

Silage

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TEAM WORK IN GRASS SILAGE MAKING :

Problems of Organisation Using a Green Crop Loader.

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- (b) Winter Fattening of Cattle : 1947-48, 1948-49, 1949-50.
- (c) Commercial Egg Production : 1949-50, 1950-51, 1951-52.
- (d) Cattle Rearing : 1951-52.

ENTERPRISE COSTS:- Economics of Silage Making in East of Scotland, 1950, 1951, 1952, 1953.

Wheat Costs - 1952 Crop.

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DAIRY LABOUR IN THE EAST OF SCOTLAND.

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TEAM WORK IN GRASS SILAGE MAKING :

Problems of Organisation Using a Green Crop Loader.

During the course of a year farmers have to organise teams of workers to do a large variety of jobs. The methods they use are the products of past experience and are constantly undergoing changes as the result of the introduction of new ideas and new machinery. The intention behind the changes is always the same, namely to ease the strain of seasonal rush periods for both farmers and men by speeding up the work and by reducing physical fatigue.

The investigations which form the basis of this report were undertaken to assist farmers in their task of improving the organisation of one of their rush periods. The technique used was that of "Work Study" which other industries have found useful for many years past. Briefly it consists of a detailed analysis of the various parts of the work in order to reveal clearly in what way one method of working is better than another. It is hoped that the following notes on the results of the application of work study to silage making will be of interest and practical benefit.

THE TEAM AND THE IMPLEMENT

Silage made from grass has increased in popularity in recent years and has become an important item in the economy of many farms in the East of Scotland. One of the most common implements used for harvesting the grass has been the reciprocating-fork green crop loader which is the subject of this present report. This machine picks up the grass from the swath left by the mower and drops it into a trailer, the whole outfit being drawn by a tractor.

It is usual in this part of Scotland for the mowing and gathering to be done as separate operations. Mowing is done before gathering begins so that the tractor used for mowing is available for taking its place in the team carting the grass to the silo. The team usually consists of two tractors with two wheeled trailers (sometimes three tractors and trailers) circulating between the field and silo, one or two men loading from the green crop loader in the field and a variable number of people at the silo. (There are, of course, several different types of silo - pits, stacks, towers etc. - as well as variations in the number of persons at work there).

Good team work on the job depends on an even balance between the various tasks. But there is generally one man who could deal with more work and one task in the job that is setting a limit to the work done elsewhere. It is the improvement in the carrying out of this task that raises the performance of the whole team. This in turn leads to a speedier harvesting of the grass and this gives a surer promise of silage of the quality sought. For, in most seasons, grass can grow beyond its best in a matter of a few brief days and harvesting must be done in those few days.

LOADING

The starting point of the grass harvesting is the loading of the trailer in the field, and that is the best point to start an inquiry into the performance of the harvesting team. There is a self-evident limit to the rate at which the green crop loader can travel without causing undue wear and tear on the machine and without making the task of loading far too difficult for the man concerned. It is necessary to set a pace which both man and machine can maintain throughout the day with the minimum of interruptions to the work. If the swath is thick the tractor will have to move very slowly to allow man and machine to handle it. With a less thick swath, the tractor can be speeded up to give the same rate of throughput. Where there is a very thin swath the rate of loading can be maintained only by side-raking /

side-raking two rows into one. This is well worth-while for one man's time spent doing it must be set against the saving in time of a team of men who might otherwise be working below capacity.

The man on the load is often the king-pin of the organisation and the amount of work he can be expected to do is of first-rate importance. If too great a strain is placed upon him, however fit and strong he may be, he will tire rapidly as the day progresses and the pace of the whole team will slow down as a result. He needs a short break between loads, so that a good steady loading pace can be kept up all through the day. He also needs time to clean grass off the cranks of the machine.

It might be thought that two men on the load would reduce fatigue and enable the work to proceed at a faster rate. But observations in the field suggest that with skilled workers this is not true except to a very minor extent. The reasons are these (1) the worker at the end next to the crop loader has to handle all the grass; (2) there is only a relatively small amount of room for two people on most two-wheeled trailers; (3) standing on a heap of grass at the front of a trailer moving across an uneven field provides a very unsatisfactory form of rest. The result is usually that two men on a load can neither do their optimum amount of work nor get adequate rest.

