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Factors Involved in the Production

of Alfalfa

Seed.

Southern Idaho is coming to be recognized as one of the most favored districts in the west for the production of forage seeds. This is true of the legume crops and more particularly, alfalfa. The industry is practically in its infancy but already there are problems which confront the grower that have become of vital importance and whose satisfactory solution will materially aid in elevating the productive standards, both as the quality and quantity of product, to the position which the southern part of this state is so peculiarly fitted to occupy. Climate, elevation, moisture and soil fertility all seems to have combined to make the Snake River Valley a district where conditions are peculiarly adapted to the production of maximum crops of alfalfa seed. Much remains to be done to place the district on the footing that it is entitled because of these favorable natural conditions to occupy, and it is with those problems and this solution that I have endeavored to treat. While much of the material herein presented is the product of others labor, still I have called largely upon my own experience and particularly in the field of the relationship of soil fertility and the production, the work is largely my own, both as to analyses and conclusions drown therefrom.

Of the varieties of alfalfa commonly used for the production of seed none are So frequently used as the common varieties. Little effort has yet been exerted to find the one variety that is best adapted to the moisture and climatic conditions found in the Snake River Valley. In general, the common varieties are used to a much greater extent than any other tho this fact is undoubtedly due to the prevalence of those sorts for forage production. They were the first to become well established and so far no other has proven sufficiently superior to them to warrant supplanting the large number of acres already in common alfalfa. In certain small districts, especially at higher altitudes in the eastern portion of the state, a tendency seems to be developing to produce the Grimm alfalfa for seed but the district where that is practiced is still comparatively small and a number of years will likely elapse before the practice becomes generalized. There is little question but that the Grimm alfalfa will increase in popularity as time goes on because of its hardihood and the fact that prices for seed of this alfalfa are considerably greater than they are for the other ordinary alfalfa seed. In sections of Eastern Idaho where some hardy variety is essential, it is already well established. Whether it will be so successful in the lower and warmer regions is still undetermined but it does seem a well established fact that the production of Grimm seed in warm regions has little or no influence upon its hardihood. Whether this will continue to be the case after the alfalfa has become thoroly acclimated is questionable.

Colorado reports that from the fertilizing standpoint that Baltic alfalfa has the greatest tendency to form seed in spite of adverse conditions and it is not at all unlikely that the same thing will be true in Idaho. Baltic alfalfa differs so little from the Grimm varieties that it is with difficulty distinguished from them and since each has the same characters to recommend it, there is not a small probability that it can be successfully introduced into Idaho as a satisfactory seed producing variety.

It must be remembered however, when considering the possibility of introducing other varieties for seed production, that its forage productive capacity rather than its seed producing possibilities. It is only in comparatively restricted districts that alfalfa cultivation is promoted for the single purpose of seed production and it is for this reason that the introduction of varieties of recognized seed producing ability it also largely confined to those restricted districts and will continue to be so until the merits of such varieties is fully established for forage as well as seed production. Owyhee County, for example, with an acerage devoted to alfalfa seed production approximating two fifths of the total acre utilized for the seed production of the common varieties and will likely do so for some time to come. There the production of alfalfa seed is entirely secondary to the production of forage and with the large yields of the latter and the assurance of ready and continuous market demands, other varieties must be of well proven merit from both standpoints before they will become

popular. Most farmers lack an appreciation of the superior marketable value of Grimm seed and are even less familiar with its comparative value as a producer of forage. Because of these facts and the hesitancy of most farmers to tear up established fields for an untried product, it is not at all unlikely that years will elapse before the hardier alfalfas attain the popularity that their merit deserves.

Cultivation of Alfalfa for Seed Production.

As cited before, the production of alfalfa seed is secondary to that of forage and it often occurs that a grower has occassioned to change his mind during the course of a single season as to which of the crops he will harvest. For this reason, the cultivation of alfalfa for seed production is necessarily practically that of the normal hay cultivation. There are certain practices which are normally followed for forage production that can be profitably emphasized in order that the best results may be secured in the event that it is determined to allow the crop to form seed. Among the most important of these is the matter of tillage of the field. For best results and greatest returns there can be no doubt as to the advisability of practicing a system of rotation on land where alfalfa is the chief crop but on many of the farms where the available water supply is derived from mountain streams whose flow fluctuates with the years and the general character of the winter and spring, it is often practically impossible to determine upon a system of rotation and adhere closely to it.

