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**INVESTIGATIONS OF  
THE GROWTH OF ALFALFA IN KANSAS.**

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During the latter part of the summer of 1898, the writer was detailed by Professor Hitchcock, of the Kansas State Agricultural College, to make observations upon the growth of alfalfa in northwestern Kansas. The trip planned extended thru the three northern tiers of counties from Manhattan west to the State line. Observations were made in twenty-seven counties. Thousands of acres of alfalfa are grown in the regions visited, and the alfalfa grower is almost universally a thrifty farmer.

The ideal conditions of soil and moisture for the growth of the plant are found on the valleys of streams where sheet water is obtained at a depth of twenty feet or less, and where the soil is a porous, sandy loam with a permeable subsoil. I am convinced, however, that alfalfa will grow and give remunerative returns upon as many varieties of soil as any other cultivated plant.

J. E. Fitzgerald, of Jamestown, Cloud county, the owner of 280 acres of upland alfalfa, says that it will grow successfully upon the poorest clay soils and the highest knolls, if the land be given a coat-

ing of barnyard manure. "In fact," he continues, "no crop responds so readily to fertilizers upon poor soil as does alfalfa."

C. M. Burr, of Grainfield, Gove county, believes that nearly every section of high prairie in western Kansas has upon it, somewhere, a spot that will grow alfalfa. Such a location must receive the surface drainage from higher land. By running furrows out into the buffalo grass sod, Mr. Burr is enabled to catch sufficient drainage water to insure him one to three crops of hay per year from alfalfa sown on land where water is found at a depth of eighty-five feet.

J. H. Taylor, of Rhinehart, Dickinson county, has 100 acres of excellent alfalfa on upland where water is obtained at a depth of 150 feet.

Alfalfa was found growing on high prairie in almost every county visited. The acreage on upland is still very limited in western Kansas. This fact partly accounts for the difficulty usually experienced by farmers in getting the plant started on high prairie. A western farmer frequently sows a small patch and then allows his whole herd of cattle to range over it in the springtime when the plant needs all the green foliage it can command for the manufacture of its own food materials. If any of the crop survives this treatment, the grasshoppers swarm in from the thousands of acres of prairie sod surrounding the alfalfa patch and "camp down" upon it until not a green shoot is left. The farmer then gives out the report that alfalfa will not grow on upland in western Kansas. Of course it will not grow with such treatment; no other plant would. Every farmer who has had any experience with it knows, however, that it will not yield as large returns from upland without irrigation as it will on bottom land. It need not be so productive in order to give good returns on the cheap upland of the west. Bottom land with sub-irrigation that will yield three to six tons of alfalfa hay per annum can be bought for \$5 to \$20 per acre, while upland may be had in many parts of western Kansas at merely nominal prices. In an interview with an experienced alfalfa grower, I was told that a good bottom-land field of alfalfa ought to be worth \$250 per acre; another conservative farmer estimated it worth \$100 per acre. In view of the high protein content of the hay, making it worth \$8 to \$10 per ton when corn is worth 25 cents per bushel, the above valuations are not extravagant.

It has been thought by some of our experiment station workers that the frequent failures of alfalfa on upland might possibly be attributed to the absence of the beneficent soil bacteria causing nodules on the roots of the plants. This subject was extensively investigated, and nodules found in sixty-three out of sixty-eight fields.

The distribution and development of nodules generally made as good a showing for upland as for bottom land. Nodules are better developed and more abundant in soil of moderate than in lands of great fertility.

#### INTERVIEWS.

The following is a synopsis of my interviews with fifty-one farmers:

**Question 1.—How many cuttings do you get from your alfalfa per year?**

The number of cuttings varies from one to four, with a yield of one-half ton to six tons per acre. Mr. Fitzgerald says that alfalfa on Buffalo Creek valley, in Jewell and Cloud counties, will yield five crops per year if cut at the right time. G. R. Allaman, of Wallace, gets four crops and pastures off the fifth crop in the fall.

**Q. 2.—At what stage of growth do you cut it?**

The majority prefer to cut it in the bloom for cattle, tho a few would cut earlier. Nearly all who use it for horses agree that it should be cut when fairly well developed and the seed pods set.

