

ALFALFA IN EASTERN KANSAS.

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## OUTLINE.

### 1. Value of alfalfa as a food - for different farm animals.

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Soiling.

Dry hay.

### 2. Value to the soil.

Fertilizing value.

Mechanical improvement.

### 3. Necessities of the young plant.

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Inoculation of the soil.

Compact seed bed.

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Proper conditions of soil as regards moisture and necessary conditions.

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5. Harvesting.

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In the extreme eastern part of the state, alfalfa, the most valuable of our leguminous forage plants, is comparatively unknown to the farmers and stock-raisers. Its acreage in the eastern third of the state in 1900 did not exceed fifty thousand acres. This is a condition that should not exist for the alfalfa rightly used in connection with our great yields of corn is the money coiner of the stock man. "It is absolutely essential to the cheapest production of beef, pork, milk and most rapid growth of young farm animals."

#### VALUE AS A FOOD.

All food stuffs are made up of three important classes of compounds - - namely, proteids, fats and carbohydrates. The two latter are interchangeable but neither can take the place of the former in the animal body. When properly mixed, these compounds become the source of animal life. The proteids consist chiefly of albumen, - - examples white of egg, lean meat and gluten of flour, - - and go to the building up of the brains, nerves, muscles, blood, hair, hoofs and other tissues in which the life force is active. Chemically they are composed of carbon, hydrogen, nitrogen, phosphorus and sulphur and thus supply quite a little mineral matter to the body. The fats and carbohydrates are each composed of carbon, hydrogen and oxygen, but in different proportions. They supply heat and energy to the body and build up fatty tissue but they cannot build up nervous or muscular tissue. To enable the digestive organs of animals to work at this highest efficiency and without waste of food materials, the quantities of digestible proteids, fats and carbohydrates must be properly adjusted.

Chemical analyses show alfalfa to be rich in digestible pro-



tein and ash, which are two of the most essential elements of a ration but the protein must be fed in the proper proportion with the fats and carbohydrates for best results.

The following table shows the composition of alfalfa hay, different cuttings and cut at different stages of growth, as compared with other farm crops.

#### POUNDS IN 100 OF DRY HAY.

Condition of crop when cut.	No. Of analysis	Protein	Fat	Carbo-hydrate	Water	Ash.
First cutting.	22	14.86	1.80	65.88	6.99	10.47
Second cutting.	14	15.18	1.68	65.69	7.24	10.21
Third cutting.	11	13.81	1.58	67.88	6.80	9.95
Not yet in bloom.	1	16.40	1.46	65.15	6.48	10.51
Just coming into bloom.	1	18.47	1.14	64.04	4.40	11.95
Half in bloom.	2	14.57	1.35	68.41	5.95	9.69
Full bloom.	1	12.88	1.76	70.08	4.31	10.97
Half ripe.	1	12.08	1.99	69.78	7.24	8.92

#### COMPOSITION OF OTHER FEEDING STUFFS.

Corn fodder.	60	3.8	1.1	51.2	40.5	3.4
Oat straw.	12	4.0	2.3	79.4	9.2	5.1
Timothy hay.	68	5.9	2.5	74.0	13.2	4.4
Clover hay in bloom.	6	12.4	4.5	55.7	20.8	6.6
Bran.	88	15.4	4.0	62.9	11.9	5.8
Oats.	30	11.8	5.0	69.2	11.0	3.0
Corn dust.	86	10.3	5.0	72.6	10.6	1.5



As said above alfalfa is rich in protein and ash. The effect of such food on the animal body is clearly shown by Sanborn, Henry, Shelton and others on the pig. They find:

1st. That the protein ration produce heavier gains for a given amount of grain.

2nd. The shrinkage in dressing the animal was greater in the protein fed animals than those getting a feed rich in carbohydrates and fats.

3rd. Protein rich feeds produce greater amounts of blood and heavier internal organs.

4th. Protein feeds produce greater proportions of lean to fat in carcass.

5th. Protein feeds produce stronger and better developed frames

They find that supplying pigs with feeds rich in protein and ash, their bodies are developed in bone and muscle to the highest extent, while those being fed feeds rich in carbohydrates and fats were prevented through lack of sufficient and proper nutrients from developing frames of bone and muscle.

