Turnips
Cost of
production
research

THE WEST OF SCOTLAND AGRICULTURAL COLLEGE

ECONOMICS DEPARTMENT

TURNIP CROP COSTINGS, 1953

AVERAGES FOR 31 CROPS

By

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CROP COSTINGS: TURNIPS 1953.

Averages for 31 Crops

Foreword

In 1939 very nearly 40,000 acres of turnips were grown in the South West of Scotland. During the war increased ploughland acreages and the need for greater self-sufficiency caused a very rapid increase in the acreage planted so that by 1944 the total had reached about 55,000 acres. With a return to peace time conditions the acreage declined again and for the past few years it has been slightly above the 1939 figure at around 42,000 acres.

In order to obtain information on the yields, costs and labour requirements of this important crop - partly for use in the milk-costing investigation - a sample of 32 cost records was collected for the 1953 crop. One of these proved unsuitable for averaging so that only 31 records are reported on here.

The records were collected from a wide area but the greatest proportion of them came from the two counties of Lanarkshire and Ayrshire, each of which supplied 10 records.

The farming year of 1953 was a favourable one as far as weather was concerned which accounts for the high proportion of good yields in this sample.

Acknowledgment is made, with thanks, of the assistance given by the co-operating farmers in the costing investigation.

Summary

1. The average yield of turnips, over the 169 costed acres, and based on the estimated yield for each crop, was 27 tons per acre. This yield is above average. For Scotland as a whole, for example, the average yield for 1953 was 18.8 tons and for the ten years 1943-52 was 17.1 tons per acre.

2. The average cost per ton was £2.3.0. This includes an estimated charge for overhead expenses of 14s.8d. per ton.

3. The average cost per acre was £58.6.0. This cost includes an estimated charge for overhead expenses of £19.18.0. per acre.

4. On the average acre it took 98 man hours to handle the crop from the preliminary ploughing until the turnips were stored, shawed, in the pit or the steading.

Costing Method and Charges

Method - The costing figures were obtained, not by full farm costing but by "enterprise" costing. Thus the items included are partly actual costs based on purchase price and partly estimated costs. The former, that is actual costs incurred on each crop, include purchased seeds, manures and materials. Estimated cost items include the rates used per hour of tractor and of horse work. One other estimate is the rate charged for work done on the crop by the farmer or members of his family. This item is covered by means of the rates per hour given overleaf.

The/

The cost statement, in Table I down to and including Cost - Not Adjusted for Manurial, Etc. Residues, takes into account - at actual purchase price or estimated cost - all current expenditure and outlays on the crop costed.

Dung applied is taken at estimated value. All fertilisers are at net purchase price i.e. after deducting subsidies. At this stage, manurial residues are left out of account. The cost of labour and power in applying fertilisers to the crop is included in the section "Crop in Ground".

All the sections which relate to "Work" include the cost of man, horse and tractor work and also of any contract work, or casual labour. All work done by family labour or by the farmer and his wife has been charged.

Purchased seeds were charged at cost price.

All "Materials" and other expenses were entered at actual cost, for example, dusts; cost of straw for pits was estimated.

The rent charge is based on the agreed rental value of the field costed.

The quoted figure for "Cost - Not adjusted for Manurial, etc. Residues", excludes all manurial and other residues from previous, and to future, crops, and also excludes any estimated charge for "overheads".

The calculation of manurial residues "from previous crops" and "to following crops" was based on the Department of Agriculture for Scotland's Advisory Leaflet, No. 24, "Residual Values of Fertilisers and Feeding Stuffs".

The item included as "Turf value" among the residues from previous crops represents a one-year share of the original sow-out cost carried forward against the crop taken out of lea.

The estimated cost of applying dung in the rotation was written off over the same period as the cost of the dung itself and this item appears as "Dung application work".