**Q. 3.—What is the effect upon the succeeding crops of cutting at different stages of growth?**

The great majority of the farmers interviewed believe that this has no effect upon the succeeding crop. Dr. M. F. Hudson, of Osborne, says : "It should be cut just as soon as it comes into blossom, the early harvesting seeming to vitalize the plant and stimulate its growth. The hay when cut early is more nutritious, containing a larger percentage of nitrogenous matter."

**Q. 4.—When do you sow alfalfa and how much seed do you use?**

Successes and failures were reported from sowing in every month from March to September. The condition of the ground at the time of sowing is more important than the time, provided the seed be sown in the growing season. In western Kansas, on high land the ground ought to be subsoiled and sub-surface packed the fall prior to sowing, in order that all the winter rains and snows may be retained in the soil. Alfalfa should not be sown until after a good rain when the ground is wet eighteen to twenty inches deep. Hon. C. B. Daughters, of Lincoln, believes the majority of failures to get a stand are due to late sowing. He would not sow as late as the first of May, because the weeds are liable to get a start of the young plants. S. Larrick, of Lenora, Norton county, has had the best success from sowing in August, and believes it would be all right to sow as late as the middle of September. From ten to sixty pounds of seed were recommended for an acre. The prevailing opinion seems

to be that twenty pounds per acre should be sown on rich valley land, for a hay crop. If the crop is to be used for seed the plants should be more thinly distributed over the ground. Eighteen persons interviewed favor 20 pounds, seven prefer 30, one prefers 45 pounds and got his finest stand from sowing 60 pounds. Twelve prefer 15, two prefer 12, and two think 10 pounds sufficient. Drilling requires less seed than broadcasting.

**Q. 5.—What kind of a soil do you prefer?**

The majority of answers indicate a preference for a sandy loam with a porous or jointed-clay subsoil overlaid with sand and sheet water at a depth of fifteen to twenty feet. The next best soil is alkali "gumbo" with a similar subterranean formation. Few farmers can choose the location of their alfalfa lands, being of necessity limited to the soil they already own.

**Q. 6.—How do you prepare the soil before seeding, and what should be its condition at the time of seeding?**

The preparation of the soil varies with its nature and location. If the subsoil is impervious to water, it will be necessary to subsoil the land eighteen to twenty-four inches deep. If the subsoil is porous, ordinary plowing will suffice. All agree that the surface should be in the finest of tilth. Plowing should be done long enough before seeding to allow the soil to settle somewhat. The land should be free from weed seeds. If the land is foul it will pay to wait a year before seeding until it can be freed from weeds by clean culture.

**Q. 7.—What method of seeding do you prefer?**

Twenty-nine favor broadcasting and twenty prefer drilling. Both lists of answers contain the names of very successful alfalfa growers. Where drilling was recommended the press drill was generally preferred.

**Q. 8.—What treatment do you give the crop the first year after seeding?**

The treatment prescribed was to mow the weeds as often as they need it. A few farmers stipulated that it is an advantage to the young plants to prune them and, therefore, preferred to mow often whether there were many weeds or not. County Attorney M. A. Wilson, of Atwood, prescribes the following treatment: "Mow three or four times and leave the vegetation on the ground, if the weather is very hot and dry. The next spring, rake the mulch up and haul it off, and give the ground a thoro harrowing. If there is plenty of rain the first season, cut the weeds and alfalfa about three times and haul off immediately, and harrow the field next spring. After the first season, disk and harrow the field about every second year.

**Q. 9.—To what extent do you practice pasturing alfalfa with cattle? If you find it a successful practice, what methods do you employ to prevent the bloat that causes so many deaths among cattle pastured on alfalfa?**

Seventeen farmers interviewed pasture it when the weather is dry, early in the spring or late in the fall after frost; twenty-eight never use it except when cattle accidentally get upon it; and three prefer to take the risk and pasture at any time. There is always more or less risk to run whether precautions are taken or not. Puncturing the left flank, putting turpentine upon the bloated parts, and tying a stick in the mouth of the sick animal were remedies suggested.

**Q. 10.—Have you ever had any or heard of any case of bloat from feeding alfalfa hay to cattle?**

Ten persons were met who had seen or heard of it. H. F. Sims, of Phillipsburg, has lost cattle from feeding the hay in the rain. F. S. Curtis, of Solomon Rapids, lost a cow from feeding his last cutting when it was frozen. H. W. Moses, of Grainfield, had some bloated calves from eating alfalfa hay the day I visited him.

