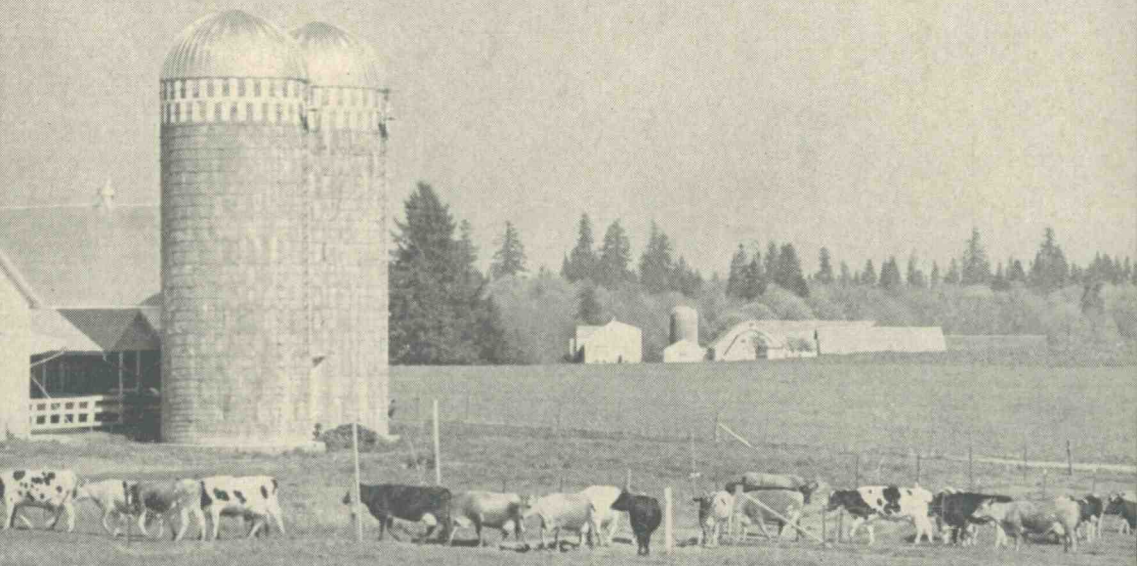
Making and Feeding

Grass and Legume Silage



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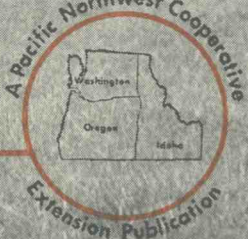
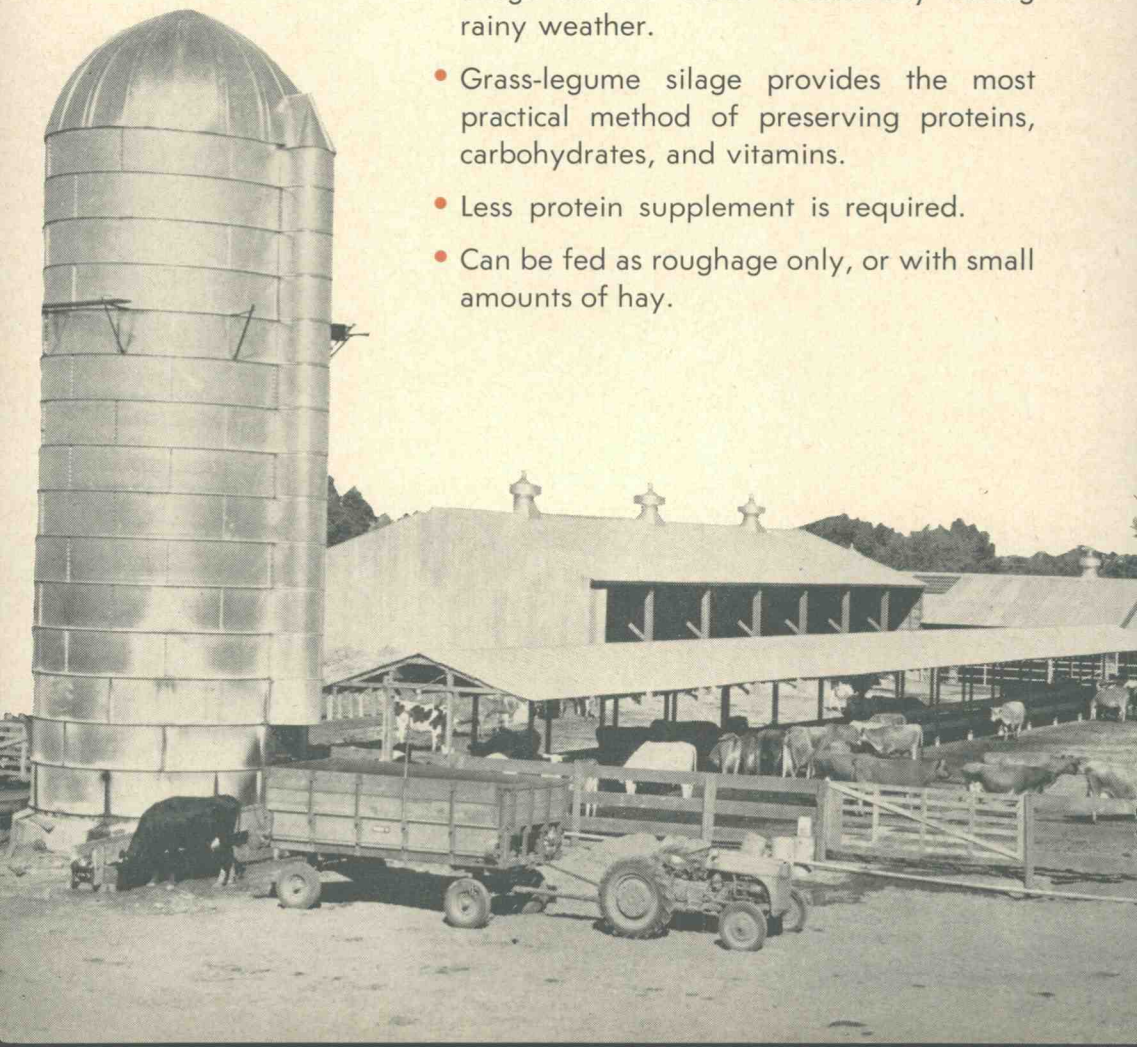


