

*Making and Feeding*

# Grass and Legume Silage

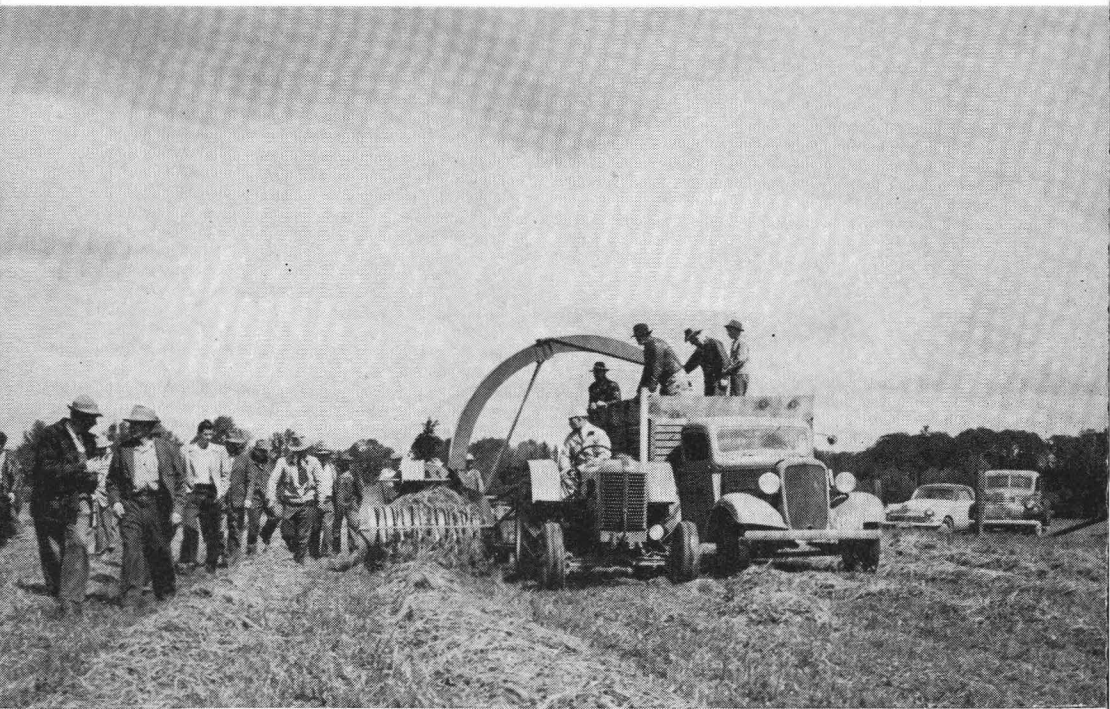
*Revised by*

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## Advantages of Grass and Legume Silage

1. Grass and legume silage can be made successfully during rainy weather.
2. Grass and legume silage provides the most practical method of preserving nutrients such as proteins, carbohydrates, minerals, and vitamins. Losses due to rains, shattering of leaves, and sun bleaching are naturally reduced. From 10 to 30 per cent of the nutrients are lost in field curing of forage crops.
3. Grass and legume silage makes it possible to increase the home-grown protein supply. With good legume-grass silage, protein supplements can be reduced.
4. Grass and legume silage eliminates the fire hazard from the storage of green or wet hay. Twenty per cent of all farm fires are caused by spontaneous ignition of hay.
5. Grass and legume silage requires about one-third as much storage space as long, dry hay.
6. Grass and legume silage can be produced with less expense than corn silage.
7. Grass and legume silage reduces soil erosion and is an important part of grassland agriculture.
8. Grass and legume silage helps control many noxious and undesirable weeds. Early cutting removes the weeds before seed maturity. Most unpalatable plants are more palatable when made into silage than when cut for hay.
9. Grass and legume silage provides succulent forage for late summer feeding. Such succulent feeds are often not available on nonirrigated farms.

## *Making and Feeding*

# **Grass and Legume Silage**

Revised by

H. P. EWALT, REX WARREN, and M. G. HUBER\*

## **An Improved Forage Program**

The sound economics of more milk and more meat per acre at less cost have turned the attention of livestock people to the greater use of silage in their feeding programs. More farmers are recognizing the value of and are putting into practice "grassland farming." A part of this program is the planting of many acres of crop and original pasture land to improved grasses and legumes. Wherever possible these acres are being put under irrigation. Other parts of the program are increased use of liquid manure tanks, more commercial fertilizers with attention to time of application, drainage, weed control, grazing management.

The importance of quality and palatability of forage is often overlooked by livestock feeders. With good pasture forage recognized as the highest quality and most palatable roughage, it is only good reasoning that any storage method which best preserves the qualities of pasture is the one to follow. The greatest production from pastures is during the three spring months. This production is more than can be used by livestock at the time. Ensiling is the answer and provides a method of leveling out the feed made available through grassland farming.

In addition to pasture forage, those crops such as alfalfa, clover, oats and vetch, and peas may be harvested at an immature stage and stored as silage. This method of storing provides more feed per acre and reduces much of the losses caused by rain and field curing.

## **Planting Crops for Silage**

Silage can be made from any crop that normally is made into hay. Legumes, grasses, or cereals growing alone or in mixture may be ensiled.

Annual hay-type crops for silage purposes may be practicable in emergencies, but as a general rule silage can be made cheaper and better by using permanent seedings of grasses and legumes.

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\* Dairy specialist, farm crops specialist, and agricultural engineering specialist, respectively. This bulletin is revised from original recommendations issued by 1946 by M. G. Huber, Roger W. Morse, and E. R. Jackman.

There is room for increased plantings of alfalfa on soil where it will grow. Thousands of acres of upland offer a home to subterranean clover. *Lotus uliginosus*, or major, is filling a real need on moist, coastal lowlands. Wherever irrigation is feasible, Ladino clover invariably steps up carrying capacities. Alta fescue is longer lived and more productive than many grasses in general use. Several of the newer grasses, such as meadow foxtail for wet land, Tualatin oatgrass, and creeping red fescue, have proved themselves worthy of wide use in pasture mixtures.

Since good grass and legume silage contains 30 to 35 per cent dry matter and well cured hays about 90 per cent, the yield of silage will ordinarily be about three times the tonnage of the same crop cut for hay. The yield of total nutrients will be about equal either as hay or silage, except that fewer nutrients are lost in silage making than in hay making if cut on the same date.