Alfalfa in itself does not constitute a ration for best results in fattening. It must be fed with some food rich in carbohydrates and fats.

#### ALFALFA FOR HOGS.

Its value as a feed for swine is shown by the following experiments.

Twenty hogs averaging one hundred twenty-five pounds each were divided into two lots of ten each and fed Kafir corn and alfalfa hay.



FEED.	Gain per hog in lbs.
Lot 1. Kafir meal dry and alfalfa hay.	90.9
Lot 2. Kafir corn meal dry and no hay.	52.4

The hogs were fed nine weeks and at the end of this time the alfalfa fed hogs were in good marketable condition. While it was estimated that it would have taken five weeks more to put the corn fed hogs into the same conditions. The ten hogs in nine weeks were fed 656 pounds of alfalfa hay of the best quality and for each 7.83 pounds of hay fed with the corn meal the hogs gained 3.4 pounds over those having dry 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 alfalfa alone but to its giving variety to the ration making it more palatable and inducing the animal to eat more grain".

The lot fed grain alone consumed 3,885 pounds.

The lot fed alfalfa consumed 4,679 pounds.

The hay fed hogs ate more grain and gained more for each bushel eaten.

#### ALFALFA FOR CATTLE.

Alfalfa holds first place for feeds for the dairy cow, being a happy combination of richness and succulence. In the balanced ration, it takes the place of bran and the high priced concentrates producing butter of the first quality and at the least cost. It is very palatable, easily digested and of a cooling or laxative character that effects the butter fat similar to green pasture and is the only single feed that will form a good balanced ration with our corn.

Alfalfa is very rich in protein and deficient in starch and when fed in connection with corn and Kafir corn, which are both rich in starch, makes our ideal ration for feeding steers. Geo. M. Hoffman



an extensive cattle feed of Little River, Kansas, who has been in the business for many years, reports making gains, on choice steers, of five pounds per day for forty-seven days by the use of corn and alfalfa. With this feed, he does not count unless than three pounds per head per day with choice steers. Alfalfa is a laxative and care must be taken in getting the animals on full feed. Professor Cottrell of the Kansas Experiment Station, recommends filling the racks with prairie hay and allowing the steers to eat all they will, beginning with a small allowance of alfalfa per head per day and slowly increasing the alfalfa until at the end of two weeks the animals may be allowed all they will. Then withdraw the other hay. Experiments show the best results are secured by feeding the grain and hay mixed in tight troughs. In the winter of 1899 and 1900, eighty head of grade Short horns were fed in this way at the Kansas Experiment Station and made a gain of two pounds per head per day on an average of seventeen pounds of grain per steer.

#### ALFALFA FOR HORSES.

Alfalfa is a good feed for growing horses but is too rich a feed for mature and working horses, as a consequence there is a great deal of complaint attending its use especially when change is first made to alfalfa. In changing from grass to alfalfa the change must be very gradual and a number of derangements are likely to appear, the most noticeable of which are thickened blood and the overtaxing of the urinary and perspiratory glands. Alfalfa hay for horses should be cut at a later stage of growth. For cattle and hogs, it must be cut when it contains the most protein - - when one-tenth is in bloom.



### ALFALFA FOR SHEEP AND POULTRY.

Alfalfa is found equally as valuable in the feeding of sheep as in feeding cattle and swine but is used almost exclusively as hay, as sheep are extremely susceptible to bloat from alfalfa pasture.

Alfalfa both green and as hay is a popular favorite of the careful growers. All classes of poultry relish the tender green leaves, especially if confined to yards and make excellent growth on alfalfa. For winter feed, it should be the last cutting with a large percentage of leaves. It can be put into a tight barrel, and chopped fine, mixed with one-half to one-fourth its bulk with corn meal or bran, wet with boiling water and covered to retain the steam and let stand six to ten hours before feeding. The mixture being rich in mineral matter, aids in the production of the egg and bone and adds to the general health of the fowls.