Making and Feeding

Advantages:

- More milk per acre than hay from the same crop.
- About 30 per cent more nutrients can be saved for feeding.
- Silage can be made successfully during rainy weather.
- Grass-legume silage provides the most practical method of preserving proteins, carbohydrates, and vitamins.
- Less protein supplement is required.
- Can be fed as roughage only, or with small amounts of hay.



Grass and Legume Silage

LIVESTOCK PRODUCTION is only a means of converting nature's abundant forage into a form suitable for human nutrition. Forage yields per acre, under both dryland and irrigation farming, have increased considerably as more attention is given to selection of suitable grasses and legumes, weed control, and grazing management.

Most livestock feeders recognize the importance of quality, palatability, and quantity of all forage for livestock. Practices necessary to achieve the most of all three are not applied as completely or thoroughly as they should be to obtain the greatest net return.

Net return per unit of production is the standard measure of the efficiency or the economy of any single operation. The highest return in milk or meat per acre usually is, but might not always be, the most economical return, depending on other costs of the operations, such as labor, fertilizer, or irrigation costs.

Standard practices cannot always be applied to all operations. Each operator must apply practices to the extent that they fit his circumstances and contribute to increased net return.

Follow those practices, discussed in this bulletin, which place the lowest cost total digestible nutrients (TDN) before your livestock.

Silage Feeding Value

Research and the experience of many livestock feeders has proved the value of silage made properly for all types of livestock. The best silage generally is made when the crop is at or very near the early bloom stage. Protein per cent will vary in silage depending on stage of growth of the plants and proportion of legumes in the silage. On the average, 3 pounds of good silage is equal in feed value to 1 pound of high quality hay.

Silage crops usually are harvested at an earlier growth stage than hay crops, which means that a higher per cent of protein and a greater percentage of leaves are retained when forage is stored as silage. There may be as much as 4 to 5 per cent more total digestible

This bulletin was written by H. P. Ewalt, M. G. Huber, and Rex Warren, Extension dairy, agricultural engineering, and farm crops specialists at Oregon State College, and reviewed by Extension and Experiment Station staffs at the State College of Washington, the University of Idaho, and Oregon State College. It is published cooperatively by the three institutions.

TABLE 1. CRUDE PROTEIN AND DRY MATTER IN SOME SILAGES[1]

Crop	Protein as fed	Protein in dry matter	Dry matter	Preservative	Time of cutting	Type of silo
	Per cent	*Per cent*	*Per cent*			
Ladino and ryegrass	7.12	18.91	37.7	None	September 20	Wooden stave
Austrian peas and wheat	3.87	15.83	24.5	None	July 1	Wooden stave
Hairy vetch and ryegrass	2.88	12.24	23.6	None	June 15	Pit
Fescue and Ladino	2.74	11.37	24.1	None	June 30	Steel upright
Red clover, crimson, and ryegrass	2.41	10.56	22.9	None	June 1	Concrete stave
Ryegrass, barley, and hairy vetch	2.39	10.53	22.7	Grain	June 15	Wooden stave
Ladino, fescue, and ryegrass	3.09	10.13	30.6	Molasses	June 10	Concrete stave
Ladino and grass	3.06	10.00	30.6	Molasses	May 28	Concrete stave
Tall fescue	2.41	9.76	24.7	None	June 1	Wooden stave
Orchard grass	2.30	9.35	24.6	None	June 9	Wooden stave
Ladino and fescue	2.56	9.31	27.6	Beet pulp	June 1	Concrete stave
Orchard, Ladino	2.32	9.12	25.5	Beet pulp	June 23	Concrete stave
Sudan and Kafir corn	1.91	8.73	21.9	None	October 8	Wooden stave
Austrian field peas	2.04	8.60	23.8	None	June 5	Pit
Vetch and oats	2.49	8.59	29.0	None	June 23	Wooden stave
Pasture clippings	2.09	8.16	25.7	None	----------	Wooden stave
Sudan grass	1.39	8.16	17.1	Molasses	July 1	Concrete stave
Alfalfa and gray oats	2.25	7.87	28.7	None	May 30	Wooden stave
Ryegrass, oats, vetch, and wheat	1.62	7.49	21.7	None	July 2	Concrete stave
525 field corn	1.56	7.43	21.1	None	November 1	Wooden stave
Sweet corn stalks	1.49	7.33	20.4	None	October 15	Pit
Field corn	1.78	7.20	24.8	Molasses	October 20	Concrete stave
Alta fescue and mesquite	2.00	7.18	27.9	Grain	June 30	Concrete stave
Cannery corn waste	1.31	7.17	18.4	None	September 15	Wooden stave
Ladino grass	1.68	6.92	24.3	None	May 30	Wooden upright
Fescue	1.53	6.37	24.1	Molasses	May 25	Wooden stave
Alta fescue	2.31	6.10	38.0	Molasses	June 10	Concrete stave
Cannery corn waste	.86	5.85	14.8	None	September 20	Trench

1 J. R. Schubert, Oregon State College, Department of Agricultural Chemistry.

nutrients in early cut forage. The total dry matter yield per acre may be 10 to 30 per cent greater when a crop is put up as silage as compared to making hay from the same forage. Three times as much carotene can be saved. All these factors together mean lower cost and higher quality feed. Only a minimum protein is needed in the grain fed when a high-quality legume silage is fed free access to livestock. Equal parts of oats, barley, and mill run is an example of a simple mixture that meets the protein supplement required.

