WEST OF SCOTLAND AGRICULTURAL COLLEGE

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Cost Studies

Grass Drying in 1950.

by

C.W. Roberts.

Economics Department,
West of Scotland Agricultural College,
6, Blythswood Square,
Glasgow, C.2.

SUMMARY

This Report concerns the operation of five grass drying plants in South-West Scotland in 1950, in their first, second or third year. It follows the general lines of the Report "Grass-drying in 1949". In this summary, 1949 figures are given in brackets for comparison.

Capital costs varied from about £13 to about £30 per ton of rated annual capacity (£11 to £30).

Actual output varied from 22% to 111% (22% to 57%) of this seasonal capacity. Grass was more abundant and the one new plant, the members of which were favourably placed for producing abundant supplies, was able to work almost continuously for the whole season once it was erected.

Fuel costs per ton of dried grass varied from £5.2/- to £7.19/- (£4.11/- to £5.16/-) and from 9% below to 193% above (15% below to 166% above) the nominal requirements for normal moisture content. (These figures are based on slightly higher nominal requirements than were assumed last year.) The higher figures are almost certainly due to the very wet summer and autumn and, at one plant, to the predominance of heavily manured Italian rye grass.

Depreciation of driers and accessory plant and buildings varied from £2. 1/- to £7.16/- (£3.11/- to £9.12/-) per ton; including field and road equipment, but excluding tractors and hired lorries, total depreciation varied from £2. 8/- to £8. 2/- (£4. 3/- to £9.19/-). All these figures are gross, before deducting any Government grants towards capital costs incurred.

Total costs incurred by the grower and the owner of the drier for all stages from cutting the grass to delivering back the product, including a share of farm overhead costs, varied from £16. 2/- to £27.16/- (£16.12/- to £29.4/-) per ton of dried grass. (Average costs of the service provided by the Milk Marketing Board in England and Wales were £17.10/-, ranging from £13.12/- to £20.17/-, against £17.17/- in 1949).

Average yields per acre, counting one acre mown twice as two acres, varied from 14 cwts. to 25¾ cwts. (11¼ cwts. to 22¼ cwts.) Yields per acre as high as 36 cwts. and as low as 6 cwts. were reported from individual fields. A yield of 70 cwts. in all was recorded from 4 cuts on one field.

Approximately 56% of the dried grass was of production ration quality, but about half the farmers failed to achieve this quality with even only a half of their individual crops.

From 93 cuts from individual fields or groups of fields the average estimated output of crude protein per acre was 2.6 cwts. per cut, equivalent to approximately 192 lbs. of protein equivalent.

If the costs of growing the grass are put at £4.10/- per ton (£4.3/-) the total costs of growing and processing the grass may be said to have amounted to £27. 5/- a ton (£27. 1/-).

Prices of materials were generally higher than in 1949.

ACKNOWLEDGEMENTS

Grateful acknowledgement is made of the help and information readily given by the owners and staffs of the grass drying plants referred to.

INTRODUCTION

This Report follows the general plan of Report No. 5 - 1950, "Grass Drying in 1949" and relates chiefly to five plants in South-West Scotland. Four of the plants are covered by both Reports, but the fifth (B in the Tables) is a new co-operative plant, first used in 1950, and takes the place of an estate plant which was unable, for various reasons, to provide information for the second year.

Types of Plant, and Capital Costs

The Table below summarizes the information about organization and total output. Although an output of 4 cwts. per hour has been recorded for an Opperman Mobile, (see, for instance, A.M.M. Rees' Report 1951/1 of Department of Agricultural Economics, Aberystwyth) the estimate of the seasonal capacity of the Plant E Opperman Mobile has been reduced from 300 tons (4 cwts. per hour) to 150 tons (2 cwts. per hour).

Type of Owner	Make of Plant	Year of first use	Estimated capacity in 1500 hrs. (tons)	Actual output 1950 (tons)	Actual output 1949 (tons)	Actual output - 1950 as % of estimated capacity
A Estate	Templewood	1948	300	216	160	72
B Society	Templewood	1950	300	334	-	111
C Society	Templewood	1949	300	257	172	86
D Society	Kennedy & Kemp	1948	300	81*	83*	27
E Farm	Opperman mobile	1949	150	34	33	22

* In addition this Society arranged for the drying of 129 tons (218 tons in 1949) by contract on an I.C.I. drier.

