SUPPLEMENTARY FEEDING FOR CATTLE

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IN this Territory conditions are in the main unsuitable for hay making as a means of conserving fodder for livestock. The lowlands regions do not support suitable plant species, while in the highlands weather conditions are unsuitable for hay curing. The humidity experienced does not make for good storage of hay.

Under such circumstances silage making is the only practical method of conserving fodder crops such as maize and sorghum, and excess grass growth. The succulence of the fodder is conserved and there is little loss of nutrients and digestible material. Unless moderate to heavy rain falls, weather conditions during silage making have little effect on the final product.

Chemical changes

During the process of converting green fodder into silage certain chemical changes take place. A brief explanation of these should assist the farmer in making a good-quality product.

When the green material is ensiled it is still alive and continues to take in oxygen and give off carbon dioxide until all air trapped in the silo has been used up. During the process heat is produced and the activity of bacteria and moulds is accelerated, acids being produced as by-products. Plant tissues are also broken down and the resulting chemical changes, assisted by the preliminary chopping and crushing of the material, improve palatability and digestibility. When all the trapped air has been used up by the plant material the moulds become inactive, although bacteria continue to live. At this stage sufficient heat will have been generated to kill the plant material.

Two main factors must be noted as causes of production of poor quality silage :—

1. If too much air is left in the fodder the temperature will rise too high. This overheating reduces the digestibility of proteins. Also, the moulds, bacteria and plant material will remain active much longer, drawing on sugar reserves in the material to provide energy in maintaining their life processes, thus reducing the nutritive value of the silage.
2. The succulence of the material also affects the degree of heating and rate of acid production. Dry material is inclined to overheat and cannot be packed as well as sappy material. However, excess sappiness may cause spoilage in the silo unless provision is made for drainage or soaking up of excess liquid.

Silage crops

A wide variety of crops, as well as pasture growth, is suitable for ensiling. Maize and sweet sorghum, both of which grow very satisfactorily in most parts of the Territory, are regarded as especially suitable and provide a large bulk of good-quality fodder. In the Port Moresby area Elephant grass (*Pennisetum purpureum*) has been shown to give high yields of nutritious green feed. Other grasses, such as Guinea grass (*Panicum maximum* var. *trichoglume*) and Para grass (*Brachiaria purpurescens*), together with legumes such as *Centrosema*, may be expected to give a good-quality fodder in the silage pit.

Maize is best cut for silage when the cobs are well formed and the grains are filling but still milky. Sweet sorghum is cut when the heads are well out but the grain is still soft. Fair crops of both of these should yield 10 to 15 tons of green material per acre.

Harvesting is most conveniently done with a forage harvester, a reaper and binder, or a mower, but cutting with bush knives is satisfactory, although somewhat slower.

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If the material has dried off prematurely at harvest due to dry weather, the addition of molasses at the rate of about 40 lb. per ton of fodder will ensure reasonable-quality silage.

