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LEGUME AND GRASS SILAGE

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The making of silage from grasses and legumes has been developing rapidly in recent years. Such silage made from crops generally cut for hay purposes is commonly referred to as "grass silage." This is sometimes referred to as "alfalfa-molasses" or "grass-molasses" or "grass-ground wheat" silages.

Emphasis is being given to the making of silage from alfalfa, clover, vetch, pea and grass crops either alone or in mixture, by the fact that weather conditions in late spring or early summer make it practically impossible to cure good quality hay in the coastal region of Oregon, and at times make it very difficult to do so in the Willamette Valley and other regions.

Silage Making Fits Western Oregon Weather Conditions

Over much of western Oregon grasses and legumes are ready for the first cutting before weather conditions are sufficiently settled to permit good hay making. This often results either in delayed cutting, which allows the crop to get overripe, or in hay that is rained on before it can be put in the barn. The practice of cutting a first crop of grass or legumes for silage before the grasses head out, and then cutting the second crop for hay, generally results in a better quality hay and greater feed return per acre. Silage can be made in the coastal section from April 15th to May 25th, depending on the fertility of the land and the earliness of the season. The second crop cut for hay will be lower in yield but will mature later when the weather is more suitable for hay making. The second crop may be put in the silo if hay is available from other sources. With good quality silage to feed, less hay will be needed, as in many instances the hay requirement has been cut 50 to 75% when good grass silage is available in large quantities.

Advantages of Using Grasses and Legumes for Silage

The tendency of farmers to use increased amounts of grasses and legumes for silage is economically sound. In some instances the growing of grass as a substitute for corn or silage offers a number of advantages among which are:

1. Western Oregon is naturally adapted to the growing of grasses and legumes and when land is seeded down to proper long-lived mixtures, feed can be produced at a lower cost per ton and at a great saving in labor.

2. The annual plowing and fitting of the soil for corn is an expensive process that can be eliminated by permanent seedings of grass. In much of the coastal range of western Oregon weather conditions are too cool for the successful growing of corn as an ensilage crop.

3. When made into silage it is possible to save the entire first crop of forage in first class condition even in rainy seasons when hay making is difficult or impossible. It is not at all uncommon for  $1/3$  to  $1/2$  of the total nutrients in hay to be lost as a result of continued rains on the hay during the curing process. Losses of nutrients in properly made silage are as a rule much less than in hay, when weather conditions are unfavorable.

4. The carotene content of grass and legume crops is more fully preserved when these crops are used for silage than when harvested for hay. As a result of the higher carotene content milk produced on good grass silage has a better color and higher carotene and vitamin A value than when weathered hay is the only roughage.

5. Many farms have a surplus of grass for pasture in May and June and this is generally wasted unless extra livestock are kept. The livestock may then prove to be too numerous later in the season when pasture becomes short. The best way to preserve this feed is to put it in the silo in the early stages of growth and, if necessary, it may be fed out during the short pasture season in late summer or fall and the same silo may be re-filled with corn.

6. Weedy crops have greater palatability when preserved as silage than when cured as hay. However, the best quality of grass silage can only be made from immature forage of good quality.

7. The spreading of many common weeds by seed can be largely prevented by cutting and ensiling at the proper time.

8. Grass silage has a higher protein content than corn silage, and its use cuts down the amount of high protein concentrates to be purchased.

9. With modern green crop loaders and silage cutters the labor cost of handling grass for silage should compare favorably with the labor cost for putting up the same material as hay or in filling the silo with corn. Lower costs of handling may be expected when new machinery for the complete harvesting of the silage crop in the field is perfected.

#### Disadvantages of Grasses and Legumes for Silage

1. As explained later there is a need for preservatives and this will require a direct cash outlay of from one to four dollars per ton. However, molasses and grain added as preservatives increase the feed value of the ensilage as well as insuring a more palatable feed.

2. Grass silage weighs more per cubic foot than corn silage, and thus stronger silos are needed.

3. If no labor saving machinery is available the cost of silo filling will probably be more than with corn, as the loading of the crop on the wagons and pitching it into the silo filler requires additional labor.