Where late water is at a premium or not available, farmers are reluctant to destroy a satisfactory stand of alfalfa for the sake of a rotation. Under such conditions, the establishment of a stand is somewhat of a gamble and almost invariably a couple of years must elapse before a thick stand of alfalfa can be secured. These are the conditions with which I am most familiar and the ones with which I shall deal largely. Under conditions such as these, I have seen fields of alfalfa that have been cropped with alfalfa for twenty years without having been torn up and they were still yielding practically maximum crops of both hay and seed. Indeed, my experience has led me to the belief thru the observation of such fields and more particularly isolated plants of great age along ditch banks or other favored spots, that old and healthy plants have the greatest tendency to produce maximum yields of seed when they are permitted to do so. These observations are born out by the well known fact that fields with newly established stands are not generally satisfactory seed producers, tho occassionally good yields may be obtained from fields in the second year if other conditions happen to be exceptionally favorable. This is rarely advisable because of the prevalence of weeds in the second year stand which cannot be successfully combated without destroying a large percnetage of the young and poorly rooted alfalfa plants. For these reasons it is not advisable to make an attempt to raise seed on newly established fields.

For fields that are older, thorough coltivation is

essential, not only to insure the very best of moisture conditions during the late summer, when small amounts of moisture are essential for seed production and irrigation is not at all advisable, but also thru the necessity of controlling weeds by this means. The various shallow cultivators should be freely used, i. e., the spring tooth harrow, alfalfa cultivator, or the disc cultivator. Where seed is continuously produced, the stand is likely to become so heary that some thinning process must be employed but ordinarily thorough cultivation with the implements designated will be sufficient. They have the further beneficial effect of destroying many noxious weeds which is a factor of growing importance in many of the seed producing sections. When it is determined to allow the second crop to make seed, cultivation of the fields after the first crop is removed should invariably be practiced. Further than the desirable effect upon weeds, such a cultivation has an extremely important function in preserving such moisture as remains in the soil at the time for utilization during the vegetative growth of the second crop. The importance of this measure can readily be appreciated when it is realized that irrigation during this period is often impossible. Where rotation is practiced only as seasonal conditions seem to warrant the greatest hope for the control of noxious weeds lies in through cultivation, and this is especially true after the first crop is removed, particularly when it has been cut earlier than is the ordinary practice. With dodders of all species this is particularly effective

since after germination this plant becomes purely a parasite and its destruction is dependent upon the eradication of every vestage of its body. Ordinarily, mowing, especially in the younger stages of that plants growth such as it has attained about the time of the first hay crop, is not sufficient to destroy it. I have reason to believe that a general adoption of this practice, whether seed is roduced or not, throughout a neighborhood would be an effective means of ridding the vicinity of this most pernicious weed.

Comparative Merit of Each of Crops for Seed Production.

One of the most important of all questions confronting a seed grower is the problem of selecting the crop which he will allow to form seed. The choice is restricted to the second and first crops with the former a preponderating favorite. The third crop for seed production matures too late even in the lowest regions of the Snake River Valley where four good crops of forage are usually secured. In addition, if it were probably that the seed would mature from year to year from the third crop, the advisability of permitting it to stand for seed production is doubtful, owing to the fact that this crop seems to have little tendency toward blooming. I have observed, however, third crop plants that grew in orchards with a grass mixture and which had been cut early for soilage, exhibit a remarkable seed forming tendency. They easily matured and turned out a highly colored, fine quality seed. This fact demonstrates

that the possibility of seed from the third crop exists if late water for a single irrigation is available and the two eariler crops are cut somewhat sooner than ordinarily.

But the choice is usually narrowed to the first two crops. Probably the best workable conditions are secured when the first crop is clipped after the alfalfa has attained a height of some few inches, followed by surface cultivation. This procedure allows the seed crop to form during the finest and most favorable of the summer weather, insures a uniformly maturing stand which the first crop may lack, and serves to hold weeds in check. But it has the disadvantage of failing to provide for hay of any sort. And this is a matter of extreme importance. As I have states previously, few seed growers confine themselves strictly to this phase of farming. Practically every southern Idaho farmer practices diversified agriculture and obtains a large portion of his net income from live stock. Seed production not only fails to provide for forage for this livestock for winter keep but also greatly limits the amount of available pasturage during the fall and early winter months. Seed producing land should be lightly irrigated and that coupled with the late harvest of the seed crop, completely prohibits any possibility of a normal aftermath which affords a fattening ration for steers returning late from the free mountain ranges. The same objections can be raised with the practice of permitting the first crop to form seed and the latter has the additional objection of fostering all the weeds that germinate in the spring, insuring their growth and maturity.

From a practical standpoint there is only one time when the first crop should be utilized as the basis for seed production and that is during an unusually dry season which is rather a favorable condition for seed production and which is not at all promising of good hay yields. The season of 1916 was such a one and the heaviest crop of seed ever produced in Owyhee County, came that year. Indeed, the first crop will almost invariably produce a heavier yield than will the later crops and as in this case, when seed was high priced and the hay crop would have been small, farmers can profitably allow the first crop to form seed and buy such hay as they need. But the weed problem, bad at its best, becomes doubly difficult to control when this practice is continued thru a succession of years.