### **Nitrogen Makes Grass**

Work by the Oregon Agricultural Experiment Station has confirmed experiments elsewhere which show that nitrogen is usually the limiting factor in grass yields. An application of from 200 to 500 pounds of sulphate of ammonia (or equivalent) per acre can be depended upon to increase the yield of grass, often doubling it.

When perennial grasses are used for silage, more of the nitrogen used as fertilizer is returned in the feed. It is a cheaper way to get nitrogen than to buy it in the form of protein supplements. Generally the older the stand of grass, the greater the return from nitrate fertilizer.

The application of nitrogen in February or March may enable pasturing two to three months earlier than otherwise. Midsummer and fall application will increase yield at a time when growth normally slows down. The good operator must continually strive for a balance between grasses and legumes in the forage stand and the most economic use of nitrate and phosphate fertilizers. The best rates can be established by trial on a particular pasture.

### **Growth of Plant Important**

The quality and palatability of any silage will depend upon the stage of growth of the forage when it is ensiled. The silage can not be any better than the original material. Experience has proved that the highest quality and most palatable silage is made when the crop is in the very young or immature stage of growth. The highest

per cent protein is found in all plants before they reach the half-bloom stage. Grasses should be cut before they bloom, just as the heads begin to show. Clover, alfalfa, and other legumes should be cut before the half-bloom stage. Oats and other cereals should be ensiled while in the milk or very early dough stage. The time of season of harvest will depend on weather, growing conditions and management practices.

For many years livestock feeders have not recognized the feed value of early cut forages either when fed as silage or hay. The superior nutritive value of early cut forage is illustrated in Table 1 by data from the Bureau of Dairy Industry.

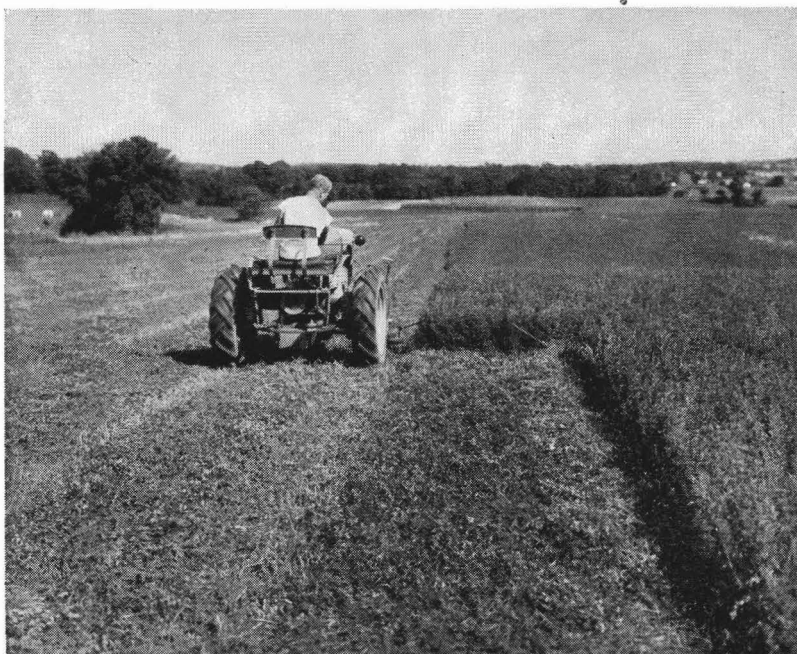
Table 1. RELATION OF PROTEIN CONTENT TO MATURITY OF ALFALFA HAY

Stage of maturity when harvested	Yield of protein per acre	Yield of butterfat per acre
	<i>Pounds</i>	<i>Pounds</i>
Early bloom .....	1,427	404
One-half bloom .....	1,381	345
Full bloom .....	997	331

## Moisture Content Control

The highest quality silage is made from forage that is put into the silo with a moisture content of 60 to 70 per cent. The moisture content should never be less than 60 per cent. A common fault is to have the forage too dry with the result that it does not pack tight enough to exclude the 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.

A forage harvested at the early-blossom stage will usually have about 80 per cent moisture. Moisture content may be reduced by wilting the crop for a period of 2 to 6 hours or more depending upon the weather. If the crop is overwilted this may be corrected by adding water or mixing 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 of forage will aid materially in controlling moisture.



*Figure 1. Heavy stands of forage can be picked up from the swath. A side delivery rake or swather may be used to good advantage.*

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

### **Ensiling and Preservatives**

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 a period of about 5 hours after being placed in the silo, the plant cells in the forage continue to take the available oxygen. 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. Under ideal conditions of moisture, lack of air, and readily available sugar, a high quality silage is the end result.

If the water content is too high, undesirable reactions develop and result in a strong smelling, low-quality silage. There will be

added losses from excessive leaching. If the moisture content is too low, high temperature will cause losses and mold will develop.

## Use of Molasses Beet Pulp

Molasses is the first choice as a preservative. It is the most effective as a source of sugar. Ground or whole grains (corn, wheat, barley, oats) may be used. Molasses beet pulp is also a very good preservative, when added at rates from 60 to 300 pounds per ton, and will take up twice its weight in water. Dried whey also is a good source of sugar when added at a rate about one-third less than that recommended for molasses. Molasses has the added advantage, however, of giving an added good flavor to the silage.

Cost should be the main consideration in deciding which preservative to use. The first cost may seem high. It must be remembered, however, that adding preservatives also is adding feed value and a measure of insurance that a higher-quality silage will be made.

The amount of preservative needed per ton of silage is shown in Table 2. Exact amount is not important. It is better to have too much than not enough.

Table 2. PRESERVATIVE NEEDED PER TON OF SILAGE

Crop	Molasses*	Ground or whole grain
	<i>Pounds</i>	<i>Pounds</i>
Legumes .....	60-80	150-200
Legumes and grasses mixed .....	40-60	125-175
Grasses or cereals .....	30-40	75-125

\* Molasses weighs 11 to 12 pounds per gallon.

## Silage Harvesting Methods

Four basic silage harvesting systems are in use as follows:

1. Mowing, raking, hand loading, hand unloading, and hand feeding to stationary chopper.
2. Mowing, raking, machine loading (loader), hand unloading, and feeding to stationary chopper.
3. Mowing, raking, pickup with field chopper, unloading to blower.
4. Direct cut with field chopper, unloading to blower.