It is difficult to give a clear-cut answer to the question of comparing nutritive values of silages, since silage made from various crops may be good, bad, or indifferent in feeding quality depending on the skill and care used in the ensiling process. Where good silage is made, following practices such as those outlined in this bulletin, feeding value of the silage is roughly proportional to that of the fresh crop. Table 1 lists the dry matter and crude protein for silages made from a number of different crops, and shows the variations that occur in the per cent of dry matter and protein. These differences are due to the type of crop used, the stage of maturity, and methods of harvesting and storage.

In considering the data in this table, it should be remembered that while chemical analysis is a valuable guide to the usefulness of silage, it does not answer all questions regarding palatability, digestibility, or cost of production.

Grass silage for dairy cows

Grass and legume silage can be fed as the only roughage for dairy cattle. Free choice of both hay and silage, however, is a good practice. With other types of livestock, silage feeding may be controlled according to needs and most economical use.

When cows have free access to hay and high quality silage, they usually eat 5 to 10 pounds of hay daily per head and make up the rest of their requirement from silage. There are records of Holsteins con-

TABLE 2. MILK YIELDS PER ACRE FROM ALFALFA FORAGE WHEN HARVESTED IN VARIOUS FORMS[1]

Form harvested	Dry matter preserved	Dry matter consumed per 100 pounds of milk[2]	Relative milk production
	Per cent	*Pounds*	*Per cent*
Alfalfa silage	110.7	51.7	111.7
Barn-cured alfalfa hay	108.0	52.4	107.6
Field-cured alfalfa hay	100.0	52.2	100.0

1 Courtesy Dairy Branch, Agricultural Research Service, USDA.
2 Four per cent fat-corrected milk.

suming up to 140 pounds of silage per day. Feeding 60 to 90 pounds per head daily is a common practice in dairy herds.

Table 2 shows the value of good silage for milk production.

Grass silage for beef cattle

Beef cattle, like dairy cattle and sheep, are noted for their ability to use large quantities of roughage; therefore, it is interesting to calculate how close silage of various types may come to providing a balanced ration for these animals. Table 3 lists, A, the recommended daily allowances of certain nutrients as published by the National Research Council for fattening yearling cattle of about 800 pounds weight, and B, the nutrients supplied by various silages fed in sufficient amounts to meet the dry-matter requirements.

TABLE 3. COMPARISON OF NUTRIENTS IN SILAGES WITH NUTRIENT REQUIREMENTS OF BEEF CATTLE

A. Recommended daily allowance

Class of animal	Body weight	Daily nutrient allowance		
		Dry matter	Digestible crude protein	Total digestible nutrients
	Pounds	*Pounds*	*Pounds*	*Pounds*
Fattening yearling	800	19.8	1.5	14.0

B. Nutrients supplied by various silages

Type of silage	Total silage fed daily	Nutrients supplied by this silage		
		Dry matter	Digestible crude protein	Total digestible nutrients
	Pounds	*Pounds*	*Pounds*	*Pounds*
Alfalfa, early bloom, wilted	56.5	19.8	1.8	10.2
Clover, half bloom, wilted	63.2	19.8	1.4	11.2
Corn, milk stage	93.8	19.8	0.7	14.0
Corn, dough stage	70.3	19.8	0.7	13.3
Grass silage	81.5	19.8	1.5	12.9
Oats, dough stage	52.5	19.8	1.3	11.1
Peavine	80.8	19.8	1.5	11.3
Sunflower	90.0	19.8	0.7	9.4
Vetch	65.8	19.8	1.3	12.4

1 Data from B. H. Schneider, *Feeds of the World*, West Virginia Agricultural Experiment Station, except for peavine silage, from F. B. Morrison *Feeds and Feeding*, 21st ed., Morrison Publishing Co.

Generally speaking, grass silage is a well-balanced feed, and when properly supplemented is ideally suited to a fattening ration where the requirements are for a high energy (high TDN) feed. For this reason it is usually recommended that grass silage be fed along with other dry feed, good quality hay and grain, in rations for fattening cattle.

In cases where beef animals are not being fattened, but are merely being grown out, wintered, or maintained in a reasonable condition, grass silage is well suited to their requirements.

Some sample rations using grass silage for different classes of beef cattle are presented in Table 4.

TABLE 4. SUPPLEMENTATION OF GRASS SILAGE IN RATIONS FOR BEEF CATTLE[1]

Class of animal	Approximate weight	Expected daily gain	Daily ration fed per animal[2]
	Pounds	*Pounds*	*Pounds*
Calves, wintering	500	1.00	Grass silage 10, mixed grass, legume hay 5, cottonseed meal 2.
Yearlings, fattening	800	2.00	Grass silage 20, mixed grass, legume hay 5, rolled barley 5, Austrian peas 1.
Bred heifers, wintering	800	1.25	Grass silage 50 *or* grass silage 20, oat hay 15.
Young bulls, normal growth	800	1.75	Grass silage 20, rye hay 10, rolled barley 3, molasses 1, Austrian peas 1.
Mature cows, wintering	1000	0.50	Grass silage 50.

1 Based on recommended nutrient allowances of the National Research Council.
2 In each case it is recommended that iodized salt and steamed bone meal be fed free choice.

Grass silage for sheep

In general, recommendations for the use of grass silage for sheep are the same as for beef cattle.

Grass silage is used more extensively each year by sheep men. They find it an excellent feed for ewes carrying lambs, and during the period following lambing. It maintains the milk flow almost as well as good pasture. Large ewes will consume 6 to 8 pounds of silage daily. It is advisable to feed some dry roughage with the silage.