The placing of an appropriate share of "farm general expenses" ("overhead" expenses) against each costed crop is a matter of great difficulty as in all cases neither the complete financial account for the farm nor information as to the sharing of overheads between the farming branches is available. The "overhead" figure which has been applied is based on a general average obtained from a sample of financial accounts of Scottish farms, and this is applied to the crop costings in proportion to the labour cost, the number of tractor hours, and the acreage used by the crop. The result of this is to give an "overhead" charge based on a national average instead of on the figures for each individual farm. As both the rate of "overhead" and the method by which it is applied are debatable, the main cost statements have been prepared to show the position before making any charge for "overheads", and also after calculations made on the above lines are included.

Charges - A summary of these is as follows:-

The rates used for labour throughout the costing were:-

Hired workers at actual hourly rate paid, plus about 2d. per hour to allow for holiday time, sick time, etc., over the year.

Family labour at rates approximately equivalent to those for similar hired labour. Examples of hourly rates are:-

	Before Sept. 1953.	After Sept. 1953.		Before Sept. 1953.	After Sept. 1953.
Farmer	3/-	3/2	Wife	2/3	2/5
Sons (over 20)	3/-	3/2	Daughters (over 21)	2/3	2/5
Sons (15 - 17)	1/6	1/7	Daughters (15 - 17)	1/6	1/7

Horse and Tractor Work were charged at hourly rates of:-

Horse work (excluding man)	1/6
Wheeled tractor (excluding man)	4/-
Tracklaying tractor (excluding man)	5/9

The rates used for "overheads" in the 1953 costing year were:-

(a) 19/3 for each acre costed.

(b) 7/- for each £ of farm labour used on the crop.

(c) 7/- for "each tractor-equivalent" hour, that is, the tractor hours plus one-quarter of the horse hours worked on the crop.

These three charges, added together, give the total of "Overheads".

By means of these "Overheads", estimated charges are brought into the cost for the following (and other) items:-

(i) A share of the farm bill for wages, fuel, light and power, and for tractor depreciation and repairs which cannot be allocated to any particular crop or department.

(ii) A share of car running expenses and depreciation.

(iii) A share of miscellaneous farm expenses.

(iv) A share of repairs to buildings, fences and drains.

(v) Shares of implement repairs, rates, insurance and depreciation on tenants fixtures and normal farm implements.

General Averages

The table overleaf gives the average yield, and details of the cost structure and average cost per acre and per ton averaged over the 31 records. It is not the cost of one typical crop. It covers all operations from preliminary cultivations until the turnips were in the pit or in the steading.

The item "Work - Summer" relates to all work connected with thinning and inter-drill cultivations and, in a few cases, to dusting for weed and pest control.

TABLE I

Turnip Crop of 1953. Average Costs Per Acre & Per Ton

31 Crops

Acreage of fields	1 - 14 acres
Total Acreage Costed	169½ "
Average yield per acre	27 tons

	Crops Using	Average on 31 Crops	Per Acre £. S.D.	Per Ton £. S. D.
Dung	17	7 tons	6. 0.10	
WORK - CARTING & SPREADING DUNG			2. 4.11	
Lime	13	9½ cwts	13. 8	
Slag	12	4¾ cwts	1. 8. 6	
Depreciation on Special Farm Implements	5		3. 5	
Rotational Manures	31	9 cwts	6.15. 0	
Seeds. Bought	31	¾ lbs	11. 7	
WORK - PREPARATION & SOWING (Excluding Dung Work)			5. 7. 9	
CROP IN GROUND			23. 5. 8	
WORK - SUMMER			7. 4. 4	
WORK - SHAWING, CARTING & CLAMPING			12.12. 0	
MATERIALS FOR THESE STAGES			6.10	
			43. 8.10	1.12. 2
Rent			1. 5.10	-. 1. 0
Cost (Not Adjusted for Manurial, etc. Residues)			£44.14. 8	£1.13. 2
Adjustment for residues, etc.				
Add from previous crops:-				
Dung residues			-.12.10	
Lime & Manure residues			1. 9. 6	
Turf Value			-. 3. 9	
Dung application work			-. 6. 4	-. 1.11
			47. 7. 1	1.15. 1
Deduct to following crops				
Dung residues			3. 5. 7	
Lime and manure residues			4. 4. 0	
Dung application work			1. 9.11	-. 6. 9
NET COST (Excluding 'overhead' estimate)			£38. 7. 7	£1. 8. 4