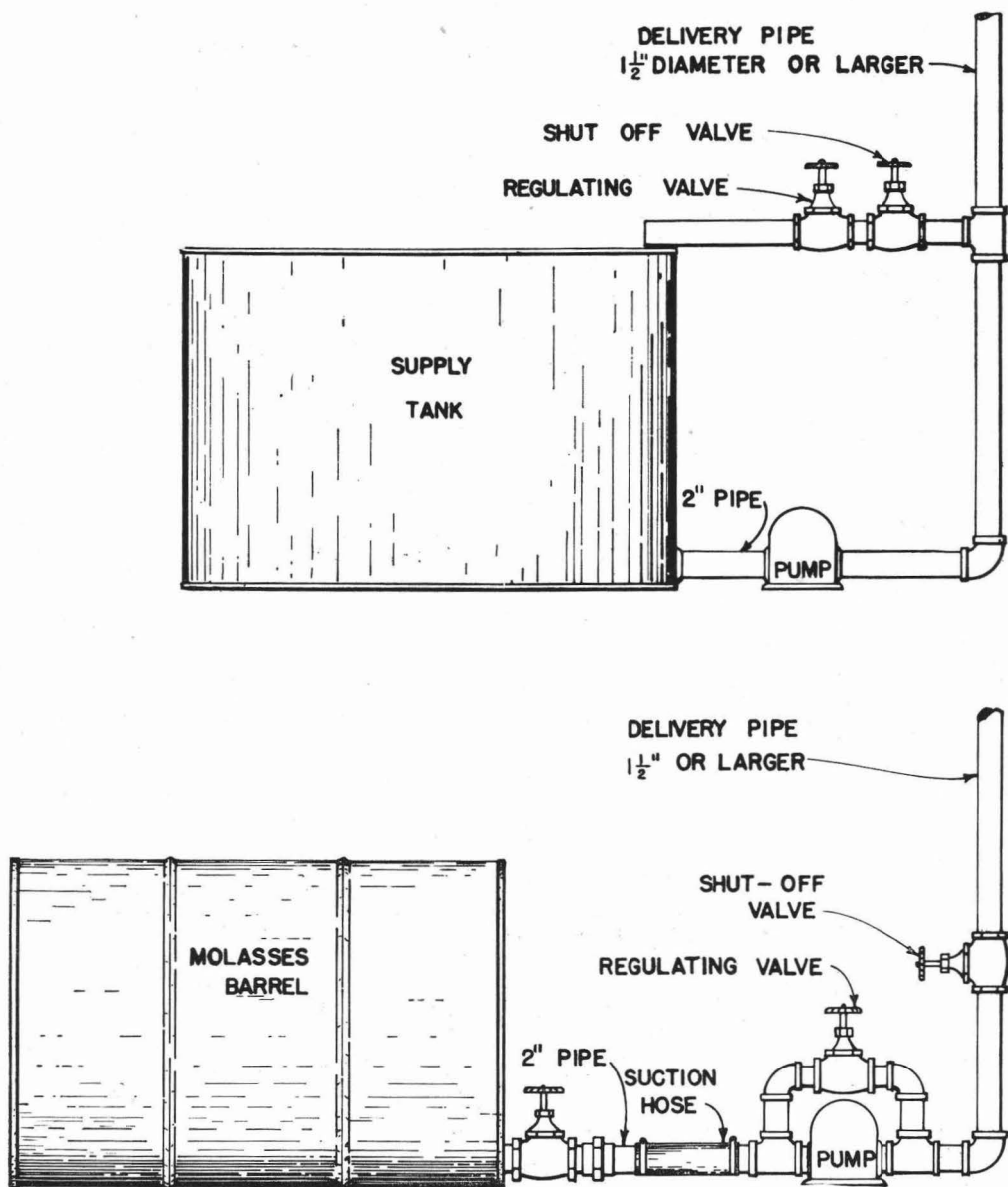


Figure 2. Arrangement for pumping molasses. It is important that the pump be on a level with, or below, the bottom of the supply tank. Top: Pumping from a supply tank. Lower: Pumping directly from the barrel.



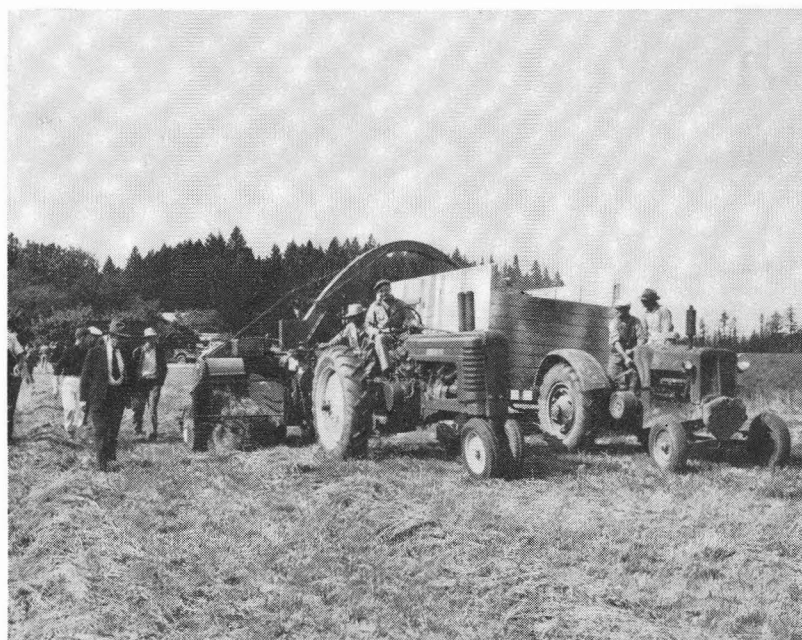
**Hand methods are limited**

The first method involves time and hard labor. It may be necessary in small operations where cash outlay for equipment and labor is inadvisable. The second method will be commonly used until field choppers are more generally available.

When mowing, it is a poor practice to cut down more grass than can be put away the same day. A windrower attached to any mower will do the work of a rake. In addition, stones are less likely to be picked up than when a side-delivery rake is used. In heavy growth, swathing is necessary. Sometimes merely a part of the swather attachment at the outer end of the cutter bar is used.

**Heavy-duty loaders are essential.**

Modern cylinder rake-bar loaders, commonly known as heavy-duty or green-crop loaders, are the most satisfactory type to use in picking up the crop. Well-built cylinder rope loaders in good condition will handle light crops or small swaths, particularly if the ropes are replaced by a No. 3 welded machine link chain and good hardwood slats.



