Report No: 77

UNIVERSITY OF BRISTOL

Economics Department
(Agricultural Economics)

A STUDY OF GRASSLAND COSTS

in

Cornwall, Devon and Dorset

(1) One Year's Analysis - 1951-52

(2) Six Years' Summary - 1946-52

by

K.G. TYERS, B.Sc., (Agric.)

S.T. MORRIS, M.Sc.,
Provincial Agricultural Economist

1, Courtenay Park,
Newton Abbot,
Devon.

February, 1954

Price:- 1/6d.

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FOREWORD

As a nation the available resources to support a population of some fifty million people at the comparatively high living standards to which we are accustomed are strictly limited, particularly land. In the circumstances, if we are to achieve maximum production on the most economical terms possible we must make our land produce all it can economically.

It is generally accepted that grass is the crop best suited to the English climate and this is particularly true of the Western half of the Country where much of our livestock industry is located. In fact, confining our attention to the Counties of the South West - North and West Dorset, Devon and Cornwall - the position is that these areas have to contend with many factors which make for a high cost farm economy, small farms, steep land, lack of drainage, obsolete buildings, distance from markets, to mention only a few.

In these areas, grass is undoubtedly the one crop where the productive disadvantage is least, in fact, it would be safe to say that the area has the greatest natural advantage for growing grass and looking to the future it can be said that in these Counties the level of farm incomes and farm living standards will depend to a considerable degree on our abilities to exploit this advantage in growing grass.

Are we making the most of our opportunities where this crop, grass is concerned? Some evidence to hand would suggest that we are not making the best economic use of our grassland.

A recent report on the Costs of Milk Production in England and Wales reveals the rather disquieting fact that expenditure on purchased foods per cow in herd was not signicantly less (allowing for the differences in level of yield per cow, it was no less) in the Far West region (Devon and Cornwall) than the average for the whole Country.

The objects of this report will have been attained if it stimulates only a few farmers to question their grassland economy.

S. T. Morris

Provincial Agricultural Economist

C O N T E N T S

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The Agricultural Economics Department of the South West Province, Newton Abbot, wishes to thank the farmers who co-operated freely in supplying the information on which this report is based.

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Any enquiries or comments arising out of this report should be addressed to:- The Provincial Agricultural Economist, 1, Courtenay Park, Newton Abbot, Devon.

INTRODUCTION

Grass is the most widely grown farm crop in this country and when properly managed gives the greatest output per acre of those nutrients which are in shortest supply - namely, proteins. Good grass is the most economical source of protein, and grassland products in the form of good grazing, hay and silage are the cheapest foods for the dairy farmer. Many references are available to show that grass as grazed in the field with the cow "harvesting" its own food is the cheapest method of producing milk. The main sources of protein before the War were cheap imported feeding stuffs but today they are no longer cheap but high in price. The importance of grassland in the national economy thus needs no further emphasis.

An examination of the acreage statistics for the three counties of Cornwall, Devon and Dorset which together comprise the South West Province of the P.A.E.S. shows that grassland accounts for nearly three-quarters of the total area of crops and grass. The importance of grass in the S.W. Province is thus clearly indicated and the South Western Counties are for the most part eminently suited for the production of this crop. The climatic conditions over most of the area are such that the area has an advantage over many of the other areas of the U.K. in having a longer grazing period and thus a shorter hand feeding period - always a costly item in labour etc.

Table 1 Percentage of Total Crop Acreage devoted to Grass in Cornwall, Devon and Dorset
June, 1952

County	Total Acres of Grass*	Per Cent of Total Acres of Crops and Grass*
	Acres	%
Cornwall	443,897	69·7
Devon	858,048	73·4
Dorset	328,425	73·9
All Groups	1,630,370	72·4

* Rough Grazings have been adjusted to their equivalent in normal grazings. 6 acres rough being taken as equivalent to 1 acre of normal pasture (the average for the sample of Milk Costers).

The South West has for a long time been recognised as a dairying and stock rearing area and the data in Table 2 show the average livestock units which are carried on these farms. The unit used is the cow-equivalent unit and all classes of stock have been converted to this one unit for comparative purposes. Pigs and poultry have been omitted from this analysis as they are generally kept off the grassland.

The overall position was that 1·85 acres of grassland in the Province supported on average one cow-equivalent unit in 1952, assuming that the stocking at June 4 was representative of the year.

Cornwall had the densest stocking, with only 1·67 acres per cow-equivalent unit, whereas Dorset had 2·23 acres per unit. Or, put in another way, in Cornwall each acre of grass was able to support just over half a cow-equivalent during the year; in Devon - half a cow-equivalent and in Dorset just under half a cow-equivalent.

Table 2 Grass Area per Livestock Unit. 1952

County	Livestock Units*	Acres of Grass (adj.)	
		Total	Per Livestock Unit
		Acres	Acres
Cornwall	265,237	443,897	1·67
Devon	471,280	858,048	1·82
Dorset	146,986	328,425	2·23
All Groups	883,503	1,630,370	1·85

* Excluding pigs and poultry

What does it cost to produce grass? While no full grassland costings have been carried out on farms in the area a good deal of data is at hand on the cost of grazing on some sixty farms which were included in the National Investigation into the Economics of Milk Production. Although the information was scanty in certain aspects, and in particular the study did not cover the whole field of grassland management, (the data having been collected for the purpose of obtaining "grazing" for the dairy herds in the scheme,) it was nevertheless thought that sufficient was available to give an indication of the costs of producing grass.