For fattening lambs, grass silage requires some supplementation to make the ration adequate in dry matter and digestible nutrients.

Experiments carried out in 1952-53 by the Department of Animal Husbandry, Oregon State College showed about equal gains where lambs were fed 1.5 pounds of alfalfa hay per head daily, or where they were fed 3.6 pounds of grass silage together with 1.2 pounds of grain in each case. Where grass silage was fed alone, without grain, the lambs did not do well, and it was reasoned that they could not eat enough to meet their requirements. Later trials (1953-54) showed that it is advisable to mix grass silage with some dry roughage for fattening lambs, particularly where the lambs are troubled with internal parasites.

Grass silage for swine

Although grass silage has not been fed to any great extent to swine, there are indications that it may make a useful part of swine rations under certain conditions. In 1948 the U. S. Department of Agriculture reported feeding grass silage as 13.6 per cent of the ration to growing hogs. It took 411 pounds of total feed on this ration to make 100 pounds gain, and the pigs averaged 1.78 pounds gain per day. This performance was compared with a similar standard ration containing 5 per cent ground alfalfa hay, which took 357 total pounds of feed per 100 pounds gain and produced an average daily gain of 1.83 pounds. It should be remembered that swine, unlike cattle or sheep, do not have the capacity to handle bulky feeds; use of silage in their rations must always be restricted accordingly. For this reason, grass silage in rations for mature sows and boars should be more successful than in fattening rations for young hogs. Grass silage might well be a source of green feed for winter dry-lot rations for breeding swine.

Grass and legume silage for poultry

Grass or legume silage put up with ground wheat or molasses is a good supplement to the regular ration for chickens and turkeys. It can be used advantageously to replace fresh, succulent, green feed during the fall and winter months. The silage must be young, tender, and finely chopped if it is to be used for poultry. Coarse silage high in fiber has little feeding value for chickens or turkeys.

Laying hens can be fed 4 to 6 pounds of silage per day for each 100 birds as supplemental feed with good results. Mature turkeys can be fed 6 to 10 pounds per 100 birds per day. Probably the greatest value of silage in chicken or turkey rations is to supplement breeder rations. Experiments show that good grass or legume silage increased hatchability of eggs when used to supplement many rations.

Silage Crops

Any crop that normally could be made into hay can be used for silage. Legumes, grasses, or cereals growing alone or in mixtures can be ensiled.

Longer lived crops will generally mean lower cost silage, but annual hay-type crops can be used, particularly in emergencies.

Alfalfa is our highest yielding forage crop on soils where it will grow, and making silage from first-cutting alfalfa or clover is becoming a common practice in areas where rain often damages hay.

Mixtures of sub clover and perennial grasses are a popular silage crop on uplands. Where irrigation is available, Ladino or white clover with grass is used. Big trefoil is filling a real need on moist, coastal lowlands.

Taller growing, higher yielding grasses such as Alta fescue, orchard grasses, and Tualatin oatgrass in mixtures with legumes are particularly adapted to silage making. For wet lands, meadow foxtail or Reed canary grass can be used.

Oats, vetch, barley, and peas are examples of annual crops commonly put up as silage.

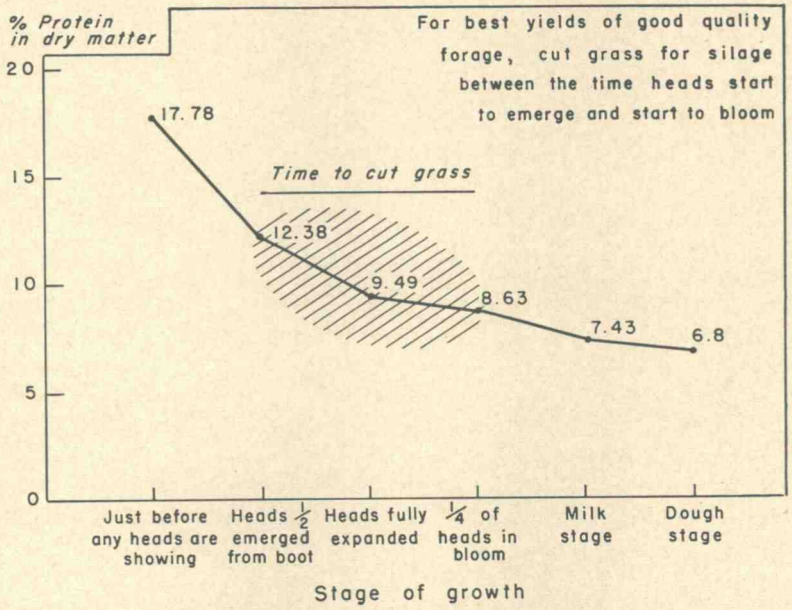


Figure 1. For best yields of good quality forage, cut grass for silage between the time heads start to emerge and start to bloom.

When to Cut Forage for Silage

The following growth stages are suggested for the silage cutting period to get maximum yield of good quality silage. Start silage making in time, so last-cut forage is not overmature.

Grass—Start silage making when first heads are showing. Try to harvest all the grass before bloom.

Red and Alsike Clover—One-half to full bloom.

Alfalfa—One-tenth bloom. First-cutting alfalfa may have little or no bloom, and cutting should be timed with appearance of second crop shoots on the crown. Silage cutting should be completed in time to avoid cutting off these shoots.

Grass-legume mixtures—Ladino clover or sub clover and grass should be cut according to growth stage of the grass. Alfalfa, red clover or alsike clover, and grass will usually be cut according to growth stage of the legume unless the mixture is mainly grass.

Cereals—Milk to soft dough stage.