If a share of overheads is included, the cost becomes:-

Add Overheads:-		
1. Per acre	-.19. 3	
2. Per £ of Labour	6.17. 3	
3. Per "Tractor-Equivalent" Hour	12. 1. 9	-.14. 8
NET COST (Including "Overhead" estimate)	£58. 5.10	£2. 3. 0

The cost before an adjustment was made for manurial residues was about £44.10s. per acre. For a yield of 27 tons per acre this gave a per ton cost of £1.13/-.

With manurial residues taken into account, but excluding the "overhead" estimate, the costs were £38.7/- per acre or £1.8/- per ton.

After charging for "overheads" the net cost was £58.6/- per acre or £2.3/- per ton.

17 of the crops were given applications of dung and 14 had no dung. Comparing these two groups the average yields were almost identical at 27 tons per acre. The costs, however, varied considerably. The group "with dung" had an average cost, before making allowance for manurial residues and overheads, of £52 per acre or £1.18/- per ton as against £35 per acre or £1.6/- per ton for the group "without dung". The average weight of dung applied in the former group was almost 13 tons per acre. As a result, the cost of all manures in this group averaged £19.15/- per acre as compared with £9.6/- per acre in the group "without dung". Because of the greater number of man and tractor hours required for spreading in the "with dung" group the cost of the work up to the stage "crop in ground" amounted to £9.8/- per acre. The cost up to the equivalent stage in the "without dung" group was £5.8/-. These two items of cost accounted for the greater part of the difference in total costs of the two groups, although the higher costs in the "with dung" group were offset to some extent by greater deductions for the value of manurial residues going to future crops.

Direct and General Costs

In Table 2, what have been termed "direct" costs i.e. those expenditures incurred specially for this particular crop are shown separately from "general" expenditure, i.e. items used for this crop but drawn from the general pool of farm labour and power, "overhead" expenditure, etc., available on the farm.

TABLE 2

Direct Costs and General Costs Per Acre
An Average for 31 Crops

	Per Acre £. S. D.	Per Acre £. S. D.	
Lime	-.13. 8		
Slag	1. 8. 6		
Other Fertilisers	6.15. 0	8.17. 2	
Purchased Seed		-.11. 7	
Sundry Materials		-. 6.10	
Contract Hire of Machinery and Operators		-.10. 3	
Casual Labour (Including Gang & Piece Work)		6.13. 4	
(1) DIRECT EXPENDITURE			£16.19. 2
Work by Farm Horses		-.16. 1	
Work by Farm Tractors		6.12. 3	
Manual Work - mainly Farm Staff		12.17. 1	
FARM LABOUR AND POWER		20. 5. 5	
RENT OF LAND		1. 5.10	
Depreciation of Special Farm Machinery		-. 3. 5	
Estimated Overhead Charge		19.18. 3	
		20. 1. 8	
(2) TOTAL GENERAL EXPENDITURE			£41.12.11
TOTAL COST (Without dung)			£58.12. 1
Estimated cost of dung			6. 0.10
TOTAL COST (With dung)			£64.12.11

In this table, all adjustments for residues from previous crops and to following crops are omitted.

Variations in Yields and Costs

The estimated yields ranged from 13½ tons per acre to slightly over 40 tons. The variation in yield was one cause of variations in the cost per ton and in the following table the range of yields and costs per ton are shown with the number of records appearing in each group. The costs include "overhead" charges and are adjusted for manurial residues.

Yield per Acre

Tons	No. of Records	Average Cost per Ton
Under 15	2	£3.18/-
15 and under 20	2	2.18/-
20 and under 25	6	2.10/-
25 and under 30	9	2. 7/-
30 " " 35	6	2. 1/-
35 " above	6	1.11/-

The lowest cost per ton in the sample was £1.3/- for a yield of 35 tons and the highest was £4.5/- for a yield of 14½ tons.