The cost data referred to grassland that was grazed throughout the season, hereinafter called "pasture" and also to grassland that gave grazing after a crop of hay, silage and/or dried grass had been removed - hereinafter called "aftermath." All the farmers who participated in the Milk Cost Investigation supplied cost data for their grassland. One or two farmers kept certain of their grass fields exclusively for the dairy cows and on their farms only this grassland was costed. The grassland costed during the year ended September 30, 1952, amounted to 87% of the total grassland on these 59 farms.

The averages given in this report are not intended to represent regional averages because the farms from which they are derived are scattered throughout the three counties and are of widely different types.

GENERAL DESCRIPTION OF THE FARMS

Of the 59 farmers who supplied information, 11 were in Cornwall, 34 in Devon and 14 in Dorset. General data relating to their farms are given in Table 3.

Table 3 General Data of Sample Farms

County	No of Farms	Crops & Grass (adj)		Acres of Grass (adj)	
		Average Per Farm	Range	Total	As % of Total Crops & Grass
		Acres	Acres	Acres	%
Cornwall	11	63.1	20 - 151	501	72.1
Devon	34	89.4	17 - 247	2256	74.3
Dorset	14	121.8	27 - 538	1217	71.4
All Group	59	92.2	17 - 538	3974	73.1

The relative importance of grassland on the sample farms, on an acreage basis, was very similar to that for all farms in the Province. 73.1% of the total area in grass for the sample compared with 72.4% for all farms.

On the sample farms the area devoted to grass in the Cornwall group was 72.1% as compared with 69.7% on all Cornish farms whereas in the Dorset Group the sample farms showed a lower percentage than the average for all Dorset farms (71.4% as compared with 73.9%) - one large farm of 538 acres with only 53.7% of its area under grass considerably influenced this average. Excluding this farm the grass percentage was 79.5%.

The data in Table 3 show that the range in size of the sample farms was from 17 adjusted acres of crops and grass to 538 acres. Nine farms had no tillage at all and ranged in size from 17 to 90 acres. On the remaining fifty farms the percentage of tillage to all crops and grass ranged from 3.5% to 52.6%. It is thus evident that the sample contained widely diverse types of farms from small and medium "all grass" farms to large mixed/arable farms. The management and grassland policy of these farms was likely to have been equally diverse and this factor must be borne in mind when interpreting the results.

The predominance of small to medium sized farms in this investigation is, however, clearly indicated by the distribution of the sizes of the 59 farms given in Table 4. 41 farms had less than 100 adjusted acres of crops and grass.

Table 4 — Range in Size of Sample Farms 1951/52

Adjusted Acres of Crops & Grass	No. of farms			
	Cornwall	Devon	Dorset	Total
Up to 50 acres	5	14	5	24
50 - 100 acres	4	10	3	17
100 - 150 acres	1	1	3	5
150 - 200 acres	1	6	1	8
Over 200 acres	-	3	2	5
All farms	11	34	14	59

The livestock populations on these farms at the commencement of the year was collected. It was assumed that this population was the average for the year and the stocking per 100 adjusted acres of crops and grass was analysed for the main classes of livestock and the results are given in Table 5.

Table 5 — Grass Area Per Livestock Unit. 59 Farms 1951/52

County	Livestock Units*	Acres of Grass (adj)	
		Total	Per Livestock Unit
		acres	acres
Cornwall	309	501	1.62
Devon	1081	2256	2.09
Dorset	530	1217	2.30
All Groups	1920	3974	2.07

* Excluding pigs & poultry

From the figures it is seen that just over 2 acres of crops and grass were required for every livestock (cow-equivalent) unit on the sample farms as compared with a little under 2 acres for the Province (see Table 2).

The importance of grassland in the economics of Milk Production is shown by the figures in Table 6.

Table 6 — Costs of Milk Production 1951/52

Item of Cost	Per Cow	Per Cent
	£ s	%
Grazing	8 10	10.5
Grass Products	9 7	11.5
Other homegrown foods	8 19	11.0
Purchased Foods	20 18	25.8
Total Foods	47 14	58.8
Labour	18 4	22.4
Other Costs	15 6	18.8
Gross Costs	81 4	100.0

The figures above show that grassland in the form of direct grazing and conserved products (hay, silage and dried grass - including their making costs) accounted for 22% of the gross cost of producing milk. This was equal to the total cost of direct labour and only a little below that of purchased foods.

The remainder of this report is devoted to analysing the cost of producing the grass on the sample farms for it is evident that if better use was made of this, the cheapest food, either in situ or properly conserved, then the total cost of producing milk would be lowered.

THE AVERAGE COST OF PRODUCING GRASS

Table 7 Distribution of the Acres Costed of Pasture and of Aftermath on the Sample Farms 1951/52

County	Pasture		Aftermath		Total Acres Costed
	Acres Costed	% Total Costed	Acres Costed	% Total Costed	
	Acres	%	Acres	%	Acres
Cornwall	355	71	146	29	501
Devon	1,240	66	631	34	1,871
Dorset	532	49	560	51	1,092
All Groups	2,127	61	1,337	39	3,464

Nearly two thirds of the total of 3,464 acres of grassland costed was grazed throughout the season and just over one third was cut and conserved and then grazed. The variations within each county are given in Table 7. Dorset had about half of its grassland as pasture and half as aftermath. At the other extreme Cornwall had nearly three quarters as pasture and only just over one quarter was cut for conserving and grazed later. All the grassland on the Cornish sample of farms was costed (cf Tables 3 and 7) whereas the Devon and Dorset samples included a few farms with exclusive cow pasturage. The acres costed (3,464) represented 87% of the total grass on those farms (3,974 acres).