The Equipment

In addition to the equipment described in some detail in the 1949 Report, some further installations were made for 1950 by three of the four plants. The most important of these were a recirculation device on Plant A, which substantially reduced oil consumption; a recirculation hood, heightened walls around the plant, and a sweep to assist the man feeding the conveyor, on Plant C; and, on Plant E an additional rake and an additional greencrop loader, used also for silage making, a shed to house the mobile drier and an electric motor to replace the tractor which drove the fan.

The table sets out the total capital cost of equipment and any special building work required - (£).

	A.	B.	C.	D.	E.
Buildings, foundations and wiring	893	2174	3300	1695	330
Drier, baler, mill, cuber, etc.	2546	5824	4967	3365	1546
Total, fixed equipment	3439	7998	8267	5060	1876
Cutting and collecting equipment, excluding tractors	573	131	345	488	542
Lorries and motor cycle	-	200	630	-	-
Total, field and road equipment	573	331	975	488	542

Expressed in terms of the nominal annual capacity of the driers these total costs, (less appropriate deductions for alternative uses of field and road equipment), are as follows:-

	Per ton of nominal annual capacity				
	A.	B.	C.	D.	E.
	£. s.	£. s.	£. s.	£. s.	£. s.
Fixed equipment	11. 9	26.13	27.11	16.17	12.10
Field and road equipment	1.18	1. 2	3. 5	16	1. 4
Total	13. 7	27.15	30.16	17.13	13.14

The/

The number of farms served

The table shows the number of farmers using the three co-operative plants and illustrates the difficulties of organization facing Plant D.

	B	C	D
Total output (tons)	334	257	210
No. of farmers drying:			
over 50 tons	1	-	-
40 to 49.9 tons	2	-	-
30 to 39.9 "	2	1	-
20 to 29.9 "	1	3	2
10 to 10.9 "	2	6	7
5 to 5.9 "	1	3	4
Under 5 tons	1	8	12
	10	21	25
Output per farmer (tons)	33	12	4
Average haul (miles)	4½	5½	12

Staffing

In general, staffing difficulties were less acute than in 1949. Plant A continued to use the estate reserve of staff; Plant B used throughout the staff of one of the members, a corn merchant and threshing machine proprietor, during the relatively slack season; Plant C used men recruited from the Labour Exchange supervised by employees of a corn merchant; Plant D used the Society's lorry drivers as drivers and engaged other workers from the Labour Exchange; Plant E used a rota of the farm staff and experienced some trouble from diesel poisoning which may have been due to the use of the mobile machine in the somewhat enclosed space of the newly erected open shed. In general, the men welcomed the opportunities of higher weekly earnings which the steady, in some cases long, hours gave. The general plan of work was approximately as in 1949. The new Plant B performed the same service as Plant C with approximately the same equipment.

Cutting and Collecting

Table I at the end of this Report shows the individual costs per ton of cutting, loading and bringing in. The costs include estimates of all the work of cutting and getting the grass to the vicinity of the drier, whether done by the farmer or the staff of the plant. Manual hours used per ton were similar to those used in 1949, and tractor and lorry hours, where known, were slightly less.

The entry for lorry work includes all the costs of running the lorries owned by the plant, including depreciation, together with charges made for hired transport. Overhead charges in respect of all farm labour and farm tractors have been made along the conventional lines agreed by the Conference of Scottish Agricultural Economists.

Total costs, including equipment depreciation at 25% of the written down value, (except trailers, at 12½%), were very similar to those of 1949.

Drying

Table II shows the individual costs per ton of drying and baling or milling or milling and cubing.

Depreciation, charged at 10% of the first cost of buildings and 25% of the written down value of plant, was lower in total for the four plants A, C, D, E, than in 1949 because one more year's depreciation had been written off, and was lower per ton because of the generally increased throughput. Despite a rise in oil prices, Plant A succeeded in lowering fuel costs per ton. This was largely attributable to the recirculation device. (No wilting was performed for this plant, all cutting being by cutlift).

The/

The relatively high oil consumption per ton on Plant B was in part due to continuing operations into the very wet weather of September and October; it was probably due in part also to higher fuel requirements for heavy crops of Italian ryegrass after early potatoes. Some wilting was practised for this Plant. Consumption per ton by Plants C & D were close to the nominal requirements of the make of drier. There is no obvious explanation of the nearly 20% increase of oil consumption at Plant D, beyond the greater humidity of 1950. (In Table II of the 1949 Report the entries 88 and 117 in the last line of columns C & D should be reversed). It appears that the nominal requirements for the Opperman Mobile plant calculated from the makers' brochure set too high a standard for Plant E.