Moisture Control Important

When forage is too dry it does not pack tight enough to exclude air. The result is too high a temperature, mold, and spoilage. Silage that is too wet will have some losses due to drainage and may be slower in developing lactic acid fermentation. The result may be a strong smelling, high acid, low palatability silage.

Per cent of moisture in the forage at time of ensiling affects the fermentation process by controlling the temperature and firmness of packing. The average silage is made with about 65 to 75 per cent moisture. Lower moisture silage can be made in upright silos. Higher moisture can be made in bunker silos with less runoff. The moisture should never be less than 60 per cent.

Moisture content of forage varies with the crop, stage of maturity, weather conditions, and amount of wilting allowed between time of cutting and time that forage is put in the silo.

The most practical moisture test consists of compressing finely chopped forage between the hands for about 30 seconds. Release the pressure suddenly and check the condition of the ball and the amount of free moisture.

Condition of the ball	*Approximate range in moisture content*
Ball holds shape and there is considerable free moisture on the hands.	Over 75 per cent
Ball opens slowly and there is little or no free moisture.	60 to 70 per cent
Ball falls apart rapidly.	Below 60 per cent

Forage harvested at the early-blossom stage will usually have about 75 to 80 per cent moisture. Moisture content can be reduced by wilting the crop for a period of 2 to 6 hours or more depending on the weather. If the crop is overwilted, add water or mix with forage that is freshly cut. If the forage is harvested direct from the stand, moisture can be partly controlled by adding 150 to 250 pounds of ground oats, wheat, or barley per ton. From 60 to 300 pounds of molasses beet pulp per ton for forage will aid materially in controlling moisture.

When wilting is practiced, only part of the crop should be cut at one time. This will prevent overdrying of the entire crop in case of a breakdown or other delays.

The Ensiling Process

When green forage from a suitable crop is placed in a compact mass in a silo, certain changes take place which convert it into silage. For about 5 hours the plant cells in the forage continue to use the available oxygen, which is replaced by carbon dioxide. The absence of oxygen prevents the growth of molds. Acetic and lactic acids are formed rapidly for several days under proper conditions, and the formation of these acids, in addition to some alcohol, prevents the growth of bacteria which cause rotting and putrefaction. A good normal ensiling process will develop a temperature between 80° and 100° F. A higher temperature may develop on the surface where oxygen is available.

Wilting

Controlling moisture by wilting is difficult and requires one more trip over the field compared to direct cut. Length of the wilting period will depend on kind of crop, stage of maturity, and weather conditions. Legumes will be higher in moisture than grass. Two hours between cutting and chopping may be plenty on a sunny day with a drying breeze. Cut only part of the field at a time to prevent overwilting. Fresh cut forage can then be mixed with wilted if necessary.

Field chopping

Field chopping, the most common method of harvest, makes the problem of moisture control much more difficult. Do not let the crop become overmature to control moisture. This practice may result in loss of protein and also in less palatable silage. Excessive moisture may result in losses in two ways. First, direct loss through drainage of plant juices from forage and second, increased fermentation losses by not having the most favorable ensiling condition of about 75 per cent moisture, temperature of 80° to 100° F., and rapid lactic acid production. Additives may help bring about these conditions.

Use of additives

Most silage is made without an additive. Some farmers use silage conditioners or additives as insurance against failure, or to get better quality silage, particularly when moisture content of the forage is high. The various additives commonly used help bring about the final ensiled condition more rapidly and with a minimum nutrient loss in the ensiling process. Depending on the material, they control moisture and bacterial action which in turn produce the acid condition necessary for preservation.

Molasses. Molasses may improve silage fermentation by providing readily available sugar for growth of lactic-acid-producing bacteria. It usually makes the silage more palatable. Thirty to eighty pounds per ton of forage is the usual rate, more molasses being used with more legumes.

Grain. Whole or coarse ground grain, corn, barley, wheat, or oats, helps regulate the per cent moisture and aids proper fermentation. Use 75 to 250 pounds of grain per ton of forage.

Beet pulp. Dried molasses beet pulp is an excellent additive at rates from 75 to 300 pounds per ton of forage, depending on the moisture in the forage. It will take up twice its weight in moisture. Research studies have shown the use of beet pulp to be profitable in feed saved and quality of silage made. Other research indicates that more dry matter will be eaten per hundred pounds of body weight when the silage is not too wet, or low in per cent of dry matter.

Sodium metabisulfite. This chemical is a dry powder. Eight pounds is the equivalent of five pounds of sulfur dioxide. Use at the rate of 8 to 10 pounds per ton of forage. Larger quantities may result in an unpalatable silage.

The amount of additive needed per ton of silage is shown in Table 5. Exact amount is not important. It is better to have too much than not enough.

TABLE 5. ADDITIVES SUGGESTED PER TON OF SILAGE

Crop	Ground grain or molasses beet pulp	Molasses[1]	Sodium metabisulfite
	Pounds	*Pounds*	*Pounds*
Grasses or cereals	75 to 125	30 to 40	8 to 10
Legumes and grasses mixed	125 to 175	40 to 60	8 to 10
Legumes	150 to 300	60 to 80	8 to 10

1 Molasses weighs 11 to 12 pounds per gallon.

Silage Harvesting and Storing Methods

Chopping the silage

Improperly adjusted cutters will slow down the work, require extra power, and put out irregular and poorly cut silage. Here are four essentials to good silage cutting:

- Right speed
- Right feed
- Sharp knives
- Good ledger or shear plates.

It is best to operate the cutter at the speed recommended by the manufacturer. It will then run just fast enough to chop the silage and blow it into the silo or wagon.