Table 8 Total Costs and Per Acre Costs of Grassland by Method of Utilisation

	Acres Costed	COST	
		Total	Per Acre
		£	£ s d
Grazed only	2,127	12,356	5 16 2
Conserved & Grazed	1,337	10,907*	8 3 2
Total Grassland	3,464	23,263	6 14 4

* Excluding making costs of hay, silage & etc.

The average overall cost of growing the grass was £6 14 4 per acre. The grassland that was cut prior to grazing cost £8 3 2 as compared with £5 16 2 per acre for the pasture grass. The costs are itemized out in Table 9.

Table 9 Cost of Producing Grass on 59 Farms. 1951/52

Per Acre

Items of Cost	Pasture		Aftermath	
	Cost	Per Cent	Cost	Per Cent
	£ s d	%	£ s d.	%
Labour:				
Manual	6 6	5·8	10 2	6·3
Horse	10	0·7	1 2	0·7
Tractor	4 7	3·9	7 9	4·8
Contract	1 5	1·2	1 7	0·9
Total Labour	13 4	11·6	1 0 8	12·7
Purchased Manures	1 4 9	21·4	1 13 5	20·5
F. Y. M.	8 2	6·9	1 12 0	19·6
Rent	1 17 1	31·9	1 16 11	22·6
Miscellaneous Expenses	2	0·1	1	0·1
Overheads:				
Machinery Depreciation	6 7	5·7	7 8	4·7
Hedging & Drainage	16 10	14·5	17 6	10·7
General Expenses	1 3	1·1	1 5	0·8
Cost of Establishing Leys	8 0	6·8	13 6	8·3
Total Cost	5 16 2	100·0	8 3 2	100·0
Acres Costed	2127		1337	

The average cost of pasture in 1951/52 was £5 16 2 per acre. The highest single item was rent, amounting to £1 17 1 per acre and representing nearly 32% of the total cost. Purchased manures averaged £1 4 9 per acre and accounted for 21·4% of the total costs. The cost of hedging and drainage and total labour were the only other items which accounted for more than 10% of the total costs for Pasture.

The average cost per acre for the grassland cut for hay, silage or dried grass (exclusive of all "making costs") was £8 3 2. The highest single item of cost was again rent at £1 16 11 per acre but this only accounted for 22·6% of total costs as compared with 31·9% in the Pasture group. Purchased manures and total labour accounted for a similar proportion of total costs as in the pasture grassland but were considerably higher per acre. The cost of F. Y. M. accounted for nearly 20% of total costs in the aftermath group as compared with only 7% in the pasture group.

ANALYSIS OF MANURING

As already stated the grassland that was cut and conserved as fodder received considerably more attention with regard to manuring than did the pasture fields.

The figures in Table 10 show the average quantities of the various artificial fertilisers, lime and F. Y. M. applied per acre. They show that nearly three times more of the aftermath pasturage had an application of F. Y. M. than did the pasture, 23·4% as com-

pared with 7·9% which shows that South West farmers still dung their hay land. The data in the table do not show the various combinations of Manures that were applied, but they do reveal that, with the exception of lime, artificials were more extensively used on the aftermath than on the pasture.

The above factors help to explain the manuring costs as found in Table 9 (on page 6) although it must be remembered that in Table 9 the averages refer to the total grassland of each group, whereas in Table 10 only those acres actually dressed are included.

All but 10 of the 59 farmers with aftermath grazing put artificials on some or all of the aftermath fields; this compares with 16 farmers who applied no artificials at all to their pastures.

Table 10

Quantities and Costs per Acre of Artificials, Lime and F. Y. M. on Pasture and Aftermath Grassland. 59 Farms. 1951/52

	PASTURE				AFTERMATH			
	Acres Dressed	Dressed as % Total Pasture	Acres Dressed: Rate per Acre	Acres Dressed: Cost per Acre*	Acres Dressed	Dressed as % Total Pasture	Acres Dressed: Rate per Acre	Acres Dressed: Cost per Acre*
	Acres	%	cwts	£	Acres	%	cwts	£
Sulphate of Ammonia	284	13·4	1·19	0·93	237	17·7	1·48	1·22
Nitrate of Soda	5	0·2	1·04	1·65	4	0·3	1·41	2·21
Nitro Chalk	314	14·8	1·99	1·62	189	14·1	2·06	1·72
Basic Slag	155	7·3	6·47	3·06	107	8·0	6·58	2·87
Superphosphate	165	7·8	2·73	1·74	120	9·0	3·28	2·54
Sulphurophosphate	20	0·9	4·10	2·77	-	-	-	-
N.A.Phosphate	8	0·4	5·25	3·61	41	3·1	3·22	1·61
Muriate of Potash	72	3·4	1·51	0·85	37	2·8	1·45	1·04
Compound Manures	288	13·5	2·61	2·59	286	21·4	2·71	2·92
Fish Manures	6	0·3	3·79	4·27	4	0·3	2·55	1·69
Kiln Dust	-	-	-	-	7	0·5	17·14	3·00
Lime	84	3·9	32·64	2·09	29	2·2	26·75	2·11
F. Y. M.	168	7·9	130·92	4·94	313	23·4	168·36	6·76

* Excludes the cost of applying

ANALYSIS OF LABOUR

The data in Table 11 show that one half of the aftermath acres were rolled during the year compared with only one quarter of the pasture acreage, the comparable figures for harrowing were 44% and 25% respectively. These figures again bear out the statement made earlier that grassland which was cut received more attention than pasture grass. It would appear from this table that artificials were applied over a similar proportion of both pasture and aftermath - 85% and 83% respectively - but it must be remembered that the acreage in this instance is the total acreage of the grass on the farms where artificials had been applied and not the actual acreages over which they were applied.