Electricity consumption rose substantially on Plant C when it commenced to cube the product. Cubing also raised the cost of repairs and maintenance since, as on plant B, the renewals of cuber parts alone could cost as much as 12/- a ton. Fuel oil consumed cost, on all plants, more than twice the low costs of solid fuel achieved by another low temperature conveyor plant in the Province. Plant C intended to turn over to the less expensive 200° oil for 1951.

Total Costs

If the cost of producing the grass ready to be mown was, say, £4.10/- per ton of product, the total cost of the processed grass amounted on average to £27.5/-. It might very well be estimated, however, that the cost of much of the grass exceeded £4.10/- per ton of product; for much of the grass used at Plant B was Italian ryegrass which may have cost as much as £8 a ton of product, and even on established swards, as at Plant A, grass costs slightly exceeded £5 per ton on fields sown, manured and well managed for dried grass production.

If the cost of the grass was £5 per ton of product, the net inclusive cost to members of the three co-operative societies, after deducting the appropriate share of the Government grants towards capital expenditure, was approximately £26.0/- a ton.

The Quality of the Product

Regular sampling for analysis was undertaken only from Plants B, C and E. From these plants the proportion of samples containing 15% or more of crude protein was approximately 56% and the number of farms having more than half their samples showing 15% or more was 17 out of 34. Generally, the poorest samples were found early in the season when grass had grown too long; but it is also true to say that individual farms consistently showed high protein contents; the most consistent farm being one where the chief grass crop was Italian ryegrass receiving a liberal basic manuring and 4 cwts. of Nitrochalk before each cut. Some fields with special seeds mixtures also showed up well.

The table shows the distribution of the 110 samples according to their crude protein content.

Crude protein %	% of samples
Below 10	6
10 - 12.45	15
12.5 - 14.95	23
15.0 - 17.45	28
17.5 - 19.95	20
20.0 and over	8
	100

It is probable that this distribution represents also the quality of the product of the farms from which samples were not analysed.

Yields of Crude Protein

There were 93 cuts from fields or groups of fields from which the crude protein content was known and from which yields per acre of dried grass could be estimated with a fair degree of accuracy. If each of these fields, or groups of fields, is given equal importance whatever its size, the average yield/

yield per acre per cut was 18.9 cwts. of dried grass containing 2.80 cwts. (314 lbs.) of crude protein, or approximately 192 lbs. of protein equivalent.

The table shows the numbers of these 93 cuts grouped according to the crude protein content and the weight of crude protein per acre per cut.

No. of cuts of given protein content and yielding given weights of crude protein per acre

Cwts. of crude protein per acre	% Crude Protein						
	Under 10	10 - 12.45	12.5- 14.95	15.0- 17.45	17.5- 19.95	20.0 and over	Total
1 - 1.49	1	1	2	3	4		11
1.5 - 1.99		2	5	7	1		15
2.0 - 2.49		2	3	6	2		13
2.5 - 2.99	2	5	6	5	4	2	24
3.0 - 3.99	3	1	3	4	1	1	13
4.0 - 4.99			4	1	4	1	10
5.0 - 5.99		1			3	1	5
over 6.0					1	1	2
Total	6	12	23	26	20	6	93

At Plant A crude protein % was not determined, but yields from individual fields throughout the season are available and are set out in the table:-

Wt. of dried grass per acre in the whole season

	1949		1950	
	No. of cuts	Total yield per acre (cwts.)	No. of cuts	Total yield per acre (cwts.)
Field 1	5	46.4	5	64.4
2	5	50.7	4	47.7
3	4	50.6	4	52.1
4	not dried		4	70.1
5	4	44.8	dried once only	
Simple Average		48.1		58.6

If these cuts averaged 16.0 % of crude protein, which is likely having regard to the nature of the sward and its management, the yield of crude protein amounted to 7.7 cwts. in 1949 and 9.4 cwts. in 1950.

Figures from Plant C relating to eleven fields which were each cut three times before the persistent rain of the autumn brought the season to a close, are given below. The fields are each given equal weight when averages are calculated.