**Q. 11.—How much cheaper can you fatten steers if you have alfalfa for roughness, than if you do not have it?**

The general consensus of opinion is that a great saving of grain can be effected by using alfalfa hay for roughness. Fifteen persons were prepared to make reliable estimates of the saving. Seven answered that you could save one-third the grain; three believed you could save half, and one said a fourth. One said you could fatten steers 50 per cent cheaper; another answered, 25 per cent cheaper; and a third said 20 per cent cheaper.

Messrs. Wilson & Blair, of WaKeeney, base their estimates upon five feeding experiments tried last winter and reported as follows:

(1) Took 102 head of old cows, that could not be sold at any price when put into the lot, the culls of 8,000 head, and fed them on nothing but alfalfa hay for three months. Sold them for \$30 per head.

(2) Put 45 old worn-out range bulls into another lot and fed them alfalfa hay and shelled corn for three and one-half months. These made a net gain of \$14 per head with an average of 10 bushels of corn per head.

(3) Fed 32 head of choice steers alfalfa hay and shelled corn five months and obtained a net gain of 517 pounds per steer. These cattle were badly shrunken from driving and dehorning when weighed into the lot.

(4) Bought 5 spring calves for \$18 per head, 3 heifers and 2 steers, and fed them shelled corn and alfalfa hay five months. These calves netted \$28.31 per head when marketed.

(5) Fed 65 head of brood sows thru the winter upon nothing but alfalfa hay. They came out in the spring in good flesh. The last cutting of hay was used for this purpose.

**Q. 12.—If you feed alfalfa to steers, to what extent do you feed it, and do you think a fattening steer will eat too much of it to make the most economical gains, or the most rapid gains?**

Eleven farmers who feed alfalfa hay to fattening cattle give them all the alfalfa they will eat unless the supply is limited. Seven think that they should be limited in order to compel them to eat enough grain. The answers to this question indicate that few Kansas farmers have ever thought of balancing a ration for fattening animals.

**Q. 13.—What has been your experience in pasturing horses or sheep on alfalfa?**

Twenty-five persons interviewed have had experience in pasturing horses and colts on alfalfa, and all declared it to be excellent pasture, especially for young animals. Three persons think that horses eat the plants too closely for the good of the pasture. But three persons had ever seen an experiment in grazing sheep upon alfalfa, and these asserted that it is more liable to bloat and kill sheep than any other animals.

**Q. 14.—Do you feed alfalfa hay to your work or driving horses, and with what results?**

Eleven persons feed it to work horses only; sixteen feed it occasionally to both; twelve feed it exclusively to both; one feeds all that work horses will eat and limits the quantity to his driving horses; and two never feed it to either because of bad results. The objections offered were that it is too washy, it affects the kidneys, and it makes horses "short winded."

**Q. 15.—To what extent can you continuously use alfalfa for hog pasture and not kill it out? That is, how many hogs do you put on an acre, how long and what parts of the season are they on, and to what extent are they compelled to get their living from the alfalfa?**

It was generally conceded that alfalfa makes excellent pasture for pigs. Six farmers practice killing it out in three to five years by pasturing five to fifty head per acre, the year round. One person compels them to make their living exclusively from the alfalfa four months, another two months, another three months, and another for the whole summer. Three persons believe it will not kill out if continuously used, providing the noses of the pigs are "rung." One farmer pastures 150 head on 100 acres without being able to find where they have been, another puts 200 head on thirty acres and does not kill it out, a third person pastures twenty-five head on three acres, giving in addition a little grain, and still another has allowed 100 head to run on three acres for two years past without killing it out. Hon. William Baker, of Lincoln, says that you can put five head on an acre and get two crops of hay besides. Messrs. Wilson

& Blair, of WaKeeney, say that an acre of good alfalfa will support ten hogs the year round. Dr. A. B. Jones, whose farm is on Big Creek valley, in Trego county, says: "I pastured 200 head of hogs, six milch cows, and six horses on ten acres of alfalfa all last summer. The hogs were fed nothing but the alfalfa. A good hog will keep fat on it from the time it starts in the spring until it freezes up in the fall."