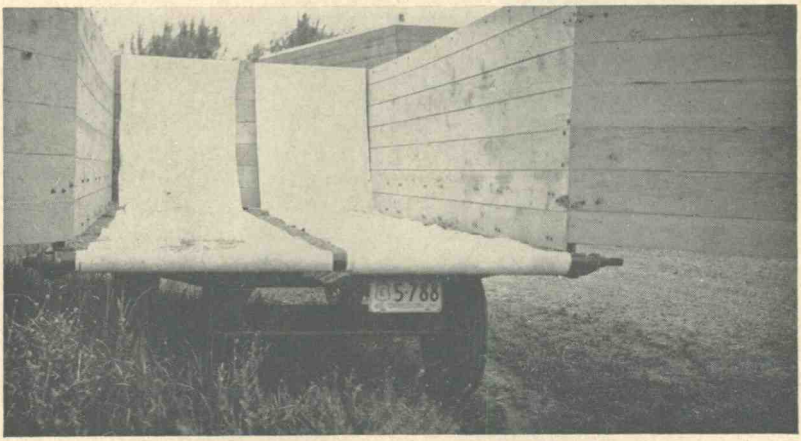


Figure 2. A trailer equipped with canvas aprons for unloading. A single canvas can be used.

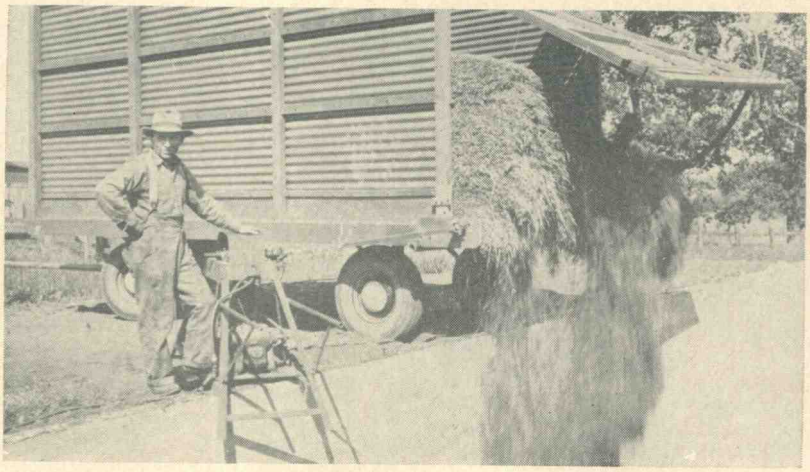


Figure 3. Emptying green forage into a trench silo.

For most grass and legume crops, the chopper is best set to cut ½-inch lengths. For pasture clippings, a ¾-inch setting is satisfactory.

Equipment for hauling

Wagons, trucks, or trailers with good, tight boxes about 14 or 16 feet long, within the legal width limit for use on highways, will meet most capacity requirements. These are loaded only to a depth of 3 or 4 feet. Rubber-tired vehicles are particularly satisfactory for fast highway travel and are pulled more easily over rough and soft ground.

If a trailer is towed behind the field chopper to save labor, an automatic hitch is desirable. It will allow easy and rapid switching from chopper to tractor and back again.

Unloading method for field-chopped ensilage

Different unloading methods may be described as follows:

- The load may be pitched off at a rear or side opening.
- The load may be dumped directly into the blower or conveyor hopper by using a dump truck.
- A false front endgate may be used, connected with cables to a power-driven drum mounted on the rear.
- The load may be slid off by a power-driven unloading conveyor built into the bed of the hauling vehicle. This method has proved the most satisfactory.

Filling the silo

Blowers and conveyors are used for both upright and horizontal silos. Portable, drag-type conveyors or elevators are available at about the same cost as blowers and require about one-fifth the horsepower. Either an electric motor or a gasoline engine is used for motive power.

Silos built in the ground, called trench silos, frequently can be filled by making provision to dump over the sides.

Horizontal or bunker silos built above ground can be filled with a blower or drag-type conveyor. If a bulldozer is available, it can be used both for filling and packing. Begin filling the silo at one end so that the silage can be pushed up an incline of silage by the bulldozer. When filling is completed, the center should be left higher than the sides because it settles more.

Distributing and packing in silo

To avoid spoilage and loss due to air pockets in the silage, it is essential to distribute the chopped grass uniformly, keeping the material slightly higher at the center. More settling takes place in the center. In upright silos, if the material is uniformly distributed, no packing is necessary until the top one-third of the silo is reached.

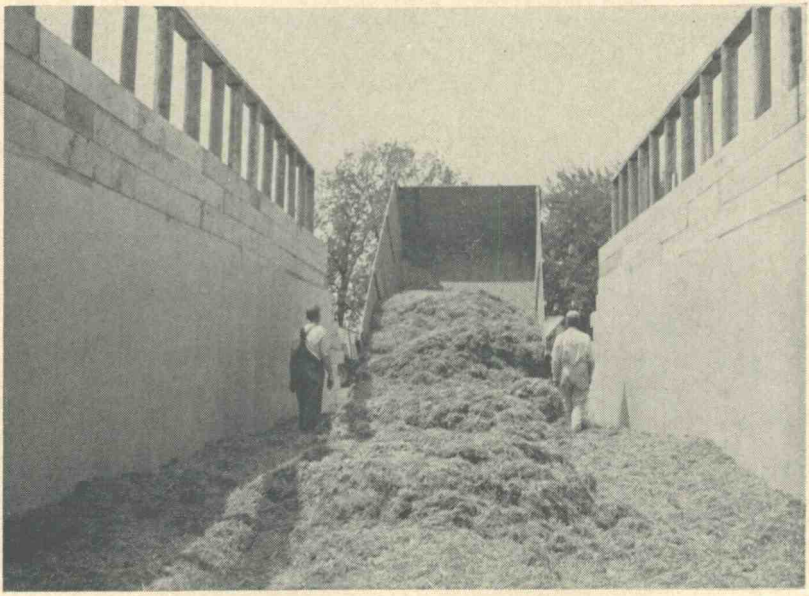


Figure 4. Using a dump truck in a bunk silo drive.