### ALFALFA AS PASTURE.

Alfalfa being a perennial plant makes a good permanent pasture and is absolutely essential to the cheapest production. It stands pasturing better than clover and very profitable gains can be secured on good pasture with little grain to finish for market. Hogs can subsist exclusively on alfalfa and make fair growth but exceedingly large returns are obtained if a small amount of grain is fed in connection with the pasture. The bulky character of alfalfa enlarges the digestive tract and enables the hog to utilize a large quantity of feed when the feeding comes.

"Pigs were pastured on alfalfa through the summer at the Kansas Experiment Station and fed a light feed of corn. After deducting the probable gain from the corn, the gain per acre from the pasture was 776 pounds of pork." With pork at three cents per pound we would realize \$23.28 from an acre of alfalfa pasture.



Alfalfa, containing as it does, growth material in abundance and, being cooling and laxative is valuable for brood sows especially just before farrowing. It furnishes the material for the pigs in the foetal stage and puts a firm flesh on the animal that is not dangerous to her health at farrowing time.

It is a valuable pasture for all stock but like clover, is very likely to bloat sheep and cattle which make it objectional as a pasture. It must not be pastured too heavily nor too late in the fall.

#### ALFALFA FOR SOILING.

Excellent returns are obtained in feeding alfalfa as a soiling crop to dairy cows. Professor Cottrell reports an instance where a Kansas farmer practiced soiling during the whole summer season with dairy cows. He fed ten mature cows, in dry lot through the summer on four square rods less than two acres. This alfalfa was all the feed they had. They were fed all they would eat twice daily, and gave good returns. "In the summer of 1899, the Agricultural College made a test of soiling dairy cows, using alfalfa whenever other crops are not available. The cattle having the alfalfa cut and fed them in a yard did not yield as much milk as those turned to pasture while the pasture was good. After the pasture began to dry up, soiling was advantageous." Alfalfa is our cheapest food for this purpose. It grows early and late; a rapid developer and gives heavy yields.

#### ALFALFA FOR HAY.

The value as hay has been shown to some extent in the previous mention of feeding experiment. Its chief value lies in the large percentage of digestible protein and ash which it contains. It has been estimated that alfalfa hay is in money value, forty-five per cent better than clover and sixty per cent better than timothy. Alfalfa



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can be produced with little cost, give large yields, adds succulence and is the farmer's cheapest source of protein. It is the only single feed that will form a good balanced ration with corn, and one if rightly used, will take the place of all the high priced concentrates with which the farmer supplies his protein.

#### FERTILIZING VALUE.

Alfalfa is our most valuable crop for fertilizing purposes. In the growing state, it is able, by the aid of bacteria which develop in tubercles on the roots, to directly utilize the nitrogen of the air and thus store it up in the roots of the plant. It has been estimated that the stubble and roots of a good stand of alfalfa six years old will add fertilizing materials to the soil worth \$35.00 per acre if plowed under after cutting. The fertilizing constituents in 1000 pounds of dry matter are 22.75 pounds of nitrogen, 5.61 pounds of phosphoric acid and 16.53 pounds of potash. The leaves which are lost annually in making the hay add minerals to the surface soil worth \$1.75 per acre and nitrogen worth \$10.53. Alfalfa being a deep feeder - - often penetrating the soil to a depth of sixty feet and over - - gathers the plant food from the deeper stratas of the soil and brings it up near the surface where other plants can utilize it when the roots decay.

#### MECHANICAL MOVEMENT OF SOIL.

In decaying, the roots improve the soil mechanically by the addition of humus, which adds much to the water storing capacity of the soil and aids in keeping the small particles of soil from running together and forming hard pan. Again in sandy land that is subject to drifting, humus aids in holding the particles of earth and preventing drifting. Alfalfa tills the soil. Being a deep feeder, it pushes



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its roots down through the subsoil and brings moisture and plant food into the upper stratas and, dying, leaves channels for the ingress of the roots of other plants. The air in these channels aerates the soil, promotes bacterial action at greater depths and leaving the soil porous, it becomes a much better reservoir for storage of moisture.

#### THE SOIL FOR ALFALFA.

Alfalfa grows in favorable soil to 7000 feet elevation and is not so much influenced by altitude as by such conditions as the depth and warmth of the soil, depth of the water table, and the physical character of the subsoil. It thrives best in a well drained sandy river bottom but "will grow on any soil that will produce corn and on good many soils where corn will not grow. A good rule is that alfalfa will grow on any soil that will produce well both corn and cotton-wood trees. It prefers soil that is rich in mineral elements of plant food, such as potash, lime, magnesia, phosphoric acid and sulphur". For best results, the soil should be moist but not soggy nor subject to overflows or standing water for any length of time.