*Figure 3. Grass silage field day showing the operation of a side delivery field harvester.*

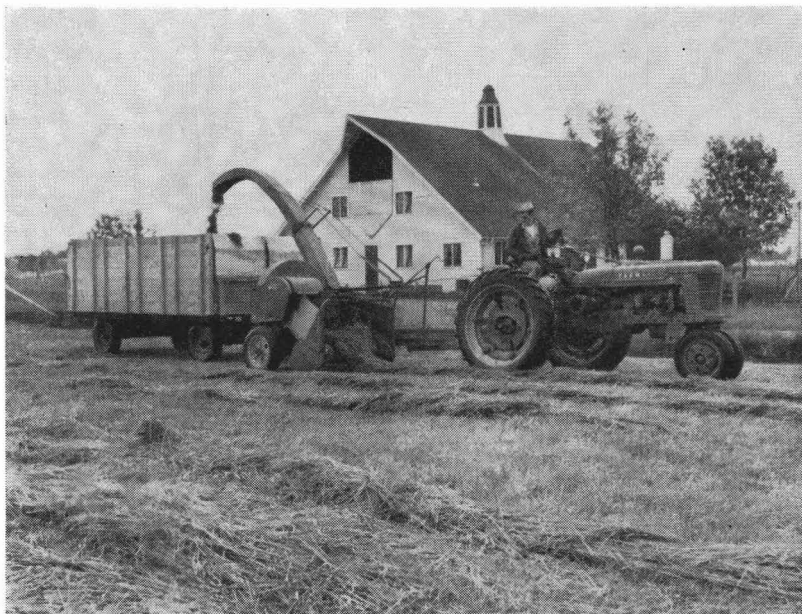
### Chopping the silage

Chopping of the silage is an extremely important phase of the operation often overlooked. 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:

1. Right speed.
2. Right feed.
3. Sharp knives.
4. Good ledger or shear plates.

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

Overfeeding a silage cutter will cause it to slow down, choke, and clog, unless adequate reserve power is available to keep the cutter up to speed. A sharp knife not only cuts the feed better but requires less power, helps in keeping a uniform cutter speed, and thus prevents clogging. The shear or ledger plate is part of the cutting equipment and must be properly adjusted so that the knives will just clear it without touching.

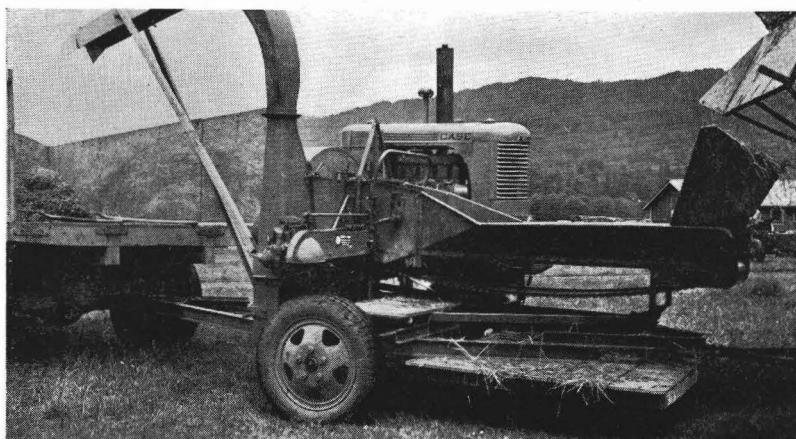


*Figure 4. One man field operation.*

For most grass and legume crops, the chopper is best set to cut  $\frac{1}{2}$ -inch lengths. For pasture clippings, a  $\frac{3}{4}$ -inch setting is satisfactory. For mature material, or when the crop is being ensiled in temporary silos, or without preservative, a  $\frac{1}{4}$ -inch cut is recommended.

### Field chopping speeds work

The field-chopper method (where one man gathers, chops, and loads the crop) is the easiest and fastest way to harvest grass silage.



*Figure 5. John Schilds, Tillamook, constructed a field harvester by placing a stationary chopper on a two-wheel trailer. Upper photo shows tandem arrangement of truck, chopper, and heavy duty loader. This is a two-man outfit.*

This method reduces the labor requirement to half that required by the green-feed loader system. In addition, it takes the hard work out of the silage operation.

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.

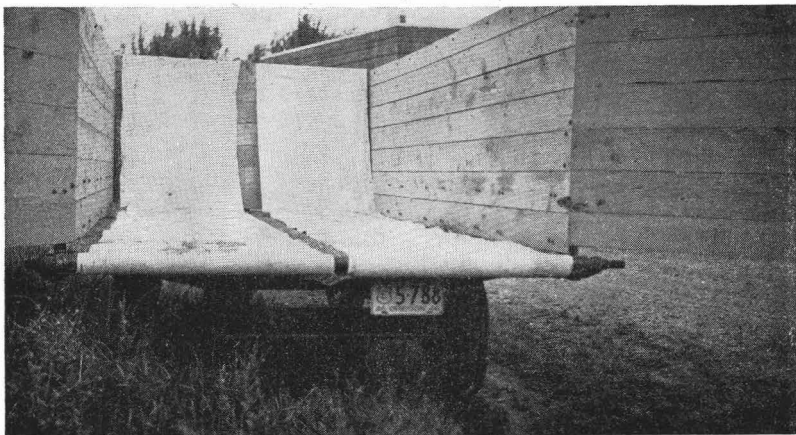
If, to cut out some labor, a trailer is towed behind the field chopper, an automatic hitch is desirable. It will allow easy and rapid switching from chopper to tractor and back again.

### Unloading method for field-chopped ensilage

Different unloading methods can be described as follows:

1. The load may be pitched off at a rear or side opening.
2. It may be dumped directly into the blower hopper by using a dump truck.
3. A false front endgate may be used connected with cables to a drum mounted on the rear which is power driven.
4. 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.