Silage storage

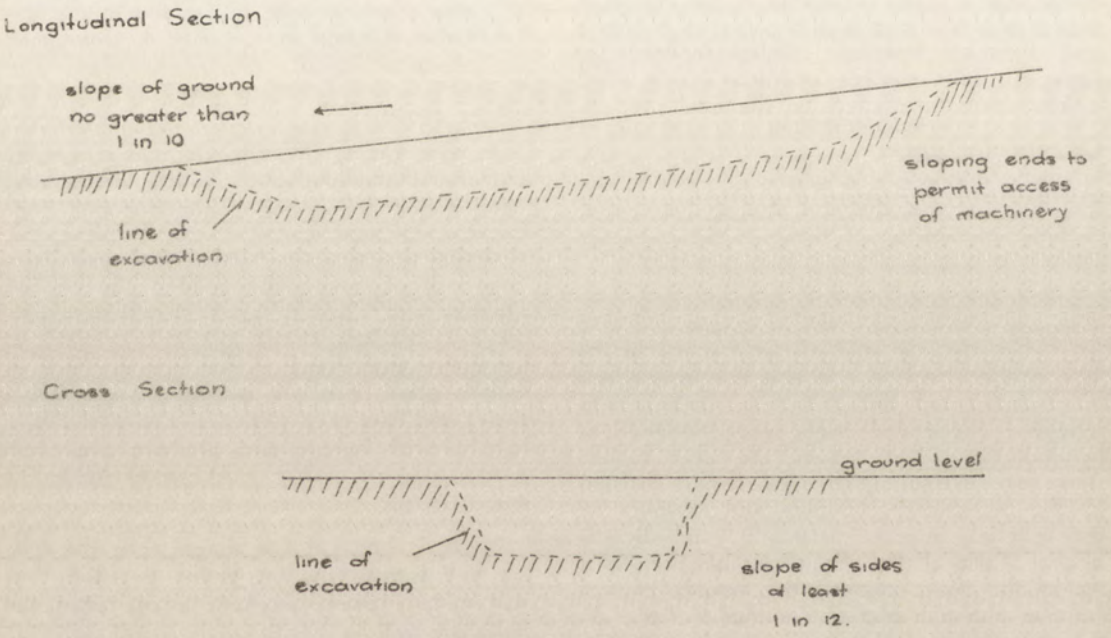
Silage can be stored in towers, trenches, stacks or clamps. The first-mentioned involves high capital costs in initial construction, and the last two are rarely used, other than for pasture silage, because of the amount of waste resulting from the large surface area in contact with the air.

Trench silage is a very satisfactory method of conserving fodder, and requires little capital outlay. The following points must be considered in the construction and filling of a trench :—

1. The trench should be excavated on high or sloping ground which is fairly well drained and where there is very little danger of seepage or of build-up of underground water.
2. Fairly long and narrow trenches are preferred to short, square types to facilitate packing of the fodder. The walls should be smooth and have a slight slope to the bottom to guard against formation of air pockets and to ensure a constant downward pressure of silage on them. The following dimensions may serve as a guide in the construction of trench silos :—

   Width 12 ft., average depth 4 ft. and length—

   a. 40 ft.—approximately 35 tons capacity.
   b. 60 ft.—approximately 53 tons capacity.
   c. 80 ft.—approximately 71 tons capacity.
   d. 100 ft.—approximately 90 tons capacity.



Sectional diagram of silage pit.

. . . . Two cubic yards of excavation hold about a ton of maize or sorghum silage.

Trenches of more than 100-ton capacity are not recommended, unless the operations are highly mechanized, because of difficulties, both economic and physical, involved in filling and feeding out.

3. In the filling of the trench, close and tight packing of the fodder is the primary consideration. Maize and sorghum are better chaffed, but if this is not possible, bundles should be laid down in closely-packed rows. The heads of bundles in each row should face in the opposite

direction to those in the preceding row, and each row should overlap the preceding one by half the length of the bundle. Stacking is continued like this, keeping the centre of the pit slightly higher than the edges. When the first two or three feet have been laid in the bottom of the pit, the tractor should be run through several times to assist in packing, and then the material left overnight to ensure that heating is commencing properly. The correct temperature is 85 to 90 degrees Fahrenheit. If there is no rise in temperature, filling operations must be delayed. When the temperature has risen to the correct level, further compaction with the tractor is done to discourage any further temperature rise in this layer. Then filling may proceed in two to three-foot layers, allowing each layer to reach the desired temperature and compacting it before adding the next layer.

4. When the filling has reached ground level, the green material should be allowed to extend a few inches outside the wall of the trench. This will ensure that as the silage sinks under the pressure of additional material, it will be compressed firmly against the walls of the trench. Additional green material should be heaped and compacted to a height of about four feet above ground level.

   A slow rate of settling indicates good packing. The importance of filling and packing cannot be overemphasized. As the stems soften during heating the weight of material above presses down until a compact mass results.