**Q. 16.—How much cheaper and better can you grow pigs with alfalfa pasture than without?**

Fifteen farmers were certain that they could grow pigs for half the usual cost; three could grow them one-third cheaper; one, 80 per cent cheaper; and one answered 75 per cent cheaper. One person can raise pigs to weigh 150 pounds without any corn. A large cattle feeder said that, by letting his pigs run loose on his alfalfa meadow, he is enabled to grow the healthiest and best of stock hogs, to run after his cattle, at a cost of 50 cents apiece.

**Q. 17.—Have you ever fed alfalfa hay to pigs in winter? If so, how and with what results?**

Fifteen persons had fed it with splendid results, using at the same time a small grain ration; six had fed it exclusively and wintered stock hogs on it in fair condition; while six had fed it occasionally and believe it to be excellent feed. Five persons know that pigs like it, tho they have had no experience in feeding it. Mrs. N. Ratliff, of Jewell county, answered: "Yes, we feed our hogs hay in winter as regularly as the horses. My husband always saves the last crop for his pigs and milch cows."

**Q. 18.—It has been stated by many that there has never been a year so dry in any part of Kansas but that sufficient moisture was held by the frost to make at least one crop of alfalfa hay in the spring. Is this true? What has been your smallest yield for the season since 1892?**

The majority of the persons interviewed believe that one crop of alfalfa can be harvested in the spring in any part of Kansas whether any rain falls during the growing season or not. I believe, however, that there have been seasons so dry in the extreme western part of the state that the plant would make no growth at all on upland. Such seasons occur very rarely. Mr. J. E. Payne, superintendent of the Colorado Rainbelt Experiment Station, at Cheyenne Wells, harvested a ton of alfalfa per acre the past season without irrigation on land 290 feet to water. The smallest yield reported was one-half ton per acre.

**Q. 19.—What is the average length of life of the alfalfa plant? How long have you grown it from one sowing?**

G. R. Allaman, of Wallace county, has grown alfalfa from one seeding nineteen years and it is better to-day than ever. As the

plant grows old the crown is apt to decay in the center and new side roots are thrown out which send up new plants from adventitious buds. This is a method of slow vegetative propagation which, I believe, may be hastened by frequent use of the disk harrow. The harrow splits open the crowns and thus causes the plants to spread.

#### FEEDING VALUE OF ALFALFA.

Alfalfa possesses, in common with other leguminosae, the ability to store up within its leaves and stems large quantities of nitrogenous substances. Its richness in protein constitutes its chief feeding value. The digestible nutrients of any food for either man or beast consist of fats, carbohydrates and protein. The fats and carbohydrates are generally found in excess in the common feed-stuffs produced on the farm. Protein, a substance indispensable to the vital processes of all living beings, is the scarcest and most expensive constituent of the different feeds. Protein contains nitrogen, and is the most essential constituent in the formation of the tissues of the nerves, muscles and brain. This important substance is quite abundant in gluten meal, linseed meal and cottonseed meal. Tho these artificial feeds possess a very high nutritive value, their prices are usually out of reach of the practical Kansas farmer. Is it not possible for us to find natural feeds that furnish the all-important protein at a nominal cost? We have such feeds in the tender green grasses of our pastures and the alfalfa of our meadows.

Alfalfa hay has a very high percentage of protein compared with other dry feeds. It contains 10.6 per cent of digestible protein, while corn contains but 7.8 per cent, corn fodder 2 per cent, timothy hay 2.9 per cent, and prairie hay 3.5 per cent. Colorado Experiment Station has proved that the leaves of alfalfa hay contain 14¾ per cent of digestible protein. This makes a ton of alfalfa leaves equivalent in feeding value to 2,400 pounds of bran. Taken stems and all, alfalfa hay is worth for its digestible nutrients 86 per cent as much as wheat bran. In other words, if bran sells at \$10 per ton, alfalfa hay is worth \$8.60 per ton. Banker and farmer, S. Larrick, of Lenora, Norton county, Kan., says that good alfalfa hay is worth as much as corn, pound for pound, to feed to fattening steers. A ton of shelled corn contains 35.71 bushels. At 25 cents a bushel, corn would be worth \$8.92 per ton. If a farmer can realize 25 cents a bushel for his corn by feeding it, according to the estimate of Mr. Larrick, he can just as certainly realize \$8 to \$9 per ton for his alfalfa hay by feeding it.