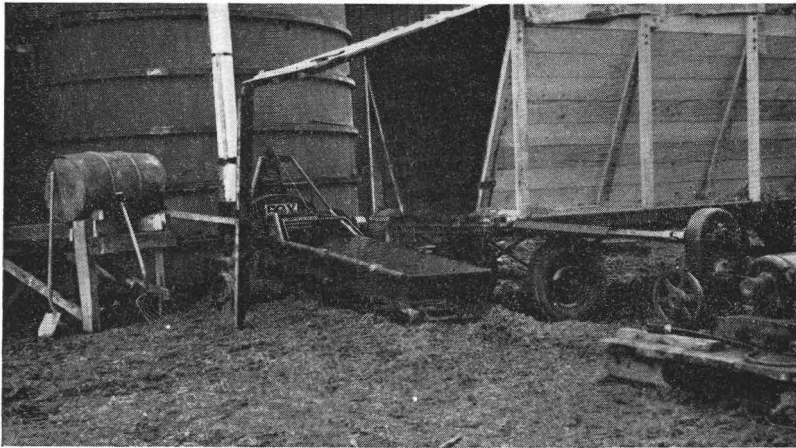
Several types of power-driven unloaders have been used and have been found quite satisfactory. The canvas bottom of one type winds on a shaft mounted to the rear of the vehicle bed. This shaft



*Figure 6. A trailer equipped with canvas aprons for unloading. A single canvas can be used.*

may be either a  $2\frac{1}{2}$ -inch pipe, mounted with a bearing on each end, or a solid shaft  $1\frac{1}{2}$  inches in diameter. The shaft extends through the bearing on one end and may be either splined or square to hook up with the power drive for unloading. The canvas is held to the shaft by fastening a  $\frac{1}{8}$ - x  $\frac{3}{4}$ -inch band over the end. Holes are tapped every 4 inches in the shaft and counter-sunk stove bolts are used. Canvas fitted for the full width is desirable. If two pieces of canvas are used, they should not be sewed in the center.

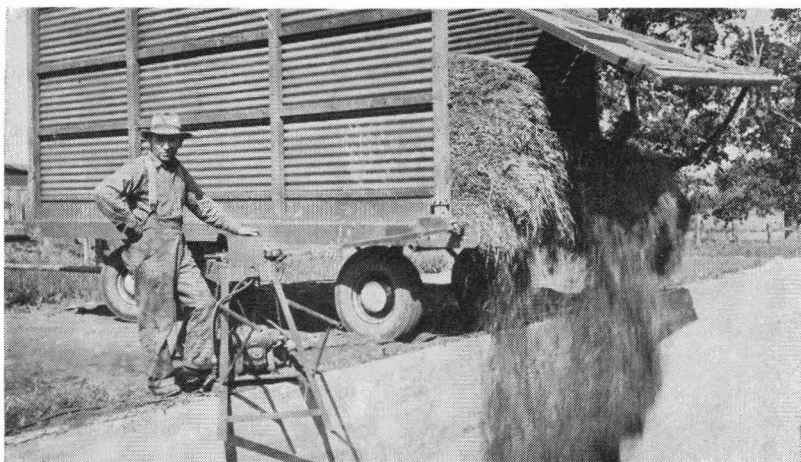
The canvas should move about 2 feet per minute. A good idea that can be incorporated with this type of conveyor is the use of an automobile transmission in the power drive. Three speeds are then provided. It is best to have the slow speed set at about 1 foot per minute.



*Figure 7. An endless slatted conveyor used for unloading grass silage.*

Another type of endless slat-type conveyor is shown in Figure 7. The canvas bottom apron has the disadvantage that it must be returned and placed in position after every load. But it has the advantage of being easily attached to an existing vehicle bed because it requires only two bearing supports on the rear of the bed. A  $\frac{1}{2}$ -horsepower motor, or preferably a  $\frac{3}{4}$ -horsepower motor, is necessary to drive the unloading mechanism. A small gas engine of 1 horsepower or more is satisfactory.

Another type is the movable or false front endgate which pushes the ensilage off the bed of the body. Cables are used and fastened to a large shaft or drum mounted on the rear of the bed the same as for other conveyors. The cable lies on the bed of the body.



*Figure 8. Emptying green forage into a trench silo.*

### **Elevating material**

A blower is best for elevating grass silage into the upright silo. Most other elevators, such as portable drag types, usually are not long enough to reach the top of the average silo. When storing in bin or trench-type silos, drag-type conveyors or slings may be used



*Figure 9. Unloading chopped hay using a canvas conveyor. Power is supplied by a small gas engine usable in any location. One man is required for this operation. The same equipment is used harvesting silage and hay crops.*



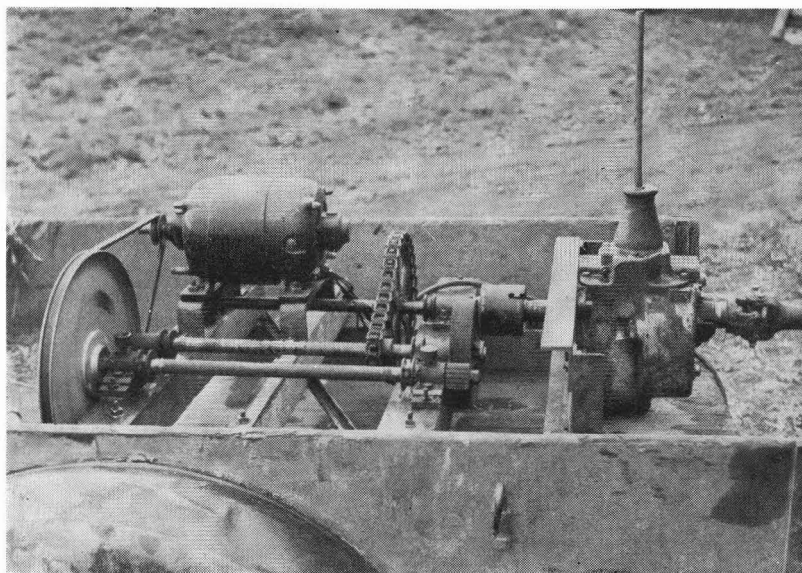
for unloading. Slings are so placed during the operation that two or three slingfuls make up a load. Stationary choppers are also used, with the knives removed, for elevating the field-chopped grasses.