For these reasons it is undoubtedly afvisable to clip the first crop early or allow it to form a fair hay crop where seed is produced from year to year. The latter practice has the additional advantage of producing a comparatively heavy crop of hay and for that reason is the one normally followed by farmers who produce seed for a cash crop, and who have livestock to feed thru the winter months.

Cultural Methods.

Where seed is subordinated to forage production, little can be said as to the cultural methods best adapted to seed production. Indeed, methods and amounts of seeding, preparation of seed bed, etc., seem to have less influence upon the yields of seed secured than do such natural conditions as moisture, location, temperature and other factors. Until the time comes when the production of seed will be entirely without the prime consideration of forage crops,

nothing of great importance can be carried out along cultural lines which may be specifically beneficial to the seed crop. In certain restricted districts where seed is a major crop and only the best of varieties are used, best results may be obtained from a fow system of planting and regular cultivation. This method has the advantage of conserving the amount of available moisture for the sole benefit of the alfalfa plants and limits the vegatative growth thru thinning the stand to such an extent that it is undoubtedly the best practice where dry farming is the rule. And if present tendencies continue the time will soon come when some such method of culture will be made essential thry the necessity of controlling the weed pest. Row cultivation will readily permit this and will do considerable to establish Idaho seeds on the high plane of quality and purity which the splendidly favorable productive conditions have made possible and warrant.

As yet, the established field system is the one in greatest favor and will continue to be so until seed production becomes a standardized industry without the attending proposition of forage production. Thick stands are not desirable seed producers tho under exceptionally favorable climatic conditions, I have seen maximum returns from such fields as would produce ten tons of hay annualy per acre. Just what conditions made this yield from extraordinarily heavily cropped fields is a problem without s satisfactory explanation, but it is a well known fact that such yields are exceptional, and thar ordinarily best results are secured

from fields that have a comparatively light stand of alfalfa. Where seed is produced from year to year, the stand of alfalfa becomes too thick for seed production and some method of thinning must be employed. Thorough cultivation with surface agitating implements will tend to destroy the weaker plants and will be of material value but this may have to be supplemented by the use of especially designed instruments which cut out strips thru the field. For obvious reasons this method has not been widely practiced.

Individual Variation toward Seed Production.

One of the most peculiar and most baffling of all the problems confronting the seed producer is the weel known variation encountered in the alfalfa plants toward seed production. Isolated plants will almost invariably produce a maximum amount of seed from one season to another if permitted to do so. I have noted this to occur with plants growing under almost arid conditions and again with individuals that were favored with a continuous and plentiful water supply, while fields adjoining, under the best of cultural and moisture conditions completely failed to form an appreciable quantity of seed. In certain fields I have noted small acres, to all appearances no more favored than any other, bearing enormous amounts of seed while other parts of the same field under apparently identical conditions, formed but little seed. What the cause of these descrepancies are, have never been determined but it is safe to say that there are still many unknown factors involved in the formation of seed. Whether these factors are related to the conditions surrounding the

plants or due to some unknown factor involved in the processes of fertilization must remain unknown until some extensive work has been accomplished. And the need is an urgent one since the production of seed from year to year with the certainity of a maximum crop is dependent upon a complete knowledge of these factors. The establishment of these factors will do considerable for seed production in Idaho since no farmer now can know whether his efforts are to be rewarded by a satisfactory crop or not until time has elapsed to reveal all of the expected evidences. In the meanwhile a farmer sees his forage crop deteriorating from day to day and at the same time has no assurance that the seed crop will amount to anything. Until such time as these factors are common knowledge, there can be no hope for a continual year in and year out dependable seed crop from those sections of the Snake River Valley where forage is the principal interest of the farmers. Nor can seed enthusiasts expect to establish the finer and more marketable and hardier varieties of alfalfa in that section for the sole production of alfalfa seed until such time as each grower can have a through working knowledge of these factors and can be assured that with normal moisture and climatic conditions that he will be able to produce with little or no uncertainty, a profitable yield of good quality seed.

Moisture, Its Regulation and Influence.