5. Two or three days after the final stacking earth is scooped on top of the material until there is a cover of nine to 12 inches. A layer of green grass may be added before covering to reduce waste, as the top few inches will have to be discarded when the trench is opened. After covering, the area must be watched closely and any depressions or cracks which may collect water should be filled in. Surface drains should be constructed to prevent water from lying in the area of the trench.

Feeding the Silage

On exposure to the air silage begins to deteriorate. Thus, the aim in feeding silage out of the silo should be to expose the least possible area of the surface of the silage remaining in the silo.

The usual method in feeding from trench silos is to open at one end, removing sufficient earth to permit a week's feeding. The silage is then cut down in a straight vertical wall across the pit, and is removed in layers.

On opening the pit the silage should be a compact mass and light-brown to olive-green in colour. A dark, charred product is indicative of poor consolidation in the trench, while a rather slimy and smelly "sour" silage results from underheating due to the laying down of very wet material or accumulation of water in the pit.

The hay knife and the axe or broadaxe are the most favoured tools for cutting silage from the pit. Many farmers have devised and improvised cutting tools to suit their own needs, ranging from old chaff-cutter blades to small chain saws. Self-feeding from the pit has not been successful, due to wastage and slush on the trench floor.

Good silage is very palatable and cattle will eat up to 80 lb. per day. For supplementary feeding of milking cows on poor pastures, about 50 lb. of silage per day plus crushed grain and a protein concentrate is recommended. When dry cows and beef cattle are on poor grazing, silage fed at the rate of 20 to 40 lb. per day will help maintain the condition of the stock.

The quantity of fodder to be ensiled as a reserve for supplementary feeding during the dry period when there is very poor pasture growth can be calculated at the rate of one-half to one ton per beast per month.

Silage making in Papua

Silage has been put down in trenches on several occasions in Papua, with varying degrees of success. The failures have been due mainly to waterlogging and faulty compaction in the pit.

In 1959, approximately 700 tons of silage was made at the Papuan Lowlands Livestock Station, Moitaka, for supplementary stock feed during the dry season. This was all put down in one pit which measured about 75 yards by five yards,

by three yards deep. This trench is much larger in size than is usually recommended, a circumstance made possible by the heavy equipment available.

The material ensiled consisted of 15 acres of maize, giving an estimated yield of 16 tons to the acre, 25 acres of Kavirondo sorghum (*Sorghum verticiflorum* var. *Kenya*), a non-toxic grazing variety, giving about 10 tons per acre, and 28 acres of volunteer Kavirondo growth yielding from four to eight tons per acre.

Nearly half the area was cut with a side-blade mower, the rest being cut by hand. The material was carted to the pit in trucks and unloaded and spread by natives. Compaction was done by the full-time use of a crawler tractor as the material was placed in the pit.

As each six to eight inches of silage was compacted it was watered with a mixture of equal parts of water and molasses at the rate of four gallons per ton of silage. This was done to stimulate microbial activity in the material which has a sugar content rather below the optimum for silage processes.

The pit was filled to a height of four feet above ground level, and left for five days, during which time it settled about two feet, indicating fairly good initial compaction.

An 18-inch layer of soil was spread over the top to exclude air and shed water from the pit. A fortnight after this sealing, two low spots were filled on the earth cover and drains were cut around the pit to assist run-off of water.

The actual filling of the pit took 17 working days using a labour force of two Europeans and 30 natives. So, using reasonable equipment, the filling of a 100-ton-capacity trench should be easily completed in one week.

When the trench was opened for feeding, the silage was of good, greenish-brown appearance. Chemical analyses indicated a content of 5 per cent. crude protein which is about half the usual figure for high-quality silage. The crude fibre figure of 35 per cent. was approximately normal.

The silage was very palatable to the cattle, both beef and dairy types, and proved invaluable as a supplementary feed to carry the stock over the abnormally-long dry season experienced in the Port Moresby area in the latter half of 1959.