### Distributing and tramping in silo

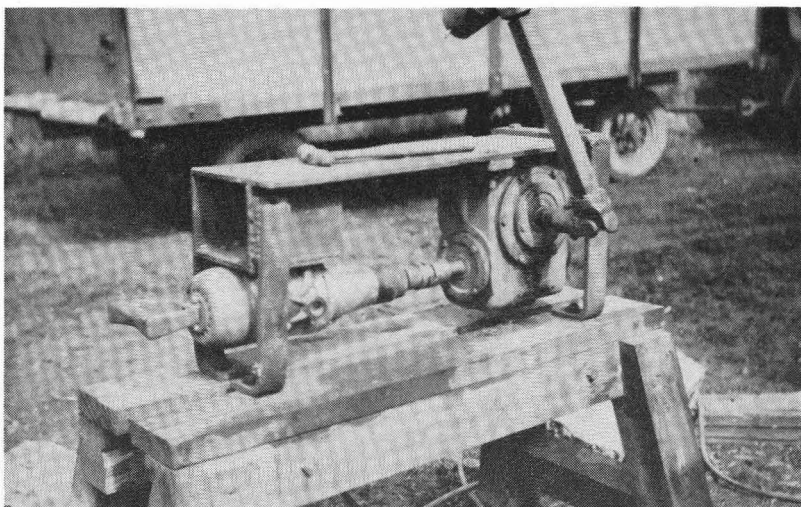
To avoid spoilage and loss due to the presence of air pockets in the silage, it is essential to distribute the chopped grass uniformly, keeping the material level or slightly higher at the center. It may not be necessary to tramp material harvested at an immature stage and cut in short lengths, except to see that the top is carefully leveled and well packed whenever cutting is stopped.

Legumes and grasses that may have matured or dried beyond the best ensilage stage need extra tramping and should be cut in  $\frac{1}{4}$ -inch lengths.

Sealing the silo is necessary to avoid spoilage. Several methods are used. On silos made of material that absorbs water, such as wood or concrete, the top, outer edge may shrink away from the inside wall unless it is tramped, daily, around the outer edge until settling stops. For an effective seal, thoroughly wet the top 6 inches and tramp well. This should be repeated for at least 3 or 4 days.



**Figure 10.** An electric motor with reduction gear and a used transmission as a source of power for unloading. This power unit is mounted in a trailer for convenient moving.



*Figure 11. This drill motor which is used in the repair shop during the winter is used here for power for the unloading unit.*

The wetting also will lessen the shrinking away from the wall. This will result in some spoilage, but is an easy and simple method. Another method is to use a layer of roofing paper lapped at least 3 inches, on top of which green weeds, wet-cut straw, sawdust, or low-grade grass is placed.

A commercial silo seal is available and from all reports, if properly applied, eliminates practically all spoilage.

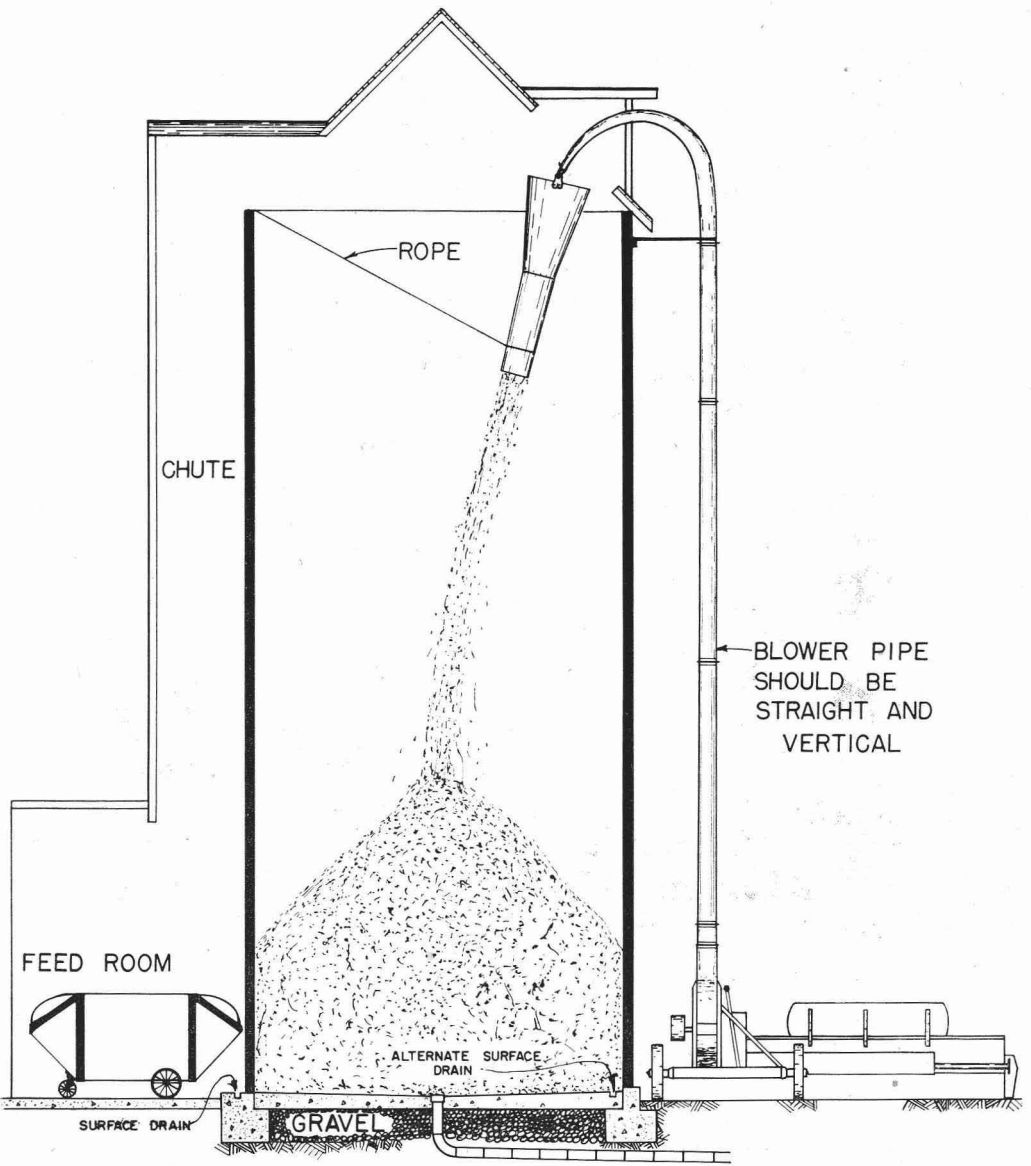
## Choosing a Silo

The upright silo is the cheapest and best type for grass silage. Because grass silage exerts  $1\frac{1}{2}$  to  $1\frac{3}{4}$  times as much pressure on the silo walls as does corn silage, silos built for grass silage need steel reinforcements. Old silos designed for corn require additional hoops before they are filled with grass silage.