Last winter, H. F. Sims, of Phillipsburg, Kan., fed 480 head of steers, weighing about 800 pounds per head at the start, as follows:



Fed snapped corn a few weeks to get them started, then ear corn, alfalfa hay and some millet. He next fed shelled corn and alfalfa hay, and finally finished them off with soaked shelled corn, corn meal and alfalfa hay. His cattle gained 420 pounds per head in seven months, consuming about sixty-five bushels of corn per steer.

The following is a report from E. J. Ryan, of Lincoln, Kan., who fed 486 steers, beginning the first of last March: "Threw alfalfa hay into the bottoms of the feed boxes and put corn meal upon it. As soon as the first crop was large enough to mow, green alfalfa was fed in the same way. Never had steers do so well in any previous feeding. The cattle gained 365 pounds per head, with good wintering and four months' feeding."

The feeding value of alfalfa hay depends very largely upon the methods of curing and handling it. Geo. R. Allaman, of Wallace, Wallace county, Kan., gives the following directions for harvesting the crop: "Mow it and let it lie in the sun two or three hours, until wilted; then rake it into windrows and let it lie two or three hours longer. In five or six hours after it is mown, the hay should be put into bunches or 'cocks' with as little stirring as possible. The following day, if the weather is good, put it into the stack and cover the stack with prairie hay or other long grass. The stacks should be in the form of ricks, not exceeding twelve or thirteen feet in width. To have good feed, it should be handled quickly, carefully and properly."

In eastern Kansas, farmers often have trouble with alfalfa molding, even after it has been perfectly cured. If two or three weeks of cloudy, wet weather should follow the harvesting of the first crop, the chances are that it would be almost ruined, even tho stored in a good barn. The hay frequently absorbs moisture from the atmosphere and becomes very seriously damaged. This difficulty can be overcome by stacking or storing alternate layers of good, dry wheat straw with the alfalfa hay, in the proportion of two loads of alfalfa to one of straw. Farmers in central and eastern Kansas annually have thousands of tons of wheat straw that could be used in this way if it were only preserved. When fed out, the straw would be partly eaten and the rest would form the finest of bedding for the animals. Alfalfa handled in this way could be safely harvested much younger than it usually is and would contain a very much higher percentage of protein. If harvested as it is coming into blossom, alfalfa furnishes more nutritious feed than if left standing longer to grow tough and woody. When intended for horse feed, the stems should be allowed to become somewhat ripened and the pods set, before it is harvested.

Steers can be fattened on one-third less corn with alfalfa for roughness than without. Owing to its high protein content, too much may be fed to fattening animals to secure the most economical gains. Horses when not working do exceedingly well on alfalfa pasture. It is not best to feed too much of it to working animals. If mixed with other hay, there is no better horse feed.

#### PASTURING ALFALFA.

It is never safe in Kansas to pasture alfalfa with cattle or sheep on account of the liability to bloat the animals. There is even some danger in feeding the hay if it should happen to get wet. Indiscriminate pasturing of alfalfa is very apt to result disastrously to the farmer, in more ways than one. I believe it is generally conceded that horses and hogs may be allowed to run upon alfalfa with little danger of injury to the animals. It is claimed, however, by some liverymen that colts grown upon alfalfa do not have the constitutional endurance that characterizes animals grown upon our wild grass pastures. T. E. Scott, of Ottawa county, says that nothing fattens up a horse so quickly as alfalfa pasture. J. E. Fitzgerald, of Cloud county, says that it is the finest pasture in the world for horses. R. C. Wilson, of WaKeeney, says: "I think you can grow colts one-third larger with alfalfa pasture than without." F. S. Curtis, of Solomon Rapids, says: "Alfalfa is the best pasture I ever put horses on."