Moisture has long been known to have impotant bearing upon production of all kinds of legume seed and where irrigation is practiced there is probably no other factor which lies within the control of the grower which can be so manipulated

as to materially influence the yield secured during any given season. A sufficient amount of water applied to fields to produce maximum hay yields is almost invariably so great as to stimulate the vegatative development of the plants to the point where all tendency toward seed production seems to be lost. The explanation for this fact is fundamental; it relates directly to the laws involving the survival of the fittest. In Nature no plant has any tendency to form seed until such time as its vegatative growth seems to be endangered and its death not at all improbable. Under these circumstances the natural method of continuing the species is resorted to and the seed forming faculty becomes at once alove and dominant. Alfalfa is a plant peculiarly adapted to the arid regions and its response to either favorable or unfavorable moisture conditions is instantaneous, on the one hand to promote rapid vegatative development, on the other to develope the propagative portions of the plant. On irrigable lands the moisture allowance can be so controlled as to give to the plants only that amount which is best suited to stimulate this faculty and produce the greatest amount of seed. Results at the Aberdeen Station have established the fact that for that portion of the State at least the most effecient method, after the amount per annum is determined, is to administer the water by means of frequent and light irrigations thru the major portion of the time of growth. Farther west in the lower retions of the Snake River Valley this has not been determined definitely but it is reasonable to suppose that the conditions are

nearly enough analogous to warrant the assumption that the same method would prove most efficient there.

But even where water is continually available during the entire summer and regulation is easily accomplished, the problem is not so simple as it appears. I have seen in the Grandview district along the Snake River, a section that theoritically possesses every single requisite so far as climate, fertilizing winds, moisture control etc., are concerned, and a section where undoubtedly the largest yields of hay per acre are produced within the boundaries of the state, efforts from year to year come to naught so far as seed production was concerned. Every known factor stimulating seed production has been given a thorough trial, water has been applied at every conceivable time and in every conceivable amount from absolutely no irrigation to the amount that is ordinarily used to foster hay production and in every single case the seed produced was os such small amounts as to make the harvesting of forage much more lucrative. Yet, only a short distance away lies the Bruneau Valley which has given to the State an enviable record for both yield and quality of seed and where an utter failure of the seed crop is unknown. And all the conditions involved are as nearly identical as can be imagined with the single exception of the soil type found in the two districts. And this cannot be the sole influence since only a few miles from Grandview mimimum seed yields are annually obtained from soil identical to that found in the lower valley. An explanation of this phenomon is difficult;

it must be due to a complexity of conditions that have combined to make the section one peculiarly not adapted to seed producing or it may be that some not at all understood condition prevails there. Whatever the reason, it only emphasises the necessity for more extensive work on the general problem and more definite knowledge of the effects of factors already partially understood.

Fertilization of the Alfalfa Flower.

Possibly the factors relating to seed production which has yielded to observation and experimentation to a greater degree than any other is that one which relates to the fertilization of the alfalfa flower. It has long been known that the alfalfa flower is with difficulty "tripped" and that such tripping was essential to fertilization. But it was generally considered that any of the ordinary insects whifh visit flowers in search of nectar were capable of tripping them and little or no consideration was given to natural sauses. More recently it has been well established that only such insects as possess an abnormally long probosis and are capable of reaching into the expreme depths of the flower can accomplish the action. Honey bees and butterfiles, which were earlier given credit for the major portion of the fertilization are now known to be of little value. Bumble bees are capable of accomplishing the feat and still more recently it has been determined that a specie of ground bee known colloqually as the "alkali bee" probably has the most credit since they are prevalent throughout most of Southern Idaho and are particularly active during the later summer

months, while bumble bees are present in such small numbers as to be of little practical value.

For many years it was considered that insects alone have a bearing upon fertilization but it is now well demonstrated that windy, warm sunshiny weather, and other similar factors have a far greater influence than was at first thought possible and far greater import than that of insects even when the latter are present in great abundance. A dry warm wind probably furnishes ideal conditions for the fertilization of the alfalfa plants but here again the evidence does not all point to that conclusion. The summer of 1915 promised to be ideal for alfalfa seed and since the water supply was somewhat limited, many farmers of Lwyhee County did not harvest a portion of the first crop hay with the idea of permitting it to form seed. In spite of ideal conditions according to such information as we now have available to determine what constitutes the best of conditions for the fertilization of the alfalfa plant, July Fourth saw lieelt tendency toward seed formation and many farmers were contemplating the harvest of the alfalfa for forage before it became so old and woody as to be of little hay value. The seed crop promised to be practically nil when on the fifth of July a heavy continous rain fell during the day. Within two days the fact that the rain had stimulated the fertilization of the plants in some way became apparent and the crop was normal both as to yield and quality of seed produced. Just what effect the rain had on the flowers to hasten fertilization is purely speculative; it may have furnished the

correct moisture conditions and with the return of the warm favorable weather, fertilization of the wayward flowers proceeded normally, or it may be that a warm rain under any conditions will have a stimulating effect upon the propagative tendencies of the plants. The effect was really remarkable in the specific case cited and without it there can be little question that the seed crop that season would have been an entire failure, for the first crop at least.