### Wooden-hoop silos not recommended

Wooden-hoop silos are not recommended in the humid regions of western Oregon unless both staves and hoops are treated for decay or are protected from weather. Wooden-hoop silos have been known to break down in nine or ten years when their outside surfaces were

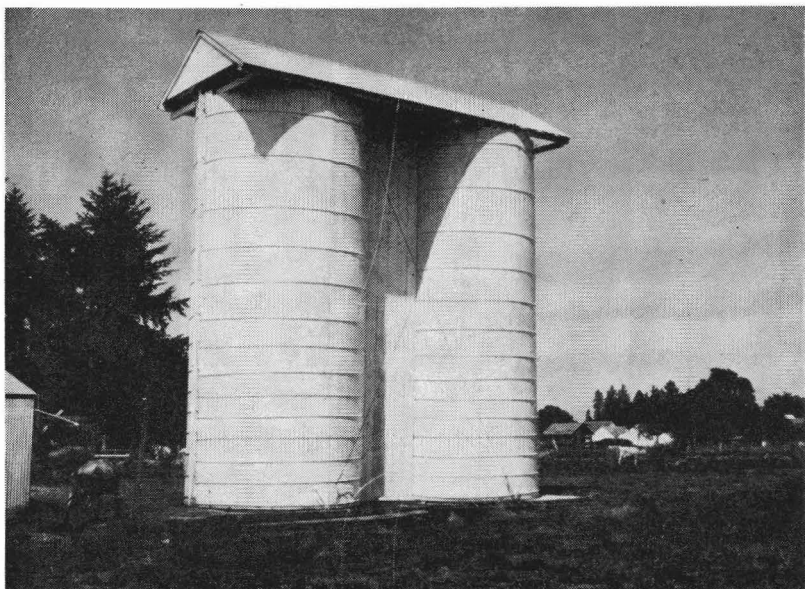




*Figure 12. The distributor pipe should be placed to form a uniform cone of silage when filling without tramping. Drainage should be provided at the silo base to control excess plant juice. Where there is not drainage under the bottom edge, holes should be provided. The trench around the outside wall will collect juice so that it can be drained away and prevent odors.*

not covered. In such cases, the hoops and places where the staves and hoops were in contact were found seriously decayed.

Wooden hoops glued together and to the staves with waterproof glue and then painted should give satisfactory service. No observations or studies have been made, however, as to the durability of such construction. The important thing is to keep water from collecting between the layers of wooden hoops and between the hoops and staves.



*Figure 13. Two well-braced wood stave silos. A silo top is necessary in western Oregon. When this type of silo is properly braced and trussed, it will give 25 or 30 years service.*

### **Upright or tower silos preferred**

Satisfactory upright silo types are: wooden stave with steel hoops; concrete with a protective inside coating; brick; tile; metal with protective inside coating.

Recent investigations at Oregon State College have shown that the bulk of the juices in the silo moves horizontally to the wall and then down to the outlet. In wood-stave silos, the juice finds its way out under the staves at the concrete base. In other silos such as steel or concrete, a groove around the inside of the silo will provide passageway for the drainage of the juice. A center drain also is

desirable, as some juice will drain from the center. In silos less than 12 feet in diameter, the center drain can be eliminated.

Grass and legume silage requires special provision for drainage. In most cases, soils will not absorb the drainage from grass and legume silage. Silage ensiled at more than 70 per cent moisture has an excess moisture that will drain off.

On tidelands and river bottom lands where it is difficult to obtain good footing the floor is best omitted. The construction of a foundation in such areas requires special attention, and perhaps technical assistance.

Anyone planning to build a new silo or remodel an old one might well refer to the U. S. Department of Agriculture Farmers' Bulletin 1820, "Silos—Types and Construction," or, if interested in a wood stave homemade silo, Oregon State College Extension Bulletin 715, "A Homemade Wood Stave Silo." Both publications are available either from the county extension offices or the Extension Service, Oregon State College.

### **Trench silos are useful**

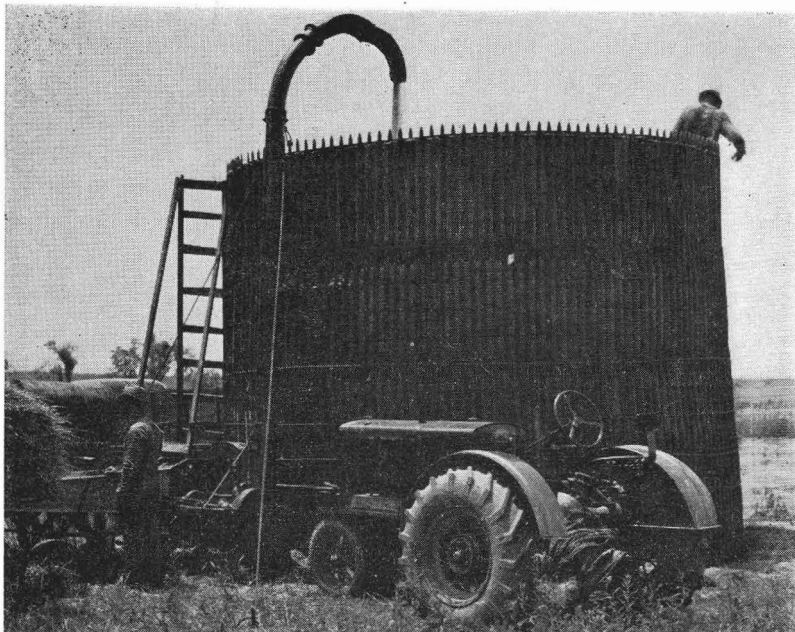
The trench or box-type silo is used on some farms. Its chief advantage is that it can be built at a low cost. For large-scale operators the trench silo has a definite advantage in that its initial cost is low and the per cent of spoilage is less as the size of silo or storage space is increased.

Filling a trench silo is a simple process. Dump trucks or mechanical conveyors built on the bed bodies of trailers or trucks may be used to dump cuttings directly into the pit. Leveling and packing may be done with tractors having blades. The silage can be removed by means of power shovels and conveyors, or trucked to the feed lot. A carrier and track can be built above the silo running to the barn or feed lot.