#### THE WEAKNESS OF THE PLANT.

When the young plants appear after seeding, they are the weakest plants that grow; so the amount of rainfall and the moisture in the soil at this time is a very important consideration. They must have sufficient moisture for normal development, but if the soil is cold, wet and soggy, the growing plants rot off beneath the surface of the ground. If the rains are excessive and heavy before the plants get a fair start, they are beaten to the earth, become covered with dirt, can never rise and are thus lost. These conditions can usually be avoided, in our section, by sowing in August when we have a rather dry period.



## LARGE SUPPLY AND EASILY AVAILABLE NITROGEN.

Alfalfa is a great nitrogen gatherer and storer and for its normal development must have a large supply of easily available nitrogen, especially when young.

The nitrogen must be in the soil and in an available form when the seed first germinates. The amount of available nitrogen in the soil is creased by thorough and frequent tillage and by the addition of humus in the form of barnyard and green manures. Besides being a source of nitrogen, the humus adds much to the physical condition of the soil, enables it to hold moisture and withstand drought. The nitrogen in humus is not directly available to the crop as plants can only utilize nitrogen in the form of nitrates. The process by which the nitrogen of the humus is converted into plant food is known as nitrification. This is accomplished by means of a number of closely allied micro-organisms, or ferments which convert the humus into ammonium compounds. These compounds are acted upon by another micro-organism and converted into nitrous acid; the nitrous acid is in turn acted upon by another distinct micro-organism and converted into nitric acid and the acid combines with bases or salts in the soil to form nitrates which are soluble by the soil moisture and absorbed as plant food. For the most rapid development of the nitrifying organisms, they must have certain food constituents especially phosphoric acid, warmth, moisture and air. Their development is most rapid in warm weather so we should use a system of tillage that will give them the most favorable supply of moisture and oxygen and store up the nitrates for the use of the young crops.

## INOCULATION OF THE SOIL.

Alfalfa, like other legumes, posses the ability to feed direct-



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ly upon the nitrogen of the atmosphere. This is accomplished by means of bacteria which dwell in small outgrowths called tubercles, on its roots and take up nitrogen gas and convert it into food and shelter for the bacteria and the bacteria in turn furnishes the plant with nitrogen. These bacteria make the legumes valuable as soil enrichers because they add nitrogen to the soil. Many soils do not possess these bacteria and for the best growth of alfalfa and the enrichment of the soil they must be inoculated with soil containing the bacteria. To be effective, the soil containing the bacteria, must be placed in contact with the seed; so, when it germinates, the bacteria can work on the young rootlets. The soil containing the bacteria is first taken up and dried until it can be brought into a fine powder by crushing. It is then sown with a drill containing a fertilizing attachment and put in direct contact with the seed using about 100 pounds to the 500 feet row.

#### SEED BED AND SOIL AS REGARDS MOISTURE AND NECESSARY CONDITIONS.

Alfalfa requires a fine, deep and compact seed bed. The ground should be plowed deeply in the fall, when intended for spring sowing, and thoroughly disced in the spring, as soon as the ground will permit and a mulch formed to retain the moisture. Allow the ground to become well settled before seeding, keeping the mulch renewed frequently. To get our seed bed in good compact condition, fall seeding is preferable. The land should be treated as for spring sowing and when in a suitable condition, some quick maturing crop that can be given good, clean cultivation, throughout the warm growing season and harvested early, should be put into the ground. Weeds are too often the cause of a failure to grow alfalfa and by such a system of



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cultivation, as above, we can free the land of weeds and weed seed, aid in getting the soil in a finer tilth, store moisture and promote nitrification, all of which are very essential to the growth of alfalfa.