Whatever may be the causes underlying the processes and variations in the tendencies toward fertilization, and whether the results that I have cites may be due more to a complexity of circumstances than to any one condition, it is safe to say that in spite of the fact that knowledge of this phase of alfalfa seed production is comparatively well understood, the interrelationship of such factors is still without definite knowledge and only close observation and the lapse of years can bring their establishment within the bounds of rule. Observation has led me to the belief that there are more factors that have a peculiar relationship to each other and all of which must have some direct bearing upon the fertilization, maturity, yield and quantity of alfalfa seed than is the case with any other such crop produced upon Idaho farms unless it be that of some other legume seed crop. So far as present knowledge is concerned, there seems little doubt that many of these complexes lie completely without the bounds of human control and the results to be secured from seed crops are only speculative until such time as the natural forces have fulfilled their mission and the

results become apparent. Much needs yet to be determined before seed production can be placed upon the certain base upon which the live stock producer, for instance, operates.

The Weed Pest, and Suggested Remedies.

Idaho has no more vital problem today in the seed producing industry than the one which relates to the control of the weed pest. And nowhere is the need more dire than in the seed producing business. Alfalfa plants mature late seed, the stand must be comparatively thin and everything favors the propagation of weed seeds. Like every other newly cultivated country, Idaho for many years was without its weed problem, but the pest always follows in the vanguard of civilization and the time has come when its seriousness is a factor in the marketability of Idaho's product. Like many an other such problem, had it been seriously considered when in its infancy, eradication and pervention would have been the ideal method of treating the proposition. But weeds have come to stay and at present they are present in such large numbers as to occassion so little concern to the seed producer and salesman. Idaho had a fairly drastic weed law and one that is comparatively well adhered to but it lacks one vital essential and without which it will never be of the service or accomplish the ends that it should. Today, the greatest distributating agency for weed seeds is the fact that some farmers have not the far sightedness to realize the grave error they are committing when their product has been of such weed content as to be unmarketable. They dispose of it to their neighbors who buy it at greatly

reduced cost and with full knowledge of its weed content. I have seen newly established alfalfa fields on new irrigation tracts that were a solid mat of dodder, that most noxious of all alfalfa weed pests. Idaho needs a drastic addition to her seed laws and she needs to educate her farmers to the crying necessity of a control of these weed pests which are doing the marketability of our seeds a great harm. The saving effected thru the purchase of inferior weedy seeds is not at all commensurate with the total losses entailed in subsequent years thru the production of inferior hay and lack of any possibility of seed production except to follow the old route and scatter the pest indefinitely.

Weed control is a matter of cooperative effort, strict adherence to drastic seed laws and persistant individual effort. In the newer districts, care in choosing seeds for planting, eradication of such weeds as do appear and eternal vigilance should keep the weed pest well within control. Where they are well established, only constant effort, extra cultivation, an enormous amount of careful hand work eliminating the individual weed plants from the seed fields and such measures can keep the weeds down. Probably the greatest single factor favoring the production of seed from later crops in preference to the first crop is the fact that the latter has always a higher weed seed content than have the second and third crops. Where seed can be profitably grown from year to year and forage production is not of prime importance, the row method of planting with its easy cultivation for eradication of weeds

is undoubtedly advisable. Alfalfa seed production is primarily on an extensive basis but there is little doubt that with a fuller understanding of the factors involved in the production of seed that it can profitably be placed on an intensive basis in much the same manner that corn is cultivated. The introduction of the rarer and higher priced varieties will tend to produce this end and until that time little can be hoped for so far as the elimination of weed seed is concerned. Rotation is always an available method for fighting weed developement but as I have previously cited, it is not always possible under irrigable conditions, to plan and adhere to a system of rotation and the value of such a proceedure is largely lost under the uncertain conditions.

Of all the weed pests, probably no one is so difficult to handle as dodder since the seeds cannot be determined with an unaided eye because of their resemblance both in color and size to the alfalfa seed. The commonly called "big dodder" seed cannot be removed from the alfalfa seed by any divised process of recleaning and the presence of the weed in fields often remains unobserved owing to the fact that it attains a height somewhat less than that of its host plant. Care must be taken to remove it from the fields when harvesting occurs since only a few large and healthy plants will produce enough seed to make the entire output below the market regulations. Removal can be readily accomplished without a great amount of additional effort when a side delivery mower for cutting the seed crop is used

and invariably pays for the additional labor cost.