Table 11

Acreage Details of Various Operations on Grassland
59 Farms. 1951/52

Operation	PASTURE		AFTERMATH	
	Acres	% Pasture	Acres	% Aftermath
Rolling	525¼	24·7	677	50·7
Harrowing	543¼	25·5	589¼	44·1
Carting & Spreading Lime	84	3·9	29	2·2
Carting & Spreading F. Y. M.	168	7·9	313	23·4
Carting & Spreading Artificials*	1803	84·8	1109	83·0

* Refers to total acres of grass on farms where artificials were applied.

The average costs per 100 acres of grass for carrying out various operations are given in Table 12.

Table 12

The Average Cost of Carrying Out Various Operations
Per 100 Acres. 59 Farms. 1951/52

Operation	PASTURE			AFTERMATH		
	Manual*	Power	Total	Manual*	Power	Total
	£ s	£ s	£ s	£ s	£ s	£ s
Rolling	10 4	16 7	26 11	9 19	14 15	24 14
Harrowing	8 11	13 5	21 16	6 12	9 17	16 9
Carting & Spreading F.Y.M.	187 11	84 6	271 17	164 15	103 17	268 12
Carting & Spreading Lime	78 0	2 3	80 3	52 16	16	53 12

* Includes Contract

The data show that carting and spreading Farm Yard Manure was the highest single item in the cost of labour for both the pasture and aftermath groups. Carting and spreading artificials, weed cutting etc. have been omitted from Table 12 since the exact acreage for each operation was not collected.

The difference in cost of carrying out the same operation in the two groups is rather surprising. It is probably interrelated with the factors of accessibility and topography. One usually finds that hayfields are fairly near to the farm buildings or at least easily accessible and the costs include the time taken to get to the field and back as well as the time to carry out the job. Fields which are selected for cutting also tend to be those which are more level and it is reasonable to expect that some of the pasture fields are not cut because of the difficulty of getting the mower over the ground either because of the steepness or through roughness etc. Both these factors would naturally increase cultivation costs.

The average hours per acre for the manual, horse and tractor labour are set out in Table 13. Contract labour has been omitted as no hours were available. The average was arrived at by dividing the total hours of all work done on the grassland (excluding hedging and drainage) by the total area of the grassland in the investigation. The total area, of course, included some grassland on which no labour had been spent during the year.

Table 13

Average Hours per Acre on Pasture and Aftermath. 1951/52

Type of Labour	Pasture	Aftermath
	Hours per Acre	Hours per Acre
Manual	2·5	3·9
Horse	0·6	1·0
Tractor	1·0	1·7

ESTABLISHING OF LEYS

In 1951/52 7·1% of the acres costed were newly established leys. The acres established together with the number of farms and other relevant data are given in Table 14.

The data in Table 14 show that 180¼ or 73·5% of First Year Leys were established with a nurse crop and that a great proportion of the total were grazed in their first year rather than cut and conserved for winter fodder.

Twentyfive farmers representing 42% of the sample utilized first year leys during 1951/52. Sixteen farmers grazed them and eleven farmers cut them in the first year and this included two farmers who established leys for both grazing and cutting.

Of the total of 25 farmers 17 sowed all their seed under a nurse crop, four seeded out directly whilst a further four farmers adopted both systems.

Table 14 Acres of First Year Leys, their Method of Establishment and other Data

First Year Ley	Pasture	Aftermath	All Grassland
	Acres $132\frac{3}{4}$	Acres $112\frac{1}{2}$	Acres $245\frac{1}{4}$
Established:-(a) under a nurse crop	$74\frac{3}{4}$	$105\frac{1}{2}$	$180\frac{1}{4}$
(b) without a nurse crop	58	7	65
First Year Leys as % of Total Grass in each Group	% 6·2	% 8·4	% 7·1
Number of Farms with First Year Leys	No. 16	No. 11	No. 25
Total Number of Farms	59	58	59

Table 15 Cost of Establishing Leys and their Utilisation 59 Farms. 1951/52

	Method of Sowing	
	Undersown	Direct
Acres Established	$180\frac{1}{4}$	65
Cost per Acre	£5 6 3	£10 13 6
% Grazed in First Year	41·5%	89·2%
% Cut in First Year	58·5%	10·8%

More than one half (i.e. $105\frac{1}{2}$ acres or 58·5%) of the leys established under a nurse crop were cut in their first year as compared with only 7 acres (10·8%) of those seeded out directly. It must be remembered that the undersown leys were in effect one year old when cutting occurred as compared with only a month or two in the case of those directly seeded and this longer period in which to get established would enable the undersown grass to be cut with safety whereas the directly seeded grass would tend to be uprooted in the cutting process.

The average cost of the direct seeding method was £10 13 6 per acre as compared with £5 6 3 for that which was established under a nurse crop. In the case of the directly seeded leys the cost related to heavier cultivations such as ploughing and working down the seedbed - the whole of these costs being charged to the establishment whereas in the undersown group the cost of ploughing and working down the seed bed have been charged to the cereal nurse crop - due to the difficulty of determining the correct allocation to each of the joint products of the land.

It is appreciated that the cost of establishing the leys under a nurse crop is not solely the total of seed and sowing. Both the cereal crop and the grass seeds benefit from the cultivations and the manures which are applied before the cereal is sown; again the presence of grass in the stubble may necessitate extra work at harvest time or a reduced yield of corn etc., but these items are impossible to assess and have, therefore, been omitted from the costings.