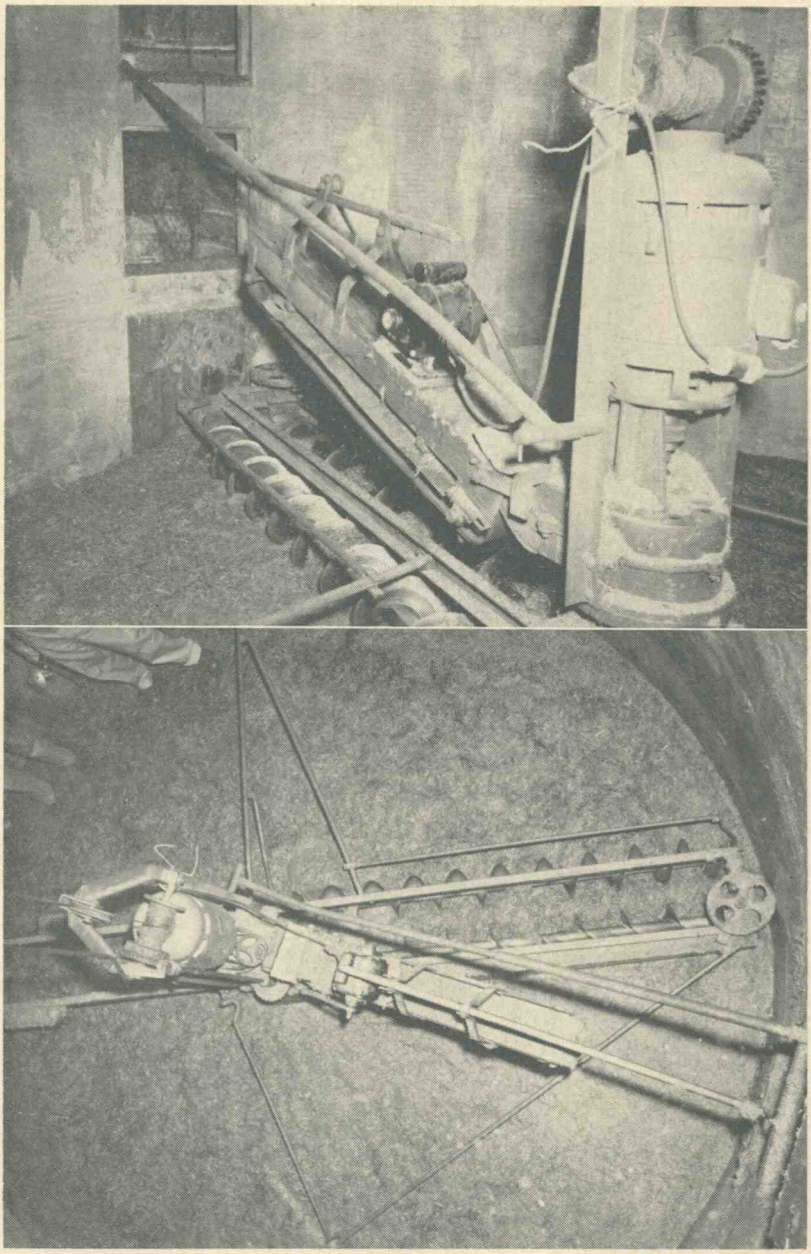


Figure 5. Above: A satisfactory top unloader for grass-legume silage can save labor. Below: Top view of upright silo unloader. A conveyor is used to carry the silage from the center to the chute.

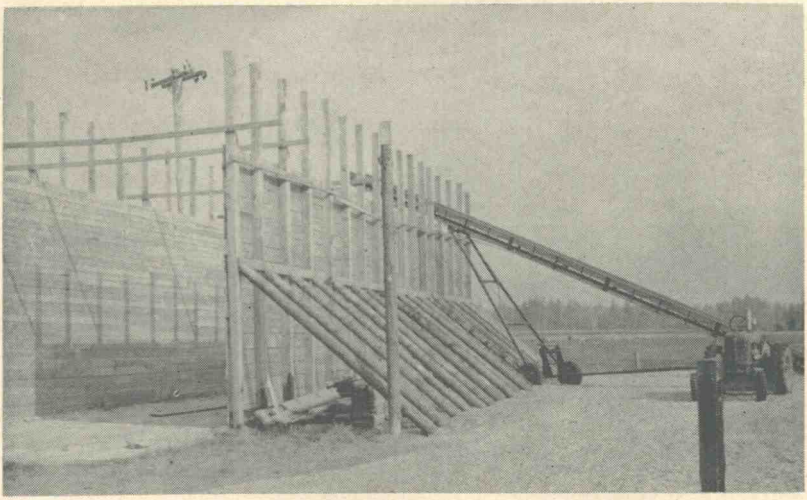


Figure 6. A conveyor may be used on both tower- and bunker-type silos.

Shallow silos such as bunker or trench silos should be packed the whole depth. A tractor with a blade can be used to distribute and pack. A wide front end on wheel tractors makes it easier to handle the tractor.

Sealing the silo

Sealing the silo is necessary to avoid spoilage. On silos made of material that absorbs water, such as wood or concrete, the outer edge may shrink away from the inside wall at the top. This is more pronounced on the side exposed to the sun. Daily tramping around the outer edge until settling stops will reduce the spoilage.

A number of methods are used successfully to seal silos. An effective method is to wet the top and tramp well, and repeat every 3 or 4 days until the top layer has mushed up. Or, use paper covered with any material to weight it down, such as sawdust, wet straw, or low grade grass. A thick layer of sawdust will do a good job of sealing. Plastic silo seals also are available and very little spoilage results if they are used properly. With care they will last a number of years. A cover is not necessary if 8 to 12 inches of surface spoilage can be permitted.