	1st cut	2nd cut	3rd cut	In the season
Average yield of crude protein, cwts. per acre	2.35	2.57	2.32	7.24
Average % of crude protein	15.2	15.4	15.9	15.5
Highest % of crude protein	19.4	19.3	18.3	19.4
Lowest % of crude protein	9.2	10.7	12.3	9.2
% of cuts containing more than 15% of crude protein	55	64	82	67
Yield per acre per cut of dried grass (cwts)				
(a) in cuts containing more than 15% of crude protein	12.6	13.1	14.2	13.4
(b) in cuts containing less than 15% of crude protein	20.3	25.3	17.0	21.5
Average yield of dried grass per acre (cwts.)	16.1	17.5	14.7	48.3
The quantity containing more than 15% of crude protein (included in the previous line) was, in cwts.	6.8	8.3	11.6	26.8

Had/

Had these fields all been at the disposal of one dairy farmer he would have had, for each acre cropped on these eleven fields, approximately 27 cwts. of this grass as a production ration and a further 21 cwts. of dried grass and super hay; the whole representing a 10 lb. a day winter ration for 3 beasts.

There is substance in the view, expressed by Dixey and Tutton (The Farm Economist Vol. VI, No. 9, 1951) that it is unsound to use the country's scarce resources of metal and fuel and skill on artificially drying low quality grass, and the efforts of many of the members of these plants to secure a high quality product are praiseworthy on that score. It nevertheless remains possible that, having regard to the losses that arise in silage and hay-making, and to the continuing pressure on supplies of winter feed on many of the dairy farms of this province, it was, on balance, profitable for some of these farmers to use the driers even for low protein super-hay. It would almost certainly have been more profitable, instead, to produce good quality dried grass from at least part of their ground, perhaps producing bulky hay or silage on the rest.

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TABLE I

Estimated Costs of Cutting, Collecting and Bringing In: Per Ton

	A	B	C	D	E	Average
	£. s.	£. s.	£. s.	£. s.	£. s.	£. s.
Manual work, including lorry drivers and including cost of transport to work	1. 8	1. 3	1. 5	1.10	1. 7	1. 6
Tractor work	1. -	-. 3	-. 3	-. 4	1. -	-.10
Lorry work	-	1. 9	1.15	2.15	-	1. 4
Repairs and maintenance	-. 5	-. 1	-. 5	-. 6	-.12	-. 6
Depreciation	-. 7	-. 2	-.18	-. 6	-.17	-.10
Management	-	-	-	-.13	-	-. 3
Share of general farm expenses	1. 2	-. 5	-. 9	-. 8	1.19	-.17
TOTAL	4. 2	3. 3	4.15	6. 3	5.15	4.16
Manual hours	10¼	9½	10	11½	11¾	10¾
Tractor hours	5¼	¾	¾	1	5½	2¾
Lorry hours	-	n.a.	n.a.	7¼	-	n.a.
Total output (tons)	216	334	257	210	34	210
Average haul (miles, approx.)	1½	4½	5½	12	¾	-
Average dried weight per lorry load (cwts.)	-	n.a.	14.1	15.5	-	-

TABLE II

Estimated Costs of Drying and Baling or Milling or Milling and Cubing: per ton.

	A	B	C	D	E	Average
	£. s.	£. s.	£. s.	£. s.	£. s.	£. s.
Manual work including supervisor and including cost of transport to work	2.18	3. 7	2. 1	3.19	3.10	3. 3
Tractor work	-	-	-	-	1. 9	-. 6
Fuel oil	5. 2	5.15	5.11	6.15	7.19	6. 4
Electricity	-.10	-.14	-. 9	-.10	-. 7	-.10
Miscellaneous stores	-	-	-. 3	-. 1	-. 3	-. 1
Wire, twine, sacks, tags, etc.	-. 6	-.12	-.12	-. 9	-. 4	-. 9
Repairs, maintenance and small tools	-.11	-.12	-.14	-.10	-	-. 9
Depreciation	2. 1	5. -	5. 4	7.16	6. -	5. 4
Rent, insurance, office and management	-. 1	1.10	2. 9	-.19	-	1. -
Share of farm general expenses	-.11	-	-	-	2.10	-.12
Total	12. -	17.10	17. 4	20.19	22. 1	17.19
Total costs of cutting, collecting, bringing in and processing	16. 2	20.13	21.19	27. 1	27.16	22.15
Manual hours, incl. supervisor	15	23	15½	33¾	27½	23
Tractor hours	-	-	-	-	6	1½
Oil (gallons)	103	119	112	141	152	125
Electricity (units)	62	173	187	88	106	123
Wt. of product per operating hour (cwts.)	4.1	3.4	3.1	2.2	1.4	2.8
" " " " acre mown (cwts.)	14.1	25.7	15.6	21.9	21.1	19.7
" " " % baled	97	32	-	99	100	-
% milled, not cubed	3	1	20	1	-	-
% cubed	-	67	80	-	-	-