THE COST OF GRAZING

The cost of grazing for the Milk Cost Investigation was a composite item being the cost of grass fields that were grazed throughout the season and a share of the cost of upkeep of fields that were grazed after being "laid up" for grass conservation products. In the former case all costs were chareable to grazing and in the latter only a proportion - usually one half or one third - depending on the utilisation of the total crop. This composite grazing is referred to as "pasturage" in the following paragraphs.

The cost of "pasturage" on the 59 farms in 1951/52 averaged £6 6 4 per acre; this average was obtained by adding the cost of pasture to a proportion of the cost of the aftermath grassland (the proportion being ascertained by the farmer in each instance) and dividing this total cost by the acres of pasture together with the same proportion of the acres of the aftermath. The adjusted acreage of the "pasturage" was 2625¼ acres.

THE OUTPUT FROM THE GRASSLAND

Although no direct measurement of the quantity or quality of the output of the grassland was made it was possible indirectly to assess the contribution that the grassland made to the total food intake of the dairy cows and also to assess the number of cow-equivalent grazing units produced from the grass.

The lack of data with regard to output from each field prevented a true measurement being made of the success or otherwise of various management factors such as cultivations, manuring, seed mixtures etc.

The contribution to the cows' total food intake which was provided by the grass that was grazed "in situ" was calculated on the basis of starch equivalents. The total hundredweights of S.E. required for Maintenance and Production were ascertained (the liveweight of the cow was assumed to be the same at both the beginning and end of the year - no allowance having been made for conversion of Starch Equivalents into body tissues) together with the hundredweights of S.E. obtained from the hand fed foods. The difference between total requirements of S.E. and that provided by the hand fed foods (including kale grazed etc.) was assumed to have come from the grazing. A serious drawback to this method of calculating the output from the grassland rests on the assumption that the quantities of the hand fed foods were accurate, - in other words this "balance" figure includes any inefficiences in hand feeding or errors in estimation.

The trend in recent years whereby crops such as kale have been "harvested" direct by the cow (as opposed to the more traditional method of cutting and carting) has added to the difficulty of ascertaining the amounts the cows have consumed. Any error in estimating the weights of these bulk foods will falsify the output calculated for the grassland.

The dangers in estimating the output of the grassland by this method also include the effect of every difference between calculated food requirements and actual consumption and also between actual composition of the feeding stuffs and the "standards" laid down in the tables in "Rations for Livestock."

The distribution of the estimated output utilized from the cow pasturage is given in Table 16.

Table 16 Distribution of Estimated Utilized Output from Cow Pasturage*. 59 Farms. 1951/52

Starch Equivalents (cwts. per acre)	Number of Farms
Under 5	3
5 - 8	8
8 - 11	11
11 - 14	13
14 - 17	8
17 - 20	8
20 - 23	1
Over 23	7
All Groups	59

* The cow pasturage referred to in the above Table is the proportion of the total pasturage that has been allocated to the cows according to the number of cow-equivalent grazing units on it.

The average output of grazing from the cow pasturage was 12.61 cwts of S.E. per acre and ranged from just below 2 cwts to just over 33 cwts.

An analysis of the output of S.E. per acre of pasturage by cow grazing weeks per acre per annum is given in Table 17.

The general trend was an increase in the output of S.E. per acre of pasturage as the intensity of stocking per acre increased while the cost per cwt. of S.E. decreased. The rather high cost per cwt. of S.E. in the "over 45 cow grazing weeks" group was due to the fact that farmers in this group dunged a higher proportion of their pasture than did those in the other groups. The high cost of dunging grassland has already been pointed out.

Table 17 The Cost and Output of Starch Equivalent from Pasturage 1951/2

Cow Grazing Weeks Per Acre Per Year	S. E. Per Acre	Cost per Cwt. S.E.
	Cwts	s d
Under 20	8·18	12 1
20 - 25	10·98	9 11
25 - 30	9·32	11 1
30 - 35	14·46	10 4
35 - 40	17·69	7 2
40 - 45	18·26	8 9
Over 45	20·87	11 5
All Groups	12·61	10 4

The second method of calculating the output of the grassland was based on cow-equivalents grazing weeks. This measurement gave an indication of the density of stocking on the farms. It is realised that a grazing week in, say, May, is an entirely different thing from a grazing week in the middle of December but for this report no weighting has been carried out to compensate for this.

The total number of cow-equivalent grazing weeks on the adjusted acreage of "pasturage" during 1951/52 was 78,242. The average cost per cow grazing week amounted to 4/3d and the cow-equivalent grazing weeks per acre of pasturage averaged 29·8.

Costs per cow grazing week ranged from 1/8 to 11/5 both the extremes being on small farms with under 10 cows each. The range in cow-equivalent weeks per acre of pasturage was from 12·8 to 63·2 which means that one acre of the grassland gave only 13 weeks' grazing for one cow during the whole year whilst at the other extreme one acre provided sufficient grazing for more than one cow for a full year. It is obvious that the amount of grazing required for dairy cows is inter-related with hand-feeding. Hand-feeding is mainly confined to the 6 winter months so it is clear that there are many pastures that are not producing nearly enough grass during the other six months.

An analysis has been made according to the number of cow grazing weeks that were obtained off the pasturage and the data are set out in Table 18.

Thō data show that whereas the cost per acre of pasturage was 2½ times more on those farms with over 45 cow-equivalent grazing weeks per acre as compared with those with under 20 cow-equivalent grazing weeks yet the cost per cow grazing week at 4/4d was 2/9½d per acre less.