Other weeds are just as pernicious but are not so difficult to remove thru cleaning and often can be combatted in the standing fields. An experienced and careful irrigator, especially where the flooding policy of applying water is employed, can often be of material service in removing such weeds as he recognizes while he is going over the fields and with but little extra work. But after all, community action is almost imperative especially in such districts where waste water from one farm is used for irrigation on farms below.

In some sections, the prevalence of insect pests is as great an obstacle as weeds. Fortunately, the weevil has been held fairly well in check and for the western and more favored portions of the state for seed production, reasonable care should prohibit the possibility of the dangerous pest gaining admittance. But the leaf mite and more particularly, the grasshopper, are yearly making greater inroads into the cultivated vegatation. Apparently the latter has little effect upon the seed crop except in so far as their activity upon the vegatative portions of the plant may hamper its full development. My observations has led me to the belief that the insect does not destroy the seed pods but confines itself to attacks upon the leafy portions of the plants as well as the tender branches. Probably no fear need by felt toward the possible ravages of these insects since they can be controlled by community action;

thorough winter discing to expose the eggs and if necessary a spray of copper sulphate may be used, and the two will generally control the insect.

Gophers of several species and a variety of squirrels cause considerable damage. The former are not so difficultly controllable since they can be completely eradicated in the course of a single year if extra care be taken and subsequent care is reduced to a minimum. With squirrels the problem is complicated by the fact that the hills and acres of dry uncultivated land are infested with the rodent. No means has yet been devised of combatting them when such conditions are prevalent and the numbers which infest farmers fields are annually increasing. They hibernate comparatively early in the summer however and for that reason have nucm hess influence upon the seed crop than their number and devastating characters would lead one to believe.

Harvesting the Seed Crop.

Alfalfa seed matures extremely unevenly and great care just be exercised in harvesting the crop. In altitudes hither than three thousand feet the season with the possibility of early severe and killing frosts must be taken into consideration but in the lower part of the Snake River Valley this matter has little bearing upon the proper harvest since it is only rarely that frosts need be feared. To secure the greatest crop with the least possible loss makes care in harvesting essential. Alfalfa shatters badly and the longer the field is allowed to stand after the majority

of the plants are matured, the greater will be that loss. Winds have a particularly baneful effect upon the yield. All modern harvesting machinery that can be procured should be used and the plants should be handled just as little as possible. Early morning dews should be always taken advantage of and even light rains are looked upon as being of especial value since the forage is so dry that there is no question about the cut and shocked material drying sufficiently to insure prompt threshing. Efforts should be particularly extended during this time to rid the crop of such weeds as appear during the mowing and which have escaped notice during the growing season. Even under the very best of conditions and the greatest of care the loss thru shattering is certain to be great. Here it is that individual care pays best and there is no question but that the greatest of care will often make the difference between a goodly profit and actual loss. Where there is no danger of frosts, the plants should be allowed to mature to the greatest possible extent since a few days will often make no inconsiderable difference in the yield of good bright well matured seed secured. It should be borne in mind however that as the plants become more and more mature the tendency toward shattering becomes more and more marked and the time will come within a day or two when the natural shattering loss will exceed the gain from the maturity of additional seed pods. Under even the best of conditions the product is almost certain to have a large number of more or less

immature seed mixed in the fine quality product but this can usually be readily removed by recleaning. Recleaning is almost essential to remove weed seeds, anyway, and there is no question but that the effort and additional expense will be amply repaid with the difference in market value of the recleaned product over the normal since most buyers will only pay well within the known limit for uncleaned seed and the producer is loser on the bargain. Many farmers are purchasing recleaners and doing their own work and there can be no question as to the desirability of such a proceedure. Hullers, especially designed for separating alfalfa seed are the most satisfactory for threshing but the ordinary separators can be used if the former are not available. Special concaves must be added but with them the work should be as satisfactory as with a legume huller.

Marketing and the Need for Educational Instruction.

Probably nowhere in the process of seed production and disposition does the farmer lose more than he does in the marketing processes. Alfalfa usually commands a fairly good price and the net returns are often astonishing. But the average farmer is not sufficiently familiar with the market conditions both as regards supply and demand to determine exactly what should be a fair price for his product. In his crop immediately after threshing and as a consequence the market is usually flodded at that time and the price for alfalfa seed is at its lowest ebb. Besides this foolish practice the average farmer who thus disposes of his seed

stands a considerable loss owing to the fact that he has not properly cleaned his seed and the buyer will deduct more than the quality of his seed really warrants. Alfalfa seed should have a standardized system of quality, color, vibility etc., in somewhat the same way that wheat has in order that the farmer and producer may have definite comparative values upon which to determine the value of their crop. The demand for first class alfalfa seed is annually increasing throughout the east and Idaho has a splendid future ahead of her if she will only stimulate the baby industry to its utmost.