Labour and Power Use

In the next table the man, horse and tractor hours are given in detail for the various stages of production. For an average acre of turnips 98 man hours were required (this includes dung work) of which nearly half were absorbed by shawing, carting and clamping. Averaging the material for the 31 costs showed that in addition 10 horse hours and 34 tractor hours were required. The table does not show the almost negligible number of hours required for special machinery, such as lime spreaders, which were hired by farmers on contract.

The cost of labour and power for the average acre amounted in total to £27.9/- which was about 47% of the Total Net Costs. It was made up of:-

Work - Preparation and Sowing (including dung work)	£7.12. 8
" - Summer	7. 4. 4
" - Shawing, Carting and Clamping	12.12. 0
	£27. 9. 0

TABLE 3

Structure and Cost of Labour and Power Use Per Acre

Hours of Work Per Acre By:-	Crop in Ground	Summer Work	Shawing Carting, etc.	Total
Contract: Man Hours	.58	.02	-	.60
Horse Hours	-	-	-	-
Tractor Hours	.48	.02	.87	1.37
Casual Workers & Neighbours	.35	4.88	6.65	11.88
All Farm Staff & Family	24.51	20.78	40.24	85.53
Total: Man Hours	25.44	25.68	46.89	98.01
Horse Hours	5.52	1.85	3.00	10.37
Tractor Hours	15.73	2.55	15.51	33.79
Cost of Work Per Acre:-				
Contract Work, inclusive	£-. 8. 5	£2. 8.11	£1.11. 3	£4. 8. 7
Casual Workers & Neighbours	-. 0.10	1. 0. 7	1.14. 1	2.15. 6
All Farm Staff	3.13. 7	3. 1.11	6. 1. 1	12.16. 7
Farm Horse	-. 8.10	-. 2. 9	-. 4. 6	-.16. 1
Farm Tractor	3. 1. 0	-.10. 2	3. 1. 1	6.12. 3
	£7.12. 8	£7. 4. 4	£12.12. 0	£27. 9. 0

In Table 4 the average number of labour, tractor and horse hours involved in specified operations are shown. The figures do not necessarily relate to all the records in the sample for each operation, since some of them were not in a convenient enough form for such analysis. Column 2 shows, therefore, the number of records involved in each calculation.

The term "Cultivations" needs defining. It covers all preparatory operations such as harrowing and discing but excluding ploughing, opening drills and sowing manures. Many of the fields may have been harrowed or disced several times. The average figures indicate therefore, the time spent per acre on the total of such operations.

TABLE 4

Labour, Tractor & Horse Hours Required for Various Operations

Operation	Number of Records	Acreage involved	Average Hours per Acre			
			Labour	Tractor	Horse	Contract Machine
Carting & Spreading Dung (Machine)	9	52	12.6	6.8	-	-
" " " Dung (Hand)	7	35	23.8	9.3	-	-
Ploughing	24	126	5.4	5.4	-	-
Cultivations	31	169	4.1	3.7	0.6	0.1
Sowing Manures	24	139	1.3	.9	-	-
Drilling (by Tractor)	23	131	1.4	1.4	-	-
Sowing Seed (by Tractor)	10	57	1.4	1.4	-	-
Sowing Seed (by Horse)	20	110	1.3	-	1.3	-
Row-crop work before thinning (by Tractor)	13	63	2.5	2.5	-	-
Row-crop work before thinning (by Horse)	7	30	4.7	-	4.7	-
Thinning	14	57	37.3	-	-	-
Row-crop work after thinning (by Tractor)	14	90	1.7	1.3	-	-
Row-crop work after thinning (by Horse)	5	24	4.2	-	3.4	-
Shawing	14	57	37.3	-	-	-
Carting & Clamping	22	121	26.1	16.9	-	-

The combined costs of labour, tractor and horse work for individual operations are shown in Table 5, averaged over the total acreage and over the acreage on which the particular operation was carried out.