The whole emphasis must be placed on arranging the flow of work to ensure that the key man is kept at his optimum rate of work. The way of doing this is to increase the rest periods of the one man loading by allowing him to change places with a tractor driver for every third load. Also a change of task at mid-day between the loader and someone at the silo would help to reduce fatigue and thereby increase output.

UNLOADING

(1) The Pit

The time needed for unloading the grass depends to some extent on the nature of the silo. The pit type of silo, for example, provides several possible and alternative ways of tackling the task. A common method is to drive the tractor and trailer on to the pit and partly tip the trailer; after which the tractor driver with one or two helpers pulls and forks off the load in lumps which are partly spread in unloading. This method is satisfactory so long as the loading is limiting the throughput of the team. There is no point in stopping the tractor driver from working at the pit if he will spend any time so saved waiting in the field.

If, on the other hand, the time taken by the tractor to turn round at the pit is causing undue waiting by the loader then other methods must be employed. The load of grass can be tipped from the trailer in one or two heaps, allowing the tractor and empty trailer to return at once to the field. The heaps then have to be spread by hand. Usually this means the use of an extra person at the pit and the unloading may have to be carefully organised to avoid wastage of labour.

The number of people required at the pit depends to a great extent on the amount of consolidation and spreading deemed necessary. A comparatively broad pit will fill up slowly and will obtain much of the rolling it requires from the loaded tractors and trailers. A narrow pit in contrast will be more difficult to keep firm. The aim, whatever the width of the pit, should be to keep the spreading of grass to a minimum so that when unloading is done by the first and slower method one man at the pit will be sufficient for all additional spreading and distribution of molasses. Any additional rolling required above previous requirements could be provided at the beginning, end and middle of the day.

(2) /

(2) The Tower Silo

Tower silos present a completely different problem. The grass has to be forked from the load, preferably by the tractor driver, on to the feed of a cutter blower. The flow of grass into this machine is controlled by another man and two more people are needed to spread and consolidate the chopped grass inside the silo. The throughput of cutter blowers is limited and on most harvesting occasions the work must be arranged to keep this machine fully supplied with grass; otherwise one may worry because the loader is standing idle in the field.

HAULAGE

Two other important factors can limit the amount of grass ensiled in a day. One is the haulage time of the full trailer from field to silo and of the empty trailer back again. The word "time" is used purposely instead of "distance", for whilst the modern high-g geared tractor can haul a load rapidly along a good metalled surface it can go little faster than a horse and cart along a badly rutted farm road. Again, where two or more tractors and trailers form the team the haulage speed of the slowest sets the pace for the whole team unless the obvious expedient is used of loading with one tractor and hauling with the other. The longer the total hauling time the more urgent becomes a quick turn round of the tractor at the silo.

The last factor to be mentioned is the size of the load. Thirty cwts. is about the largest weight of grass that can be comfortably loaded with a green crop loader on to most two-wheeled trailers. But this requires stopping to alter the loading platform to its top adjustment and, with the more careful loading needed, means that the last 5 cwts. of this 30 cwt. take proportionally longer to collect than any previous 5 cwts. Therefore, approximately 25 cwt. loads are the most satisfactory until haulage time becomes of over-riding consideration. With a long haulage time the larger load gives a distinct saving, making it possible to bring to the pit a larger quantity of grass in the time available (in other words, providing a higher throughput in cwts. per minute).

FARM STUDIES

Detailed studies were made of the use of green crop loaders on three farms where the work was organised differently. These farms can be conveniently referred to as Farms A., B. and C.

On Farm A. the team studied was made up of two drivers with tractors and two-wheeled trailers and a man loading in the field. At the pit there was a man helping the tractor drivers unload and also spreading some grass after unloading, a woman spreading grass and molasses and a tractor driver rolling with a heavy tractor. Approximately half the time of the people at the pit was spent with the team studied and the other half with another team working at a second pit from another field. In this way full use was made of the labour at the pit. The loads were around 30 cwts., the maximum, and were hauled on to the pit for unloading by forkfuls from the partly tipped trailer.

This organisation was working smoothly and to good effect in circumstances where the average total haulage time was $7\frac{3}{4}$ minutes in each round trip of a trailer. Had the haulage time been a little greater the team's output could have been maintained only by speeding up the turn-round of the tractors at the pit. Calculations indicate that quick unloading of the trailer would have maintained the balance of the team until the total haulage time rose to as much as 11 minutes per load. After that point distance would cause delay in loading in the field.