#### SPRING SEEDING USUALLY A FAILURE.

In eastern Kansas, spring seeding is usually a failure. This is due in a large measure in the improper preparation of the seed bed - - to get it compact, in fine tilth and free from weed seed. The tender young plants are not capable of maintaining themselves among a growth of even the least vigorous weeds and are likely to be smothered at the start. Our cold and excessive rains in the spring are very detrimental. They cause the young plants to rot off beneath the surface of the ground and again, while so weakly, the tender plants are beaten into the earth by the heavy rains and lost. Our light frosts are also certain death to the young plants.

#### FALL SEEDING MOST SUCCESSFUL.

Fall seeding on fallow land, or land that raised a crop of potatoes, peas, beans, or some crop that has been given clean cultivation, is best for eastern Kansas. By this system we get rid of the noxious weeds and grasses, promote nitrification and store moisture which is essential to the germination of the seed and growth of the plant and also avoids the loss of one season's use of the land. By fall seeding we avoid most of the unfavorable conditions met with in the spring. In late summer or early fall, is our period of least rain fall and if moisture has been stored by proper tillage and the seed properly sown, we need have little fear of failing to get alfalfa to grow.



### PREPARATION OF THE SOIL.

The preparation of the soil for alfalfa should begin two or three years before seeding to free it of weeds. Begin by putting the ground in wheat; as soon as the crop is harvested, plow the ground deeply following in the furrows with a subsoiler. Keep the ground thoroughly pulverized with a disc harrow and drag the harrow up close to the plow to conserve the moisture. Renew the dust mulch every ten days after each rain and in August, put in a crop of rutabagas or turnips. After the roots are harvested, plow the ground deeply and leave the ground unharrowed to the disintegrating action of the frost. In the spring re-plow as soon as the ground warms up and is in good workable condition and put in the finest tilth possible. Then put the ground in potatoes, peas, beans or some crop that can be given good clean cultivation and harvested in time to put in alfalfa in late summer or early fall. Subsoiling is advisable except on very sandy land, but should precede the seeding at least a year so the ground will have time to settle. Land that has been spring plowed and given good cultivation throughout the summer should not be plowed, but disced, if intended for alfalfa in the fall. The discing should be done as soon as possible after the removal of the crop, followed by a good harrow to put in the finest possible tilth. This will give a fine seed bed with subsurface rather firm and well supplied with moisture.

### TIME AND METHOD OF SEEDING.

"The time for seeding is of great importance and should be determined more by the absence of unfavorable conditions than by the season. Alfalfa has been successfully sown in Kansas every month in the year from March to September." If sown in the spring, it should



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not be sown until the season is well advanced and there is no danger of cold, wet periods and of frosts. It should not be sown on spring plowed ground, rather on ground that has been fall plowed and disced in the spring. Usually in our section the rainfall is so heavy in the spring that sowing is risky business; so, I should prefer to wait until fall. Fall seeding should take place from the middle of August to not later than the 10th of September. The middle of August is the best time if the conditions are favorable, because, it gives the young alfalfa a chance to make a better growth and go into winter in good condition.

With good seed, twenty pounds per acre is an ample allowance. This can be sown broadcast and run over immediately with an unweighted smoothing harrow or better still put in with a press drill, sowing ten pounds per acre and then cross drilling with the other ten pounds. By use of the press drill, we get the seed in at an even depth, which should be about one inch if the ground is moist and deeper if dry, and press the earth firmly to the seed and thus secure quicker and more even germination. Mix the seed with corn chop or bran.

#### AFTER TREATMENT.

After the sowing of the seed, should a rain settle the soil and form a crust, it should be broken with a light harrow, even if part of the seed has sprouted, for the young plants will never break through the crust.

#### MOWING AND DISCING.

After the crop has made some little growth, it should be mowed - - not too close - - frequently, to keep down the weeds and stimulate the young plants. It should be mowed at such frequent in-



tervals that there will not be enough of the clippings to smother the plants when left on the field as a mulch. If too much clippings it must be removed. In no case must alfalfa be pastured or mown so late in the fall that it will not make a fair growth to go into winter in good condition.

Great benefits are derived from discing alfalfa of one year or more standing.

1st. It forms a mulch that retains the moisture for the use of the crop.

2nd. It splits up the crowns, causing the alfalfa to stand out and thus secure greater yields and of a finer quality.

3rd. It destroys weeds and noxious grasses by turning up their roots to the sun.