### Protein Production Per Acre

Increasing protein production on western Oregon farms where alfalfa is not commercially grown and where clover stands are of short duration is an important problem for dairymen and livestock producers. One of the most practical methods of doing this is to take advantage of the high protein content crops in the earlier stages of their maturity. Immature crops are always higher in protein than the same crops when more mature. Silage made from immature grasses and legumes with an average yield produce about 600 lbs. of protein per acre. When the same crops are allowed to become more mature and are cut for hay, the protein yield declines to about 375 lbs. protein per acre; and if allowed to mature for seed, less than 200 pounds of protein per acre is obtained.

### Reasons for Adding Preservatives

When corn is properly ensiled in a good silo, the sugars and other soluble carbohydrates present in the forage, and particularly in the corn stalk, are rapidly converted by enzymatic and bacterial action to acetic, lactic and other organic acids. When fermentation has proceeded in well packed silage until 1 to 2 per cent by weight of the silage consists of organic acids, bacterial action ceases and the silage will keep indefinitely.

There are two main reasons why special precautions must be taken when legumes or grasses are to be ensiled. In the first place these crops are low in sugar, other soluble carbohydrates and starch. This prevents the rapid development of organic acids in sufficient amounts to act as a preservative. Secondly, the legumes and immature grasses are high in protein (the proportions being 1 part of protein to 2 to 3 parts of starches and sugars in legumes and grasses in contrast to 1 part of protein to about 7 parts of starches and sugars in the corn plant) and if ensiled alone bacterial action on the protein usually occurs, resulting in an unpalatable, ill-smelling silage. The rapid development of organic acids prevents protein decomposition.

### Methods of Ensiling

#### 1. With Molasses

Good quality silage can be made by adding 40 to 80 lbs. of molasses to each green ton of material. For crops consisting almost entirely of grass or immature cereals 40 lbs. per green ton is sufficient. A crop about one-half grass and one-half legume should have 60 lbs. per green ton, and a crop pre-dominantly legume should have 80 lbs. per green ton. An exact amount is not

necessary, but it is safer to err on the side of having too much rather than too little. If molasses is available at a price to make costs comparable with other preservatives it is recommended as the best so far developed for the purpose. Molasses may be difficult to get during the present war emergency, but when used for making grass silage it has a priority at the present time.

Molasses may be added by gravity by allowing it to flow on the grass as it enters the throat of the cutter, or it may be added by use of special molasses pump equipment as provided on the newer ensilage cutters. It need not be diluted unless it is more convenient in handling. To determine the rate of flow of molasses a preliminary trial will indicate about the size stream required. Farmers can estimate the weight of their loads and then by determining how long it takes to put this load into the cutter can then compute how much molasses will be required.

<u>A stream of molasses that will</u> <u>fill a quart bottle in</u>	<u>Delivers in 10 minutes</u>
40 seconds	40 lbs.
30 seconds	60 lbs.
20 seconds	80 lbs.

A fifty gallon barrel of molasses when used at the rate of 40 pounds per green ton will be enough for 15 tons green material, or when filling is done at the rate of one ton every 10 minutes, one barrel will last 2 hours and 30 minutes operating time.

At 60 pounds per ton a 50 gallon barrel will be required for 10 tons green weight or for one hour forty minutes operating time.

For legumes alone, using 80 pounds per ton, one barrel will be required for each  $7\frac{1}{2}$  tons green weight or will last for one hour fifteen minutes operating time.

## 2. With Acids

Grass silage can be made by the addition of various acids to the forage at the time of ensiling. First to be used was the patented A.I.V. method, using mineral acids. Later there came into use phosphoric acid mixtures utilizing principally 75% food grade phosphoric acid in the amount of 15 to 30 lbs. per green ton. The acid methods have not been popular because of the deteriorating effect on equipment and because the resulting silage has not been as palatable. The cost of acids has generally been higher than molasses per ton of green material. Such acids are now difficult to obtain as they are being diverted to war industry channels.

## 3. With Grain

Experimental studies show that there are some possibilities of making grass and legume silage by using farm grains as preservatives. Ground barley, wheat and corn have been used in these studies, but a sufficient amount of

experimental work has not been done to determine the minimum amounts of grain required per green ton. These studies indicate that ground grains added at the rate of 150 to 250 lbs. per ton will aid in making good silage, the smaller amounts used on grasses and the larger amounts on legumes. While there will be some loss of feed nutrients in the ensiled grain, it will markedly increase the feeding value of the silage and at the same time make possible the preservation of the forage and result in a palatable silage. If molasses is not available, this probably will be the method that Oregon farmers should resort to during the present emergency.

