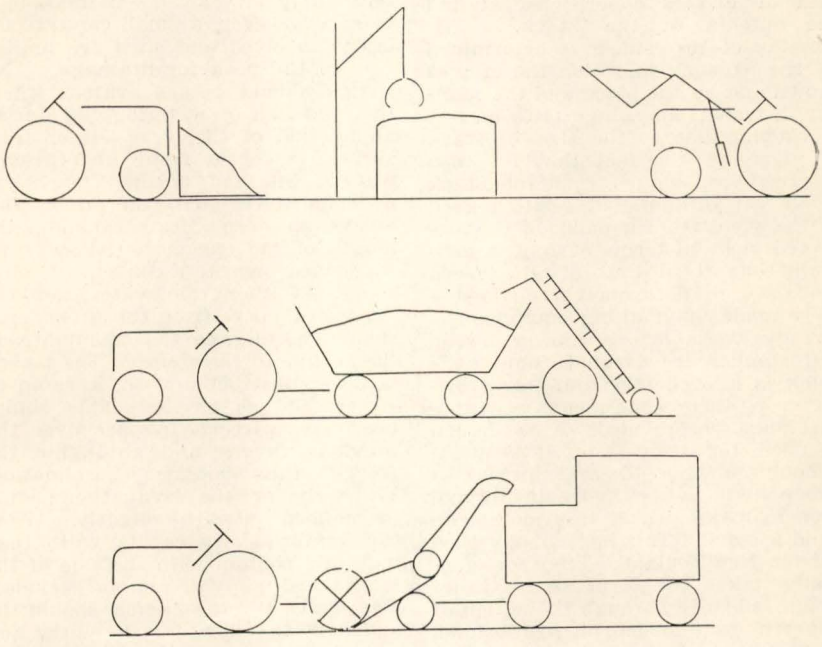
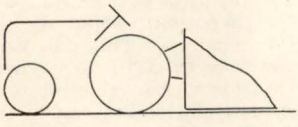
The Mechanisation of Silage-making





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IN BULLETIN No. 251 the making of silage in stacks, trenches and towers was discussed. This bulletin deals with the mechanisation of the process. Fundamentally the problem revolves around the cutting, carting and unloading of a green crop. Because the making of silage involves the handling of a heavy green crop, complete mechanisation is advantageous. The equipment should be selected to fit in with the method used, and the work must be planned to avoid delays and keep labour and equipment busy. Only a combination of equipment will make full use of key plant. It must be remembered, however, that the output of machinery is largely conditioned by the operator. Little, if any, farm machinery is fully automatic. The operator should never lose sight of the overall picture nor should he allow the available equipment to sway his judgement from the principles underlying the making of good silage. Whether silage is made in a stack, trench

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or tower will have an influence on the equipment that can be used.

THE STACK:

A stack provides the greatest choice of location and involves no capital expenditure. The decision to make silage can thus be made at a moment's notice. As no wall is provided against which the green crop can be pressed to exclude air a good deal of loss is experienced around the outside of the stack. The location of the stack is determined by the paddock in which the crop is grown and by the place and the manner in which the silage is to be fed. A rough guide to the size of stack is given by the fact that 100 tons of green crop makes a suitable stack 28-30 feet in diameter. With regard to the yield from a paddock the expected yield in terms of hay is generally one third that of the green crop. On most farms where silage is to be made, haymaking equipment is already available. A mower, sweep and stacker are adequate unless the stack is located far from the growing crop, then some means of transport must be provided. A sweep can be used for transport. It is not a difficult matter to arrange for a sweep to be raised hydraulically and even to make use of this method to build a stack. This has already been done in New Zealand. Transport generally takes the form of a trailer which is loaded through the action of a green crop loader hitched behind. The loader picks up and elevates the crop from the swath to the trailer. In England a special machine has been developed for cutting and loading a green crop all in one operation. Known as the Cutlift this machine is tractor drawn and its mechanism is driven from the power take off. A trailer attached behind receives the crop. This machine is as effective in cutting short grass as it is in cutting long crops such as marrow stem kale. Where trailers are used, another man is needed on the trailer in order to spread the load. In general two men are needed for cutting and carting.

Stacking with a mast and boom stacker absorbs the energies of five people. Other types of stacker can be used but they have not the mobility of the mast and boom. Finally there are elevators. Their use involves the forking of the green crop on to the foot of the elevator either from a heap left from the activities of a sweep, or else from a trailer drawn alongside. Those who have done this work will realise that it is most satisfactory to cut down the amount of hand forking to a minimum where a long and a tangled crop is involved.

TRENCH SILAGE:

A trench provides a wall against which the green crop can be pressed to exclude air. Losses in making and storing can thus be reduced to a reasonably low level. In making a trench, however, a small capital outlay is involved and sites are limited due to the need for drainage. No trench should be excavated where there is risk of waterlogging during any period of the year, either from surface water or from underground water. One end of the trench can be made lower than the other; this allows an open drain along the length of the trench to be led from the lowest point to a convenient soak-away. Neither rain water, nor the expressed juices from the green crop should be allowed to accumulate in the bottom of the trench. The trench is best constructed with a ramp at either end so as to enable equipment for carting to pass over the previous layers and through the trench thus aiding consolidation. The walls of the excavation should be inclined outwards slightly. When the material settles it will then maintain contact with the side of the trench and air will remain excluded. The width of the trench should be sufficient to allow for the entry and passage of carts and trailers used during filling. The length will depend on the amount to be made. If conditions allow it is best to increase the depth rather than either of the other two dimensions. This will keep the final surface area to be covered with earth down to a minimum. Such an excavation lends itself to the capabilities of a bulldozer or, a scoop. Provided the soil walls are solid enough such a structure should last for a few seasons. To make it more permanent small mesh wire plastered with concrete can be used successfully as a cheap method of lining. For all weather filling and feeding out it is essential to put down a load or two of gravel on the ramps at either end.