Speeding up the unloading of the trailer at the pit presents the problem of extra work, and therefore additional help, in distributing the grass in the pit. One partial solution is to throw a wire rope round the load of grass as it lies on the pit, fasten the free ends to a tractor and pull over the load and thereby spread it along the pit. This action will effectively reduce the work of spreading by hand.

A point arises whether the work of spreading done on this farm by the woman was really necessary. An answer would require technical experiments or trial and error work in the field. But a recent survey by M.J. Nash of Edinburgh University suggests that mechanical rolling and compaction with a tractor can be an effective substitute for teasing out and spreading by hand.

A quick turn-round of the tractor at the pit was practised on Farm B. because of the long haul to and from the field which averaged in total $13\frac{1}{2}$ minutes for each round trip. Two tractors and trailers were enough to keep the loaders busy in the field because the rate of loading was slower than on Farm A, despite the use of two loaders instead of one. Only part of this difference could be attributed to the thinner crop of grass. Had the pace of loading been the same as on Farm A. it would have been preferable to fill the trailers to capacity (30 cwts.) instead of having the 25 cwt. loads which were found adequate in the circumstances. These changes would have increased the throughput of the whole team. At the pit on this farm there were two or three people (even four at times) to spread the heap of grass and roll the pit whilst the tractor and trailer returned immediately to the field.

Farm C. used a cutter blower and tower silo. The team was composed of two men inside the silo, one man feeding the cutter blower, two tractor drivers each with a tractor and two-wheeled trailer and one man loading in the field. Each tractor driver forked his own load at the silo. The cutter blower had a limited throughput but, despite the fact that haulage time was very small from a field close to the silo, this machine was not kept continuously at work. This was due entirely to the small loads of about 15 cwts. An increase in size to only 20 cwts. would have prevented this and 25 cwt. loads would have ensured that any waiting was done by the loader in the field.

Because the tractor drivers stayed at the silo for the whole of the unloading time this task would set a limit to the work of the team. If the haulage time had been as great as on Farm A ($7\frac{3}{4}$ minutes) the throughput of the team would have been reduced by waiting periods both in the field and at the silo. Big loads could not avoid this trouble. It would need an extra man and another trailer at least. Then the full trailers could be uncoupled at the silo and the tractors return immediately with empty trailers. Better still if this extra man could be provided with a tractor he would fit into the existing organisation and there would be no need for unhitching at the silo. With the third unit small loads would suffice unless haulage time was very large.

In such circumstances it becomes worth-while to consider ways of collecting small loads (of 15 cwts.) with the green crop loader without using a man for loading. A suggestion is that high sides to the trailers of light construction and an improved hitch to give the green crop loader two positions relative to the trailer would make this a practicable alternative.

CONCLUSIONS

The basic principles for the organisation of a team to make grass silage with a green crop loader can be summarised as follows, taking them in order of consideration :

A. With pit silos

1. Have a minimum team of 2 tractor drivers hauling two-wheeled trailers, one man loading in the field and one man at the pit who will help with the unloading.
2. Provide additional help at the pit as found necessary (the narrower the pit the more help will be required).

3. /

5.

3. Put on good loads (25 cwts.) in the field.
4. If the tractor drivers are waiting in the field whilst loading is completed for the other trailer, then they should load every third load to make sure that the person loading does not become overtired and so slow up the whole team.
5. Use the slower method of unloading until the loader in the field is being kept idle to any appreciable extent. Then take measures to speed up the turn-round of the tractors at the pit.
6. When even a quick turn-round is not avoiding a break in loading increase the size of the load to the maximum.

B. With tower silos

1. Have a minimum team of 2 tractor drivers hauling two-wheeled trailers, one man loading in the field (unless automatic loading is possible), one man feeding the cutter blower and two persons spreading and consolidating inside the silo.
2. Put on good loads (25 cwts.) at least and increase to the maximum load if necessary to keep the cutter blower at work.
3. Add a third trailer (and tractor if possible) to the team when haulage time is causing breaks in the work of the cutter blower.
4. Make sure that the man feeding the cutter blower has the opportunity of breaks during the day without stopping the flow of grass into the silo.

The method adopted on the basis of these principles will necessarily vary from farm to farm and also on any one farm will vary from field to field depending on conditions.