4th. It destroys the eggs of cut worms and grass hoppers that prey on the alfalfa.

The first discing should take place as early in the spring as the condition of the ground will permit, with the discs set at as great an angle as possible, if the crab grass is thick and if not just so they will turn the soil. It should also be cross disced and form a good mulch. The early discing conserves the moisture and destroys the noxious insect eggs and larvae. Immediately after each cutting of hay, the ground should be thoroughly disced and cross disced to conserve the moisture and destroy the weeds. By this method of discing, the Farm Department of the Kansas Agricultural College obtained four crops of alfalfa on high land in a dry season and the alfalfa made growth enough to go into winter in good condition.



### HARVEST. - - EFFECTS OF EARLY CUTTING.

In making alfalfa hay no pains must be spared in handling to retain the leaves. They contain from 22 to 27.3 per cent of the protein and are very easily detached and lost. For greatest feeding value, alfalfa should be cut when it contains most protein - - one-tenth in bloom.

If cut at this time, we get a much greater annual yield; it contains a higher per cent of more available nutrients; it contains a larger proportion of leaves and a greater proportion of it is digestible. We have said that the value of the hay depends on its protein content. Below are tables showing the per cent of protein when cut at different stages of growth.

#### KANSAS.

	PROTEIN.
One tenth in bloom.	18.5 per cent.
One half in bloom.	17.2 per cent.
In full bloom.	14.4 per cent

#### COLORADO.

Coming in bloom.	18.5 per cent.
Half in bloom.	14.6 per cent.
In full bloom.	12.9 per cent.

Early cutting seems to stimulate the alfalfa to more rapid growth and under favorable circumstances three to four crops can be cut in a year. The different crops have about the same food value pound for pound, but the third or fourth contains a greater percentage of leaves making it more valuable for feed. Experiment shows the di-



gestibility to remain practically constant from time of budding until full bloom. The hay changes somewhat when stored of a considerable length of time, but its chemical composition does not indicate that the food value is materially diminished.

#### CURING, HANDLING AND STORING.

In harvesting we mow just as soon as the alfalfa is free from dew, as much we can put up in a day. After wilting, usually in the afternoon of the same day mown, it is raked into windrows and shocked or left to cure in the row. It is best to shock while quits green and let cure in the shock. By so doing the leaves keep on absorbing moisture from the stems and giving it off until the stems are quite dry. It also retains the leaves, prevents bleaching and preserves the aroma. By this method we get a much better quality of hay but in many sections and where a large acreage is to be handled it is allowed to cure in the windrows. After curing, the windrows are driven over with a wagon and hay loader, preferably the Hawkeye because it takes the hay up in a continuous string, without running over it and without tearing it to pieces, and loaded on the wagon. It is then hauled to barns, sheds or stacked in the field and covered or the stacks topped out with some suitable grass to prevent them from taking water. Always remove the hay from the wagons with a horse fork. It will more than pay in a saving of the valuable leaves, rapidity of handling and excite the hired-man to better action. There can be no set time as to when alfalfa will be ready to put in the mow or stack after cutting. This will depend all-to-gether on conditions of weather and crop. The only method to follow in our country is to study the weather and then "make hay while the sun shines". Alfalfa hay is very



easily injured by rain. Chemical analysis of hay exposed for fifteen days to three showers aggregating 1.76 inches of rainfall shows it to contain only 11.01 per cent of protein, while hay from the same land, cut same day, but air dried without exposure contained 18.71 per cent of protein. In countries of heavy rainfall alfalfa, after being cured and stored, is liable to absorb moisture from the atmosphere and mould and spoil. To prevent this loss, dry straw should be used alternately with layers of alfalfa. The straw need not form more than one-fourth the total weight of the hay and is readily eaten by the stock.

The successful farmer of today and of the future cannot do without alfalfa for "its cultivation and feeding marks the highest development of our modern agriculture. It is one of nature's choicest gift to man. It is an excellent plant. It is the preserver and conservator of the homestead. It is peculiarly adapted to a country with a republican government, for it smiles alike on the rich and the poor. It does not fail from old age. It loves sunshine, converting the golden sunbeams into gold coin in the pockets of the thrifty husbandman and is the greatest mortgage lifter yet discovered".