The trench silo is an excavated trench in the ground with sloping sides lined with concrete or other material. The box-type silo may be in combination with the trench silo. Part of the box silo may extend below ground level with additional height built above ground. Some box silos are of wooden construction and built in a rectangular shape. The sides generally slope inward at the bottom so the silage compacts itself as it settles. While this type of silo may be justified under some circumstances, almost without exception the well-constructed, upright silo is the most satisfactory in the long run. In western Oregon the trench silo should have a roof, and drain pipes should be distributed along each side at the bottom.

### Temporary silos

Temporary silos made of woven wire, picket fencing, or snow fencing are used in emergencies to store surplus feed. They are not practicable unless lined with a double thickness of heavy fiberpaper such as kraft paper. Lining materially reduces the spoilage. Additional information on temporary silos is available in Farmers' Bulletin 1820.



*Figure 14. Temporary silos could be used much more than they are at present. These temporary silos are lined with a strong paper to reduce spoilage.*

### Silo Storage Costs Less

Grass silage, as viewed from the cost of building angle, has a number of advantages. It makes possible real savings in storage-room construction. The cost of hay storage in a barn is about the same per cubic foot as the cost of silage storage in a silo, but each cubic foot in a silo stores more than three times as much dry matter (see Table 3).

Table 3. COMPARISON OF SPACES USED BY FORAGE IN DIFFERENT FORMS

Form of storage	Whole hay	Chopped or baled hay	Grass silage	Corn silage
Feed stored per cubic foot ..	4 pounds	8 pounds	45 pounds	40 pounds
Dry matter per cubic foot ....	3.6 pounds	7.2 pounds	13.5 pounds	12 pounds
Cubic feet per ton of feed ..	500	250	44	50
Cubic feet per ton of dry matter .....	555	278	148	167

## Silage Feeding Value

Research work and the experience of many livestock feeders have proved the nutritive value of properly made silage. Those with experience make silage from a crop that is harvested at the very early-bloom stage. The most palatable silage is made from forage that is at its most palatable stage of growth. Forages have the highest per cent of protein up to the early-blossom stage. The per cent of protein will vary in silage depending on the stage of growth of the plants and the proportion of legumes in the silage.

### Hay compared to silage

On the average, 3 pounds of good silage is equal in feed value to 1 pound of high quality hay. Grass and legume silage can be fed as the only roughage between pasture periods. Many dairymen use silage to supplement pasture, particularly during the latter part of the season.

When cows have free access to hay and high quality silage they usually eat 3 to 4 pounds of hay daily per head and make up the rest of their requirement from silage. There are records of Holsteins consuming up to 140 pounds of silage per day. Feeding 60 to 90 pounds per head daily is a common practice.

The milk yield per pound of dry matter usually is higher when a good legume-grass silage is fed. This is due to the fact that a higher per cent protein and a greater percentage of leaves are retained when a forage is stored as silage. Silage crops are usually harvested at an earlier stage of growth than hay crops. There may be as much as 4 to 5 per cent more total digestible nutrients in the early cut forage. The total dry matter yield per acre may be 10 to 20 per cent greater in silage. The milk yield per acre may be 10 per cent greater with high quality silage. Three times as much carotene is saved. All of these factors together mean a lower cost, higher quality feed. Only a minimum protein is needed in the grain fed when a high-quality legume silage is fed free access to the dairy herd.

Silage may impart an off-flavor to the milk. For this reason it should be fed immediately after milking.

Table 4. MILK YIELDS PER ACRE FROM ALFALFA FORAGE WHEN HARVESTED IN VARIOUS FORMS<sup>1</sup>

Form harvested	Dry matter preserved	Dry matter consumed per 100 pounds of milk <sup>2</sup>	Relative milk production
	<i>Per cent</i>	<i>Pounds</i>	<i>Per cent</i>
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

<sup>1</sup>Courtesy Bureau of Dairy Industry.

<sup>2</sup>Four per cent fat-corrected milk.

### Grass Silage for Beef Cattle

Beef cows were wintered on grass silage at the Northrup Creek Experiment Station in Clatsop County. The cows consumed from 45 to 50 pounds of silage daily. They were fed no hay or grain. In the spring these cows were in excellent, sleek condition.

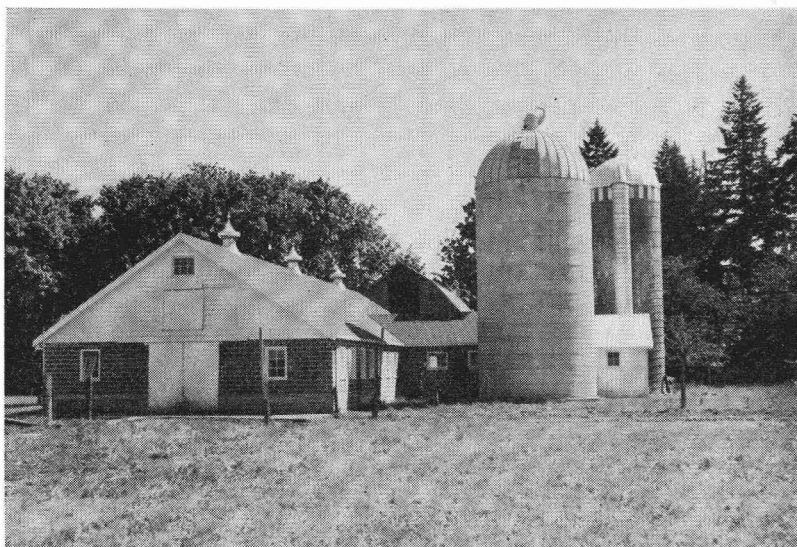


Figure 15. A compact, modern dairy arrangement, consisting of a milking barn, metal hay keeper, and concrete silo. A second wood silo is behind the hay keeper.

Beef steers in the same feeding test made good gains. They consumed 35 to 50 pounds of grass silage daily, together with a small amount of hay and about 8 pounds of grain for yearlings and 7 pounds for weaners.

Cattle are being fattened commercially in the coast area and along the Columbia River on grain with grass silage as the sole roughage.

### **Grass Silage for Sheep**

Grass silage is used more extensively each year by the sheep men of the Willamette Valley. They find it an excellent feed for ewes while 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.

### **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 to advantage 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 increases the hatchability of eggs.





*Figure 16. Silage making with a field harvester at the Astoria Experiment Station.*