Table 18

Analysis of Cow Grazing Weeks per Acre of Pasturage
59 Farms. 1951/52

Cow Grazing Weeks Per Acre of Pasturage	No. of Farms	Cost per Acre of Pasturage	Cost per Cow Grazing Week
		£ s d	£ s d
Under 20	8	4 14 9	7 1½
20 - 25	6	5 6 11	5 7
25 - 30	13	4 17 7	3 9
30 - 35	15	7 7 9	4 6
35 - 40	6	6 0 7	3 1½
40 - 45	4	7 2 3	4 1¼
Over 45	7	11 18 10	4 4
All Farms	59	6 6 4	4 3

Whilst the above figures are by no means conclusive they do at least show that improvements in grassland management (by an increase in the use of fertilisers and cultivation methods, etc.) give greatly increased output as measured in cow grazing equivalents. Although the cost per acre of pasturage is higher the increased output is of even greater extent thus making the unit cost of grazing lower.

In Tables 19a and 19b the farms have been grouped according to the number of cow grazing weeks per acre of pasturage and then the costs per acre of pasture and of aftermath have been given separately for these groups.

In both Tables it is clear that those farmers who obtained a higher output from their total grassland generally applied heavier dressings of manure and also spent more in labour, etc. This increase in costs was less than the increase in output and showed a net saving in the unit cost of grazing.

Table 19a

Cost per Acre of Pasture by Cow Grazing Weeks
59 Farms. 1951/52

Item	Cow Grazing Weeks Per Acre of Pasturage Per Year							All Groups
	Under 20	20-25	25-30	30-35	35-40	40-45	Over 45	
	£	£	£	£	£	£	£	£
Labour	0·53	0·19	0·52	0·66	0·37	0·88	2·29	0·67
Manures & F.Y.M.	1·04	0·45	0·81	2·27	1·17	2·17	5·48	1·65
Rent	1·52	2·58	1·70	1·92	1·96	2·09	2·43	1·85
Miscellaneous Costs	-	-	0·02	-	-	-	-	0·01
Overheads	1·17	1·65	0·91	1·47	0·98	1·20	1·84	1·23
Establishment of Leys	0·16	-	0·56	0·44	-	0·87	0·65	0·40
Total Cost Per Acre	4·42	4·87	4·52	6·76	4·48	7·21	12·69	5·81

Table 19b

Cost per Acre of Aftermath by Cow Grazing Weeks
59 Farms. 1951/52

Item	Cow Grazing Weeks Per Acre of Pasturage Per Year							All Groups
	Under 20	20-25	25-30	30-35	35-40	40-45	Over 45	
	£	£	£	£	£	£	£	£
Labour	0·83	0·51	0·84	1·35	1·01	0·60	1·48	1·03
Manures & F. Y. M.	2·61	2·10	2·71	4·02	4·15	2·12	4·10	3·27
Rent	1·69	2·60	1·51	1·83	2·28	2·00	1·82	1·84
Miscellaneous Costs	-	-	-	0·01	-	-	-	-
Overheads	1·40	1·48	1·05	1·48	1·56	1·24	1·30	1·35
Establishment of Leys	1·14	0·28	0·20	0·92	0·31	0·36	1·21	0·67
Total Cost Per Acre	7·67	6·97	6·31	9·61	9·31	6·32	9·91	8·16

6 YEAR COMPARISON OF GRASSLAND COSTS - 1946/47 to 1951/52

The annual cost of producing grass for the 6 years from 1946/47 to 1951/52 are given in Table 20. The grassland has been split up into pasture and aftermath as in the first section of this Report. The method of costing has been similar throughout the six year period except that the information in the earlier years was collected only once a year (during the July visit) whereas in the two last years it was collected quarterly. Also during the two last years of the costings each field was costed separately as compared with the overall grassland costings collected previously. The main significance of this method of collecting the data was that less reliance had to be put on memory over a relatively long period of one year, and the field by field treatment lessened the likelihood of some information being omitted.

During the six years with which this section of the report is concerned certain changes were made with regard to prices paid for labour, fertilizers, seed etc. The most important of these changes were as follows:-

(1) Labour

The minimum statutory wage rates for adult male workers in agriculture were as follows:-

Date of Change	Weekly Rate £ s d	Index
14th July, 1946	4 0 0	100
31st August, 1947	4 10 0	112
13th March, 1949	4 14 0	117
21st November, 1950	5 0 0	125
22nd October, 1951	5 8 0	135
18th August, 1952	5 13 0	141

This shows that labour costs rose by nearly one half over the 6 year period.

Table 20

Annual Cost of Grassland, Labour Analysis and Cost per Cow Grazing Week 1947 - 1952