A rough guide to the size of trench is given by the fact that a trench 15 feet wide, 4 feet deep and 40 yards long holds 200 tons of silage.

The final covering of earth can be put on by means of a bulldozer on a scoop. Where the ground has little fall successful trenches have been built part below and part above ground. Buttressed walls erected

on level ground have also been used to construct a trench.

For filling a trench, one of the most satisfactory types of sweep is the buckrake. This sweep or rake is mounted on the standard hydraulic gear behind a tractor. The tractor is driven in reverse along the swath with the fingers on the down position resting on the ground. When the crop has piled up sufficiently the rake is raised by means of the hydraulic mechanism and the tractor is driven forward through the trench. The load is discharged without stopping by dropping the points of the fingers.

The most satisfactory method of dealing with a green crop is by chopping it into short lengths. Subsequent handling is then made a good deal easier. The forage harvester, developed in the U.S.A., is designed to do this. Forage harvesters are generally designed to cut directly or to pick up the green crop from the swath, chop it and blow it into a trailer drawn behind, or to one side by another tractor. The capacity of these machines is considerable and in order that full use may be made of them, a well thought out organisation to support them is essential. Trailers with four sides and some kind of canopy over the top are necessary in order to confine the crop. Where the crop is not chopped, as with the Cutlift or mower and hay loader, trailers with two ends only are all that is needed. Speedy unloading of the trailers, particularly where forage harvesters are used, cuts down the number of trailers necessary to keep the harvesting machinery in constant work.

Where trailers are used for filling a trench, unloading does not present a serious problem. Two methods have been used with success in Canterbury. One consists in the use of stout wire netting on the bottom of the trailer. Once the trailer is in the pit the netting is pulled up over the load and rolls it out backwards. The other method consists of a canvas laid on the floor of the trailer. The canvas is wound up from the rear end by means of a hand or power take off operated roller. Both these methods involve the removal of the load from the rear end of the trailer. Where trailers with four sides are used, doors must be incorporated in the rear. The same method can be used with unchopped material. In this case trailers with two ends are used and the rear end would have to be removed for unloading. Tip trucks have been tried but are not successful. Successful unloading with a tip truck involves moving forward. This is usually impossible with a heavily loaded truck. The load has to be taken off from the truck or trailer before it can move forward once it comes to rest in a pit and its wheels become embedded in the crop.

TOWER SILAGE:

A tower provides a complete wall against which the green crop can be pressed. Only a small area at the top is left for final covering. Losses are therefore reduced to a minimum. Feeding out is easier due to the help provided by gravity. The filling of a tower, however, involves the use of a blower, and the capital cost of a tower is very much greater than that of a trench. If the green crop is brought from the paddock in the long state a chopper blower is used for filling the tower. This machine chops and blows the crop up into the tower all in one operation. If a forage harvester is used and the green crop is brought to the silo in short lengths only a blower is needed for filling. Such a machine requires less power than a cutter blower.

Of the three ways of making silage outlined above the trench method, if conditions allow, is undoubtedly the cheapest, involves less loss and requires the smallest labour force. For the small-scale worker the buckrake is the outstanding piece of equipment. For large-scale work the forage harvester is outstanding. It is to the green crop what the header harvester is to the grain crop. Harvesting is done in one operation and chopping the crop into short lengths makes subsequent handling very much easier.

Finally there is the question of costs. Farmers are moved to buy equipment for two main reasons. Firstly, in order to make essential work easier and more convenient, and secondly with a view to obtaining a suitable return on capital invested. About the first point there can be little argument. Any piece of equipment that makes silage making easier and quicker is a good thing. Time and energy can then be devoted to other matters. But this point is important: The machinery must fall within the skills of the farmer and his men. Machines poorly serviced and with adjustments misunderstood can be a source of a good deal of trouble and expense. Always aim at the simplest machine provided it does its work according to good farming standards. The

other aspect, the return on capital invested, is more complex and it must depend in the last analysis on an estimate of the increase in revenue to be obtained from the use of silage as stock feed. This estimated increase in revenue must be balanced against the known cost of making silage per unit weight. The cost of making silage depends on the labour force and the equipment used. The trench and the buckrake reduce these to a minimum. Remember it is the overall cost of an operation that is important. In making an assessment the standing charges as well as the running costs would have to be included.

Finally silage provides a reserve of foodstuffs which can be used over a long period, the value of which cannot be assessed in an adverse season. It can be fed with good results to many classes of stock, to calves, to dairy cattle and to fattening cattle as well as to sheep and horses. Depending on the main enterprise of the farm the stock carrying capacity can be increased or animal production maintained at a higher level during the dry summer and winter months by the better use of the excess spring growth which frequently goes to waste on New Zealand farms.

Copies of this Bulletin may be obtained from the Secretary, Canterbury Chamber of Commerce, P.O. Box 187, Christchurch.

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