TABLE 5

Cost of Work Distribution and Operation Costs

	Over total acreage costed	Only over acreage on which each job was done
Spreading Dung	£2. 4.11	£4. 1. 6
Spreading Lime	3.10	-.15. 6
Ploughing	2. 3. 4	2. 3. 4
Cultivations	1.10. 7	1.10. 7
Sowing Manures	-. 6.11	-. 7. 7
Applying Slag	-. 1. 4	-. 7. 1
Drilling	-. 9. 8	-. 9. 9
Sowing Seed	-. 6.10	-. 6.10
Miscellaneous	-. 5. 3	
TOTAL CROP IN GROUND	£ 7.12. 8	
Row Crop Work before Thinning	-.15. 7	-.17. 5
Thinning	5. 1. 3	5. 2. 7
Row Crop Work after Thinning	-.11. 2	-.13. 1
Hand weeding	-.16. 0	2. 3. 6
Dusting	- - 4	-. 4.10
	£7. 4. 4	
Shawing	5. 2. 6	5. 2. 6
Carting & Clamping	7. 9. 6	7. 9. 6
	£12.12. 0	

The cost of labour per hour taken as an average of the whole sample was:-

Farmer	3/1d. per hour.
Male workers - 20 and over	3/2d per hour
Male workers - 18 - 20	2/3d " "
Male workers - up to 18	1/11d " "
Female workers - 21 and over	2/0d " "

For casual, piece-work and gang labour the average costs per hour were:-

Casual work	- 2/7d per hour
Piece-work	- 2/7d " "
Gang-work	- 4/- " "
Neighbours	- 3/1 " "
Juvenile Casual	11d " "

Fertiliser Use and Cost

In Table 6 details of fertiliser use and cost are given.

On 27 of the fields compound turnip manure was used. It was used in conjunction with other manures on 22 fields. On only 5 fields was it the sole fertiliser sown. The details of the other manures used with the turnip manure are:-

10 fields had only dung and compound turnip manure.
10 fields had turnip manure and slag (of which 4 used dung also).
1 field had turnip manure, super phosphates and dung.
1 field had turnip manure and nitro-chalk.

Of the three fields which had applications of compound potato manure, one had no other manures, one had dung and potato manure and one had potato manure, slag and dung.

The remaining field was given applications of super-phosphates, bone meal, potash, nitro-chalk and sulphate of ammonia.

Out of a total of 2346 cwts of fertilisers applied, compound turnip manure, compound potato manure and slag made up 2265 cwts. leaving only 81 cwts of other fertilisers.

TABLE 6

Turnip Crop 1953. Fertiliser Use and Cost

	Compound Turnip Manure	Compound Potato Manure	Slag
Number using	27	3	11
Acreage	151¼	13	61¾
Total Weight (cwts)	1353	92	820
Total cost	£996.5s.	£71.8s.	£241.3s.
Av. cwts per acre	8.1	7.1	13.3
Av. cost per cwt	14s.9d.	15s.8d.	5s.6d.

The costs shown above are actual costs to the farmer, i.e. after deduction of subsidies.

Cost of Nutrients

The cost of protein and of starch are given below using the conversion factors of 0.7% for protein equivalent and 7.3% for starch equivalent. Three sets of calculationsare given - first, taking the cost of one ton of turnips at £1.13.2d (i.e. before adjustments for residues or overheads have been made), secondly, taking the cost as £1.8.4d (after adjusting for residues but not for overheads) and thirdly, taking the cost as £2.3.0 per ton (i.e. after adjusting for residues and overheads).

Cost of Nutrients per Cwt.

	Protein	Starch
Before adjusting for residues or overheads	£11.16.11d.	£1. 2.9d.
After adjusting for residues (but not for o'h.)	£10. 2. 4d.	-.19.5d.
After adjusting for residues & overheads	£15. 7. 2d.	£1. 9.4d.