, and so arrange a small acreage as to determine what line of treatment is required by his fields."

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