On the contrary, alfalfa alone will not fatten hogs, tho it may keep them in as good condition as is necessary for the thrifty growth of young animals. Corn, to provide sufficient carbohydrates, and green alfalfa in addition, furnish an excellent ration for fattening hogs. Pigs, when turned loose upon an alfalfa field, do not get a sufficiency of the tenderest and best morsels, unless they have a very wide area of frequently mown meadow upon which to range. In order that the plant may often send up its tender shoots, it is necessary to prune it frequently with the mowing machine. This is not practicable in a hog pasture. The animals, when pastured, usually are compelled to subsist largely upon the woody, ripened stems. The stomach of the pig is not adapted to the digestion of woody fiber. Hence the farmer frequently finds his pigs on the alfalfa pasture running down in flesh when they ought to be gaining. A better way is to sow an alfalfa field near the hog lot, where the green feed can be mown and fed to the pigs. The portion of the field first mown will quickly send up a succeeding crop, and will be ready for the mowing machine by the time the last of the first crop is harvested. For pig feed, alfalfa should not be allowed to blossom, and if cut at the right time, it will furnish six or seven crops

during a single season. M. A. Wilson, of Atwood, the veteran alfalfa grower of Rawlins county, says: "My experience is that in two years 100 head of hogs will kill out ten acres of alfalfa. I don't pasture it any more, but mow it and feed it to them green. Two acres will give better results by mowing and feeding than ten acres to let them pasture on it."

It is an undisputed fact that green alfalfa fed in unlimited quantities is liable to bloat and kill cattle and sheep. Hundreds of farmers, knowing this fact, persist in turning their stock upon their alfalfa fields at all times of the year and in all kinds of weather. The loss of a single animal in a season would probably amount to more than the wages of a man to haul out the feed to the cattle. Each animal could thus be limited and overfeeding need not occur. Animals that have been on the alfalfa pasture for months often suddenly bloat up and die, because of eating the green feed wet or frosted. The very richness of the feed, constituting its chief value, is the cause of the great and frequent losses from bloat.

Another great loss occasioned by the pasturing of alfalfa is the destruction of the plants. No other forage plant endures mowing so well as does alfalfa, but it will not stand continuous or close grazing. Horses bite it off too closely and cattle tramp off the buds from the sides of the crown. Sheep bite closer than horses and hogs root out the plants. In the fall or winter time, a hog will often root out a hole around an alfalfa plant, and then grasp the tap-root crosswise in his mouth and jerk the whole plant out of the ground. He will then proceed to chew up the tap-root. Getting a field seeded to alfalfa is no small task, and a ruthless destruction of a good stand seems to me to be reckless extravagance.

Pigs can be grown for almost half the usual cost if green alfalfa be added to their ordinary ration. It pays to feed them the hay in winter, provided they get grain in addition.

#### FAILURE TO GET A STAND.

In western Kansas the failure to get a stand is more often due to drouth or grasshoppers than any other cause. To provide against drouth, subsoil the land eighteen to twenty inches deep and wait until the ground is thoroly saturated before seeding. You may have to wait two or three years, but it will pay you to wait rather than to lose your seed and labor. You may get a better stand than you would be led to believe by first appearances, so do not be in a hurry to pronounce your efforts a failure. M. A. Wilson, of At-

wood, Kan., has the following to say upon this subject: "In 1888, I sowed a field of fifteen acres on second bottom land where water is obtained at a depth of twenty-five feet. I mowed it three times in 1888, three times in 1889 and three times in 1890 and did not take off a load of hay during all this time. In 1891, I cut three crops of the finest of hay from this field and it has given good yields ever since."

The grasshoppers are a very serious drawback to alfalfa growing in many parts of Kansas. One man near Grainfield, in Gove county, keeps a large number of turkeys to rid his alfalfa fields of grasshoppers. He builds his turkey houses on sleds, and hauls them out into the middle of his fields. He turns out the turkeys after sunrise and they remain in the vicinity of their home during the day gorging themselves upon the "hoppers." Early in the evening he goes out and drives the turkeys into their house and securely shuts them in for the night. In a few days he hitches his team to the turkey house and moves it into a different part of the field. O. B. Haise, of Russell county, finds turkeys to be a great help in reducing the number of grasshoppers on his farm. B. F. Hall, of Rawlins county, scatters his poultry coops over his alfalfa meadow, with the result that grasshoppers do not injure his hay crop. Geo. R. Allaman, of Wallace county, recommends turkeys very highly.