Soil Fertility and Alfalfa Seed Production.

Among the possible explanations for some of the peculiar things which occur to every individual who is familiar with seed production, none holds more interest than that of the possible bearing which the soil fertility may have upon the problems. I have noted from year to year on my fathers farm a peculiar condition, that could only be produced by an almost inconveivable complexity of all the conditions known to favor seed production or that must have some direct bearing upon either the water holding content of the soil and its relationship to the general soil conditions or else it must have an explanation in the field of soil fertility. It is this: my father's property happens to be almost equally divided by an old watercourse, now nothing but a meadow. This water course divided the two most prevalent of all soil types found in southern Idaho. The one with a southern exposure, is a typical white "dobie" soil of the Southern part of the state, commonly found in the native conditions with a good and healthy crop of greasewood. It is neutral in reaction, has a large percentage of alkali salts and is of fine soil that becomes extremely sticky with irrigation or a small amount of rain. Because of its alkali content it has the reputation of being practically worthless, and particularly eastern people who come to Idaho interested in her soils, are invariably cautioned to avoid exactly such land.

The other is a silt loam somewhat similar to Palouse soils having a large percentage of humus, light and friable and without the objectionable features of the finer lighter colored soil described above. It is a soil that produces an extraordinary native vegetative growth, is alkaline in reaction and has a high producing capability. This type of soil is what is currently known as "sage brush" land and is much prized.

It should be clearly understood that these are soil types of considerable divergence in characteristics and that they are typical of practically all of Southern Idaho, where almost all of the Agricultural land corresponds rather closely to one or the other or these two types. And I use the specific cases found on land with which I have worked for a number of years for the reason that I have seen the productive capacity of the two types as there revealed thru a considerable number of years of actual experience.

All southern Idaho soils are of volcanic origin and hence are rich in those basic constitutents such as calcium and phosphorus which make a soil at once productive and wearing. The soil type first described and hereinafter called Number 1, is almost impossible to bring under cultivation in a single season; it produces only a small amount of grain and is so alkali in nature that alfalfa plants experience some difficulty getting a start. Once established, however, alfalfa does splendidly and maximum crops are obtained with only the smallest amounts of water. From then on no difficulty is ever experienced even when the fields are

town up and reseeded; an immediate and satisfactory stand almost invariably resulting. In its vergin condition, these soils are lacking in nitrogen as can clearly be seen from the fact that they are almost white and have only the smallest amounts of humus present. This may account in some measure for the difficulty experienced in getting alfalfa started, and is undoubtedly the reason for the failure of grain crops on such soil during the early years of its cultivation. But the peculiar and most striking thing in regard to this soil type is the fact that it produces a seed crop of alfalfa from year to year and apparently under almost any sort of moisture conditions. Plants that grow along the meadow mentioned above where the water level is so near the surface that the alfalfa plants have difficulty surviving are absolutely loaded with seed every year that the opportunity is given them. And this is of course contrary to all the commonly accepted rules in regard to the moisture requirements of alfalfa plants that are allowed to form seed. Moisture seems to have little influence upon the seed producing capability of such soil since it does as well as any other when the water is regulated according to the best information available and when that amount is materially increased it seems to have little influence upon the seed producing ability of the soil. The seed producing faculty does not seem to be controlled by the moisture content.

The other soil is one that will produce almost any crop with maximum yields that will grow and mature in Southern Idaho. It is easy to establish a stand of alfalfa on it and

extremely heavy hay crops are produced. Ocassionally, when weather and moisture conditions are exactly correct, this land will produce the heaviest yields of seed that the Snake River Valley can boast of. But there is nothing certain about the seed producing business when conducted upon such land as this type exemplifies since it is satisfactorily productive of alfalfa seed only under the most ideal of seed producing conditions. For year and and year out producing ability when all seasonal variations are considered it does not compare with type Number 1. I know one small field in the favored Bruneau Valley which thru a four year period averaged a little over twenty bushels to the acre per annum. This piece of property was typically like soil Number 1. The conditions were not exceptional when this productive record was made except that the field, being small, received exceptional care. Last year the field was like the majority of the other alfalfa seed lands of Owyhee Co., it produced little or no crop. Whether this was due to the unusually unfavorable seasonal conditions or whether it may have another significance from the standpoint of soil fertility is questionable, possibly a combination of the two accounted for its failure to produce the yields that had come to be expected of it. This case will be cited again later.