PER ACRE

	PASTURE						AFTERMATH*					
	1946/7	1947/8	1948/9	1949/50	1950/1	1951/2	1946/7	1947/8	1948/9	1949/50	1950/1	1951/2
	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d
Labour:-												
Manual	5 5	7 2	7 11	8 4	8 0	6 6	11 4	12 1	13 5	11 8	11 7	10 2
Horse	1 0	1 0	10	1 0	1 1	10	2 3	1 6	1 6	1 2	1 4	1 2
Tractor	1 8	2 2	3 0	5 1	3 11	4 7	3 6	4 7	4 11	7 2	7 0	7 9
Contract	4	1 2	4	1 5	10	1 5	5	5	1 2	1 9	8	1 7
Total Labour	8 5	11 6	12 1	15 10	13 10	13 4	17 6	18 7	1 1 0	1 1 9	1 0 7	1 0 8
Purchased Manures	8 11	13 10	15 0	1 0 2	18 11	1 4 9	17 2	16 0	1 6 6	1 10 11	1 13 9	1 13 5
F. Y. M.	6 11	7 3	6 0	5 9	6 2	8 2	1 4 6	1 2 1	17 5	15 8	14 6	1 12 0
Rent	1 16 5	1 13 7	1 13 4	1 15 0	1 16 8	1 17 1	1 15 3	1 15 5	1 12 7	1 13 8	1 17 4	1 16 11
Overheads:-												
Depreciation	3 11	4 11	5 1	5 0	5 3	6 7	4 2	5 6	5 3	5 3	5 11	7 8
Hedging & Drainage	11 3	15 5	15 3	16 4	15 8	16 10	12 11	15 7	16 3	17 4	16 7	17 6
General Expenses	2 3	2 9	2 7	1 1	1 3	1 5	3 1	3 5	5 3	1 7	1 8	1 6
Share of Cost of Establishing Leys	2 2	2 10	4 3	7 9	9 0	8 0	16 5	10 11	9 11	11 0	15 0	13 6
TOTAL	4 0 3	4 12 1	4 13 7	5 6 11	5 6 9	5 16 2	6 11 0	6 7 6	6 14 2	6 17 2	7 5 4	8 3 2
Labour Analysis:- (Excluding hedging etc.)	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours
Manual	3·0	3·2	3·2	3·4	3·1	2·5	5·9	5·4	5·5	4·7	4·5	3·9
Horse	1·3	1·0	0·8	0·8	0·8	0·6	3·0	1·6	1·5	0·9	1·0	1·0
Tractor	0·5	0·8	1·2	1·3	0·9	1·0	1·2	1·6	1·8	1·8	1·7	1·7
Cost per Cow Grazing Week (all grazing)	s d	s d	s d	s d	s d	s d	s d	s d	s d	s d	s d	s d
	2 10	3 3	3 4	3 7	4 0	4 3	-	-	-	-	-	-

* The average annual cost per acre in growing the grass for Hay, Silage and/or Dried Grass, but excluding all "making costs."

(2) Fertilizers

The subsidy on fertilizers which had been operating since the war days to keep down the price of fertilizers to the farmers was removed in two stages. The first half was removed from 1st July 1950 and the second half a year later. Since most of the farmers purchase their fertilizers for applying to grassland in the spring months it is unlikely that the effect of the withdrawal of the first part of the subsidy would be apparent in the grassland costs until 1950/51 - and the second part in the 1951/52 costings.

After the withdrawal of the fertilizer subsidy, however, there was a more complicated scheme to subsidise the use of phosphatic fertilizers and this scheme was subsequently extended to cover nitrogeous and compound fertilizers. This complicated scheme partially offset the increased costs of manures on grassland but its effect on increasing the use of the manures is difficult to measure.

There is one important factor which is outside human control but which will have its effect on the production of grass and that is, of course, the weather. The presence or absence of moisture will considerably influence the effect of the manures on the grass and will also determine the cultivations that will have to be carried out (e.g. rolling, harrowing etc.) but as this report is less concerned with the output of the grass than with the costings a detailed analysis of the weather conditions would be out of place. Its importance should not be overlooked, nevertheless, since it indirectly affects the costs in that the number of times an operation has to be carried out will be almost entirely governed by the climatic conditions.

The data in Table 20 indicate that the actual manual labour expended on the pasture grass and the grass cut for hay, etc., over the 6 year period has gradually declined particularly in the two last years. Part of this decline may have been due to the increase in the cost of manual labour which as we have seen rose by 41% over the period but some at least has been brought about by an increase in mechanisation. In the pasture grass, for instance, the manual labour in 1946/47 was 3·0 hours per acre - this was carried out in conjunction with 1·3 hours of horse labour and 0·5 hours of tractor labour. The comparable figures for 1951/52 were 2·5, 0·6 and 1·0 hours respectively. In other words although manual labour had declined by half an hour per acre the tractor hours had risen from $\frac{1}{2}$ to 1 and the horse hours had fallen from 1·3 to 0·6 per acre.

In the grassland that was cut prior to being grazed the same trend in mechanisation is apparent - the horse hours being reduced from 3 to 1 per acre and the tractor hours increasing from 1·2 to 1·7 per acre.

Whilst at first sight it would appear that less operations were carried out on grassland in 1951/52 than in 1946/47, an examination of the data suggests that the increase in mechanisation would allow for the same if not more work to be done in a shorter period of time.

Reference to Table 20 shows that the cost per acre of purchased manures on the pasture grass was nearly three times higher in 1951/52 than it was in 1946/47. During the first four years of the period the price of manures was fairly stable and the withdrawal of the fertilizer subsidy only increased the costs from 1950/51 onwards. The steady rise from 8/11d to £1 0 2 per acre over the first four years clearly indicates that farmers were increasing the overall rate of fertilizer application on their grassland. The apparent

effect of the removal of the subsidy was to reduce the expenditure on purchased manures from £1 0 2 to 18/11d. per acre. Since prices rose during 1950/51 the actual decrease in fertilizer application must have been considerable. The re-introduction of a subsidy scheme to the farmer (discussed earlier in this section) tended to offset this in the last year of the costings when the cost per acre rose to £1 4 9.

The grassland that was cut prior to being grazed did not show such fluctuations in the cost per acre of purchased manures as did the pasture grass. In the first year the cost of purchased manures per acre was already nearly twice that of pasture. Since prices were stable it can be seen that there was a slight reduction in fertilizer application in 1947/48 or else a cheaper type of fertilizer was used. During 1948/49 the rate of fertilizer application was increased from 16/- per acre to £1 6 6 and remained approximately at that level. The increase in cost per acre during 1950/51 of nearly 3/-d was no doubt a result of the withdrawal of the first part of the subsidy - so that although there was a decrease in the use of fertilizers it was not so great as on the pasture grass; most farmers apparently deciding to put their limited supplies on hay or silage land rather than grazing. The rather surprising difference, however, occurred in 1951/52 - we have already seen that on pasture grass the cost of manures rose from 18/11d to £1 4 9 per acre - on the grass that was cut for conserving, however, the cost was slightly lower than the previous year. Viz. £1 13 5 as compared with £1 13 9. As the effect of the withdrawal of the second part of the subsidy increased prices in 1951/52 it is thus clear that a not inconsiderable decline in fertilizer application must have taken place.