In eastern Kansas, failure to get a stand is more often due to foul land than any other cause. To keep the weeds from choking out the young plants, it is well to summer fallow the land and sow the alfalfa after rain falls, in sufficient quantity to soak the ground to a good depth, in August or the first half of September. It might be best to wait until the next spring unless the fall season is very favorable. Weeds do not usually injure fall-sown alfalfa, and the following year it will yield three crops of excellent hay. If the ground is not in proper condition, do not be in a hurry to sow. Where alfalfa has not yet been grown, I would advise farmers to sow small areas for a start. The young plants are too tender and the cost of seed too high to risk all at one venture. It should be sown late enough if in the spring, and early enough if in the fall, to guard against the possibility of frost catching the young plants with only their first two leaves developed. The plantlets are more tender at this time than at any other stage of growth. Excessively hot weather following the seeding is apt to produce disastrous results. Very late spring seeding usually results in the plants being choked to death with weeds. Twenty to thirty pounds of seed should be sown per acre. The soil before seeding should be put in the finest possible tilth and freed as nearly as possible from weed

seeds. The seed should not be sown until the ground is moist enough to insure immediate germination. If not covered too deeply, alfalfa may be either drilled or broadcasted with equal probabilities of success. It is very easy, however, to set the drill too deep. The seed should not be covered more than one inch in depth. Weeds should not be allowed to shade or crowd the young plants, and are best removed with the mowing machine. Mowing often does not injure the alfalfa plant but seems to stimulate the vital processes.

#### FAVORABLE CONDITIONS OF GROWTH.

Suitable locations may be found in almost any part of Kansas for the growth of alfalfa that will produce every year one-half to six tons per acre, or an income per annum, calculated on the basis of digestible nutrients, of \$4 to \$50 per acre. Under irrigation, it has been cultivated in arid regions for ages, and it can be most perfectly and successfully grown and most ideally cured and handled where irrigation is practiced.

This does not argue, however, that it cannot be grown without irrigation. The process of irrigation has developed in the plant the ability to resist excessive drouth by simply remaining dormant, and to resume activity very quickly during any growing season whenever water is applied. It loves the sunshine. In fact, it owes its marvelous powers of rapid growth to the great abundance in its green parts of chlorophyll, a green coloring matter which is formed only in the presence of sunlight. It readily responds to a liberal supply of water, and yet very few other plants are so easily injured by too much water. Alfalfa absolutely refuses to grow in wet, marshy soil. Where the subsoil is unpermeable and excessive rains fill the top soil with standing, stagnant water, the plant perishes. This frequently happens in eastern Kansas where the soil is a heavy clay. The roots of alfalfa will rot off about as readily as potatoes will rot when put into standing water. The observing farmer aptly puts this fact as follows: "Alfalfa can't stand wet feet." Many failures to grow alfalfa in eastern Kansas have been reported, and I have no doubt that the cause is frequently too much water. Alfalfa will thrive best on a fertile loam soil underlaid with a porous moist subsoil. It will produce a fair crop, however, upon poor land, if not water-soaked, bringing the nitrogen down from the air and the minerals up from the depths below, and adding to the fertility of the soil upon which it feeds. Sufficient moisture in the soil is the one condition indispensable to a good crop of alfalfa. It is a deep feeder, exploiting the subterranean stores of moisture and the hidden mineral elements of the earth.

**ALFALFA: FEEDING NOTES.**

H. M. COTTRELL, AGRICULTURIST.

In the fall of 1898, the Kansas Experiment Station made an experiment to test the value of alfalfa hay when fed daily to fattening hogs that were being given all the grain they would eat. The gain greatly exceeded our expectations, and if further experiments show the same results, alfalfa hay will form a regular part of the rations of every well-fed pig fattened in Kansas in the winter.

The hogs fed in this experiment were bought of farmers, and averaged in weight 125 pounds each. They were placed in lots of ten each, in large pens, having for shelter some sheds open to the south. The alfalfa hay used was of the best quality, carefully cured. Black-hulled white kaffir corn was the grain used, the hogs being fed all that they would eat without waste. The hay was fed dry in forkfuls in a large flat trough. The pigs were given more than they would eat, and they picked out the leaves and finer stems, rejecting the coarser stems. One lot of hogs was fed kaffir corn meal dry and alfalfa hay; one lot whole kaffir corn dry; one lot kaffir corn meal dry; and one lot kaffir corn meal wet.