A comparison of these soils from the standpoint of fertility may shed some light on these peculiar conditions. All southern Idaho soils are so sufficiently supplied with calcium that little or no consideration need be given this element, other than repeating the well known fact that one of

the basic reasons for the success of alfalfa culture in Southern Idaho is the prevalence of calcium in the soil, without which alfalfa seems to do but poorly. Nitrogen is never extremely abundant in Snake River lands except in rare and isolated cases tho there are many soils which have a sufficiently large amount for the production of grains, and this is particularly true of those soils which correspond closely with soil type Number 2. It is on these nitrogen soils that seed production, to be successful, must have the best conditions, the stand must not be too thick, water must be kept at almost a constant and minimum amount, and ideal fertilizing conditions must be present during the blossoming time to insure a goodly crop. It all points very difinitely to one conclusion, that a soil rich in nitrogen to produce a good crop of seed, must not be given too great an amount of water during the vegatative development of the plant or the seed forming tendency seems to be entirely subordinated to the heavy production of forage. Nitrogen stimulates vegetative growth, nitrogen and water together make a maximum crop of forage. The two cannot be together with any expectation of harvesting a profitable seed crop.

Soil type Number 1, on the other hand is proverbially a Nitrogen-poor soil. This is the chief reason that land buyers are urged to avoid it. Experience is necessary to get the soil into proper condition to produce profitable crops. Grain grown upon such virgin soil has the typical appearance of all nitrogen starved plants, being somewhat small, a light yellowish green instead of the bright dark green that healthy

plants should have, and the general tendency is rather toward the development of small spindly plants. A stand of alfalfa is with difficulty procurable but when once established the future of the land is on a profitable and enduring basis. Like all alkali lands, once under cultivation the productive capacity is almost inexhaustible and the land seems to improve with years of continuous productivity. It is ruch in such soluble salts as potassium, sodium, magnesiu, etc., and has a plentiful supply of phosphorus. But the outstanding feature of this soil is the remarkable productivity that it possesses for alfalfa seed, crops being produced year in and year out practically regardless of the seasonal conditions and when soil type Number 2 fails completely to make a profitable crop.

The explanation must have a basis in the relationship which the various factors determining fertility establish and the peculiar capability that this soil possesses of retaining such soil moisture as is given it. This soil will produce forage with little or no water when other soils dry up so completely as to absolutely prohibit plant growth. In the early dry autumn months this soil will be moist and foliage on alfalfa plants will be green when other adjoining fields are barren and brown. In spite of the fact that it has little or no humus, nevertheless it has the marvelous moisture absorbing capacity when irrigation is prolonged sufficiently to allow the water to percolate deeply into the soil. And it has the faculty of retaining that moisture.

It must be borne in mind, however, that alkali soild must possess a considerable higher moisture content before the water is available for plant usage owing to the concentration of the saline solutions.

The only possible explanation in the light of the above facts for the remarkable performance of this soil lies in the combined influence of its water holding capacity and hence, better physical condition, producing an effect about equivalent to the known desirable effect of adding irrigation water at frequent intervals in small amounts to seed producing fields, and the apparent fact that nitrogen content need not be high to insure good seed yields. Southern Idaho soils need not be inoculated, and nitrogen shortage is readily provided by the action of symbiotic organisms. In the presence of a sufficiently large amount of water to completely prohibit all seed forming tendency on rich humus soils, this type of soil produces good results. It must be due to the fact that the nitrogen shortage is a marked and rather than a hindrance to seed production, and more particurlarly is this true when water supply is plentiful. The vegatative development does not so completely overshadow the propagative tendency.

Alfalfa seeds are extremely rich in phosphorus and it can readily be imagined that continuous seed cropping will have an exhaustive influence upon the phosphorus content of the soil. Fortunately for southern Idaho soils, phosphorus is ordinarily plentiful and when the amount is practically

exhausted, more is readily provided from the enormous beds of phosphate rock which can be cheaply furnished as fertilizer in the eastern part of the State. So far little or no difficulty has been entertained from this course with the single expection of the one case that I discussed earlier, a field in the Bruneau Valley that had produced maximum yields for a period of years and then seemed to have completely lost its productive capacity. While it is not at all impossible that this condition was the direct result of adverse climatic conditions throughout the last couple of seasons, it may have another significance. Total phosphorus content of soils is not a true criterion of the phosphoric value of them since all phosphates continually are breaking down to that state where they are soluble and hence available for plant consumption. Available phosphorus is thus only a portion of the total phosphate content of soil. It may be that the production of maximum crops thru a series of years had exhausted a large part of the available phosphates and seed production was limited from that standpoint. No analyses are available to demonstrate this and it may not be correct but it would be an interesting study and a friutful one. Certain it is that such crops surely would in time exhaust the available phosphates.

Potassium is present in sufficiently large amounts in most Southern Idaho soils as to occassion little or no aprehension.