In summing up, therefore, it would appear that over the six years 1946/47 to 1951/52 the trend of costs of producing grass have been upward in each year as in nearly all other commodities. Fertilizer applications on the sample farms tended to fall off slightly when the Government subsidy was withdrawn - more so on the grassland that was cut for conserving than on the pasture grass.

Mechanisation enabled the farmers to carry out their cultivations on the grassland at about the same cost in manual labour despite a considerable increase in the wage rates for agricultural workers. The cost of tractor and contract labour doubled itself over the six year period whilst the cost per acre of tractor labour showed a decrease. Part of the increase in the cost of tractor labour was due to changes in the rate per hour over the six year period. A better picture of labour changes is reflected in the analysis of hours per acre rather than costs per acre.

SUMMARY

During 1951/52 the average output of grazing from the cow pasturage on some 60 farms in the South West Province was equivalent to about 12½ cwts of Starch Equivalent (S.E.) per acre. The sample farms are those which participated in the National Investigation into the Economics of Milk Production and the general range on these farms was from about 6 cwt to 25 cwt S.E. per acre. It must be remembered that this measurement was a "balance" figure and included any inefficiencies in hand feeding and/or errors in estimation.

An analysis of the data showed that there was a correlation between the output of the grazing and the intensity of stocking. Those farms with a greater number of cow grazing weeks per year on their pasture (i.e. more intensively stocked) showed a higher output of S.E. per acre and this higher output was the result of either better grassland management (by a more liberal use of fertilisers and by the use of the roller and harrows etc.), or a better utilisation of the existing grass, or a combination of both, since our unit of measurement was the effective utilisation of the grassland and not the true measured output. However, the greater output of S.E. per acre on the more intensively stocked pastures tended to reduce the cost per cwt of S.E. as compared with the cost on the lightly stocked grassland.

The analyses also showed a correlation between the cost per acre of pasturage and the intensity of stocking. The higher cost per acre found on the more intensively grazed pastures supports the contention mentioned above that good management was an important factor in increasing the intensity of stocking. The higher cost of producing grass for grazing on the more heavily stocked pastures was proportionately less than the increase in output and the cost per grazing week was thus lower than that on the less intensively grazed farms.

From the above observations it would appear that there was ample scope on many farms for an increase in the output of food (i.e. grazing) from the grassland with a net saving of total food costs.

APPENDIX 1

Costing Method 1951/52

Labour Charges

Manual	Adult Male	2/8d per hour
	Adult Female	1/11d per hour
	Youths	Appropriate rate to age
Horse		1/3d per hour

Equipment Charges

Tractors	Light	4/2d per hour
	Medium	4/6d per hour
	Heavy	4/10d per hour
	Tracklaying	6/-d per hour

Machinery Depreciation

An allowance to cover implement depreciation and repairs was obtained by making a charge of 20% of the valuation of each group of implements used in the production of grass. The implements were grouped into:-

1. General Implements (e.g. tractor/trailers, carts, rollers, manure distributors etc.)
2. Implements used specifically for grassland work (e.g. grass harrows, grass seed distributors etc.)

The charges arrived at were then divided by the appropriate acreage so as to arrive at a cost per acre for each group and these costs have been applied to the grassland.

Share of Overheads

A share of the general overhead expenses of the farm (e.g. office expenses, car expenses, farm insurances, etc.) has been charged at the ratio of the manual labour involved in producing the grass to the total manual labour on the farm.

Share of the Cost of Establishing Leys

The cost of sowing seeds, harrowing-in and rolling the seeds and the cost of the seeds themselves together with any manures applied specifically for the benefit of the ley, have been charged to the grassland under the appropriate headings of Pasture or Aftermath.

Share to Grazing

A proportion of the costs of harrowing and rolling grassland which was cut and conserved and also the cost of dung and artificials, rent, field upkeep, establishment, etc., has been charged to aftermath grazing - the proportion taken being estimated by the farmer in each instance.

Manurial Residues

No manurial residues from previous years have been charged to the pasture or aftermath grassland nor have any residues been carried forward to the succeeding years due to the difficulty of collecting data on the numerous small fields so common to farms in the South West.

APPENDIX 2

Costing Methods. 1946/47 to 1951/52

Labour Charges

	Rates per Hour					
	1946/47	1947/48	1948/49	1949/50	1950/51	1951/52
Manual:-						
Adult Male	1/11*	2/3	2/6	2/6	2/7	2/8
Adult Female	1/4	1/6	1/9	1/9	1/10	1/11
Youths	Appropriate rate to age					
Horse	9d	1/-	1/-	1/3	1/3	1/3
Equipment Charges:-						
Tractors. Light	3/-	2/9	2/6	3/8	3/8	4/2
Medium	3/-	2/9	2/9	4/-	4/-	4/6
Heavy	3/-	2/9	3/-	4/4	4/4	4/10

* 1946/47 Adult Male Workers charged at actual rate on each farm - not overall rates on all farms. The average was 1/11d.

Machinery Depreciation, Overheads, etc.

Similar accounting methods used throughout the six year period.

Manures

Artificial manures and Lime charged at net cost to the farmer. Farmyard Manure charged at 10/- per ton on all farms throughout the six year period.