The experiment began on November 24 and lasted nine weeks. By that time the alfalfa-fed hogs became well fattened and were marketed. We estimated that it would require four to five weeks additional feeding, with ordinary winter weather, to get the hogs that were fed grain alone into good marketable condition. The recent continued extreme cold weather will make the time required considerably longer.

The gains in nine weeks from the different methods of feeding were as follows:

	Gains per hog in pounds.
Kaffir corn meal dry and alfalfa hay.....	90.9
Kaffir corn whole .....	59.4
Kaffir corn meal fed dry.....	52.4
Kaffir corn meal fed wet.....	63.3

The gain from feeding alfalfa hay with kaffir corn meal fed dry, over the meal alone fed dry, is more than 73 per cent.

The gains per bushel of feed were as follows:

	Pounds.
Kaffir corn meal dry and 7.83 pounds alfalfa hay ..	10.88
Kaffir corn whole .....	8.56
Kaffir corn meal fed dry.....	7.48
Kaffir corn meal fed wet.....	8.09

Ten hogs in nine weeks were fed 656 pounds of alfalfa hay; and as shown above, for each 7.83 pounds of alfalfa hay fed with the dry kaffir corn meal, the hogs gained 3.4 pounds over those having dry kaffir corn meal alone—a gain of 868 pounds of pork per ton of alfalfa hay. These results are not due to the feeding value of the alfalfa alone, but also to its influence in aiding the hogs to better digest the kaffir corn. The alfalfa hay also gave a variety to the ration, making it more appetizing and inducing the hogs to eat more grain. The ten hogs having grain alone ate 3,885 pounds of dry kaffir corn meal, while the ten hogs having hay and grain ate 4,679 pounds of the kaffir corn meal and 656 pounds alfalfa hay. The hay-fed hogs ate more grain and gained more for each bushel eaten.

Valuing the alfalfa hay at \$3 per ton, the average price on Kansas farms, and fat hogs at 3 cents per pound live weight, the kaffir corn fed alone brought 22.4 cents per bushel, while the kaffir corn fed with alfalfa hay brought 31.4 cents per bushel after deducting the cost of the hay fed with it.

At the date of writing this bulletin we have in progress a repetition of the experiments of feeding alfalfa hay with kaffir corn for fattening hogs. The second experiment has been conducted for five weeks, and so far fully confirms the results shown in the first experiment.

In a former experiment at this College, pigs were pastured thru the summer on alfalfa with a light feeding of corn. After deducting the probable gain from the corn, the gain per acre from the alfalfa pasture was 776 pounds of pork.

These facts indicate that to produce pork most cheaply the Kansas farmer must have alfalfa pasture in summer and alfalfa hay in winter.

In the summer of 1898 the Farm department of the College sent a letter to each creamery in the state, asking for the address of the patron receiving the highest cash income per cow. Correspondence was begun with the patrons in order to secure information in regard to yield, character of feed and methods of handling the cows and their products. We were surprised to find that most of the large yields came from the western part of the state. Dairy-men in the eastern part of the state have better shelter, more abundant feed, feed more grain, and as a rule have better-bred cows than the dairymen in western Kansas. The price paid for butter fat is fully as high in the eastern part of the state as in the western section, yet \$20 to \$30 is a high return for the milk of a cow in eastern Kansas, while \$40 to \$50 per cow is not uncommon in west-

ern Kansas. Why this difference? We found that almost without an exception the cows giving high returns were fed alfalfa hay.

Protein in feed is the material that stimulates large milk yields. Alfalfa is rich in protein, while nearly all other Kansas feeds are greatly deficient in this milk-producer. Where we find dairymen in eastern Kansas feeding alfalfa we usually find good milk yields.

The Kansas Experiment Station has not yet been able to secure funds for testing the value of alfalfa for beef and milk production, but the results obtained by our feeders indicate that alfalfa is as valuable for producing beef and mutton as it is for producing milk and pork.

The facts given in this bulletin indicate that every Kansas farmer needs a sufficient quantity of alfalfa to feed all his stock, and the high returns secured by feeding it should induce every farmer to secure a supply as soon as possible.