If ground grain is being used as a preservative it is most easily added and evenly distributed by pouring on the feed roll of the cutter, or it can be allowed to flow out of a hopper placed above the feed table with a sliding gate to regulate the flow.

The grain can be ground fairly coarse and put up in about 100-pound sacks. Two such sacks would be used for each ton load of immature grasses and legumes.

The cost of preservative in the form of grain as compared to molasses, at present prices, will be approximately twice as much for the grain per green ton of silage.

#### 4. Without Any Preservative

Some farmers and experimental workers have been successful or fortunate in the ensiling of grasses and legumes without preservatives, but this requires a fairly exact knowledge of all the various conditions, including moisture content and state of maturity. A large percentage of those who attempt it without this knowledge fail and as a result have a product of very little or no feeding value.

If the dry matter is closely controlled at 35%, the forage fairly well advanced in maturity, and the product is finely cut and closely packed, it may result in a product that will keep. However, there is much evidence to indicate that silage so made does not have the palatability found in the better grades of molasses silage.

#### Time to Cut Material for Silage

There is no magic in the preservation of livestock feeds in the form of silage no matter what the preservative might be. The silage will be no better than the material ensiled. The best silage is made of legumes or mixtures of grasses and legumes cut at the stage at which they would be extremely palatable to livestock as a pasture plant. The nearer the cutting can be to the stage at which the plants are ideal for pasture, the better will be the ensiled product. However, maximum yields as well as good quality silage need to be considered. The grasses should be cut before they bloom and it is preferable to cut them just as the first heads begin to show.

Alfalfa and clovers should be cut slightly more immature than when cut for hay. Pea vines, the refuse from pea canning, must naturally be taken at the time the peas are harvested for cannery purposes.

### Grass Silage as Livestock Feed

Properly made grass silage is relished by most classes of livestock even more than the best quality alfalfa hay. Dairy cattle will readily consume up to 60 or 70 lbs. of good grass silage daily, and with no apparent ill effects. In some instances dairy cattle have been fed on rations of grass silage as the only roughage for several months. Beef cattle that run out on pasture in the winter months, supplemented with 30 lbs. of grass silage daily, have shown economical wintering costs and a much lower feed waste than when fed hay. Better dairymen are feeding 4 to 8 lbs. of legume hay daily with what grass silage cattle will clean up and a low protein grain in proportion to production.

### Additional Suggestions on Ensiling

1. The crop to be ensiled should contain sufficient water but care should be taken to prevent leakage. However, it is better to have the silage too wet than too dry. If too dry it is impossible to pack it well and as a result it heats, molds and spoils.

While nutrients are lost when juice runs from silo, the safest procedure is to have just a small amount of juice drain after filling. This is far better than having it too dry.

2. In drying weather the crop should be cut and ensiled within an hour or so, while in slow drying weather it may lay out about one-half day. The crop should be wilted but not dry.
3. If the crop is very immature or extra wet on cutting during poor drying weather, it should be allowed to wilt a few hours before ensiling.
4. Overripe or mature crops should be ensiled immediately following cutting and preferably this should be when wet with dew or rain.
5. If the crop becomes overwilted following cutting it should be cured into hay or water added at the silo and several feet of unwilted forage put on top to aid in packing it down to exclude air.
6. The forage should be cut in  $1/4$  to  $1/2$  inch lengths in order to insure good packing in the silo.
7. It is even more important to carefully distribute and tramp grass or legumes being ensiled than it is in the case of corn if spoilage is to be prevented. Packing along the walls is especially important.
8. If the silo doors are not tight they should be covered with tar paper as filling progresses.

9. Top spoilage can be largely prevented by careful leveling and tramping and wetting down the surface several times during the week following ensiling, or the silo can be sealed with about a foot of wet waste material, straw or sawdust.
10. In determining the weight of loads it can be estimated that the green material will weigh about three times as much as cured hay.