Feeding from silos

Unloaders are available for upright silos, and a manger conveyor makes it possible to control the complete silage feeding operation from one electric switch box.

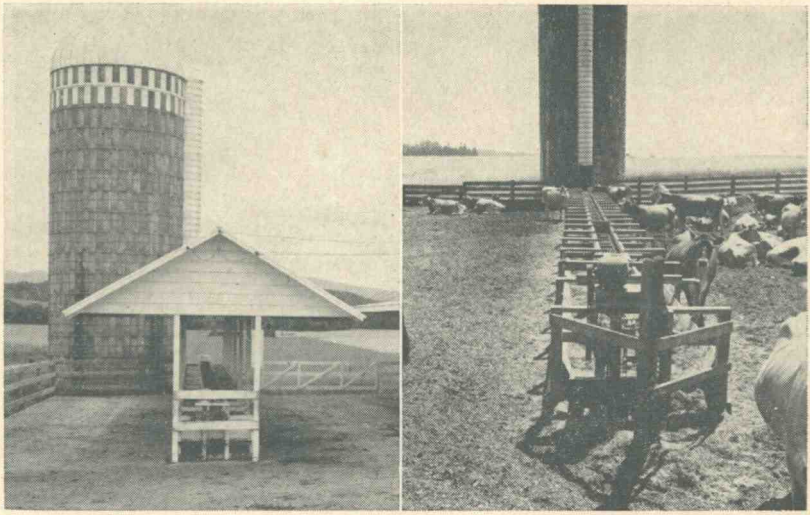


Figure 7. Left: A compact, labor-saving feeding arrangement for silage and hay. Note the silage conveyor over the center of the silage feed bunk. Right: A satisfactory summer-corral feeding arrangement. With roof and concrete platform the same area could be used for winter feeding.

Mechanical unloaders are not yet in the practical stage of development for trench or bunker silos. Tractor-mounted power forks are the best available equipment for removing silage.

Both good and poor results have been reported for self-feeding from horizontal silos. Whatever feeding method is used every effort should be toward getting cattle to consume the desired amount of silage daily. Night lights in the feed area may be helpful, as some animals will eat during the night.

Which silo to build

Here are some points to consider: available space; cost per ton of stored silage; amount of silage to be stored; how the feeding operation is to be handled; equipment for filling.

Space must be available for filling the silo and for the feeding area. Feeding should be done near the silo to save labor and extra equipment.

The upright silo is generally more costly per ton of storage; however, the per cent of spoilage usually is less. Top unloaders are practical, and by combining the unloader with a manger conveyor it is possible to have "push button" feeding of silage.

Figure 8. A power fork is used on many bunk silos.

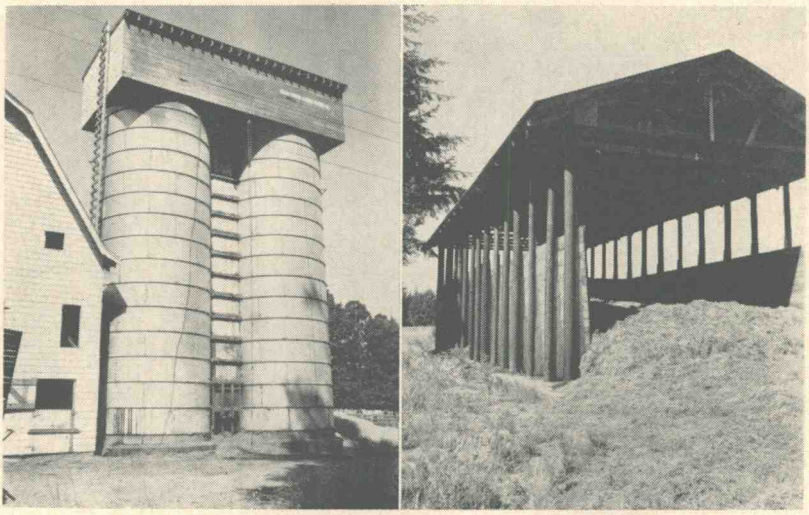


Figure 9. Left: Metal silo with top structure for top cover provides a track to transfer top unloader from one silo to the other. Right: A treated-pole, above-ground, trench-, or bunker-type silo. Sides are sloped by using a tapered piece of 2 x 8 on the inside of the poles.

Caution

Suffocating gas from fermenting silage, mostly carbon dioxide, forms in all silos shortly after filling begins and continues until fermentation stops. The gas, being heavier than air, collects and remains in any depression or enclosed space when there is not a strong, free movement of air or when the air in the silo is no longer agitated. Enter silos with caution.

Trench silos require good drainage. A well-drained site is essential. If it cannot be located near the feed area, it might be better to consider an above-ground bunker silo. In some cases it may be possible to construct the silo so that you can drive straight through. Sides should be lined with concrete or wood.

Horizontal or bunker-type silos are adapted to any place where upright silos can be used. They can be located for convenience, which is not always possible with a trench silo. Plans are available from Oregon State College for horizontal pole-frame silos.

Bunker and trench silos should have a slight outward slope to the sides, so as the silage settles it presses tightly against the sides. A slope of about 1 inch per foot of depth is adequate.

Roofs

Silage should be protected against excessive rain. Rain will tend to reduce the palatability of silage and cause some spoilage.

Size of silo to build

Calculate on the basis of 1¼ tons of silage per cow per month when the cows have free choice. The weight of silage in trench or bunker silos 10 to 15 feet deep will average 35 to 40 pounds, and if only 10 feet deep, 30 to 35 pounds per cubic foot. Upright silos will average 45 pounds per cubic foot of silage.

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