



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

March, 1953

Land clearing

An interim report was prepared by the Department on the
Costs of the Bracken Eradication Trials in Bowmont Valley for the 1951
season. This present report deals with the 1952 season when the same
four machines after covering the ground once over twice in 1951 moved
on to attack further areas of bracken in the adjoining Kale Valley.
Once again the areas treated were gone over twice, the first "cut"
comprising on the 11th and lasting for three to four weeks while
the second "cut" started on July 10th and continued until each machine
had covered its particular area for a second time. This lasted from
the 10th to the 20th.

ECONOMICS OF BRACKEN ERADICATION, 1951 AND 1952

(An Interim Report on Trials in Bowmont and Kale Valleys)

by

W. B. DUTHIE

EDINBURGH AND EAST OF SCOTLAND COLLEGE OF AGRICULTURE
(Department of Economics)
22 ROSE STREET, EDINBURGH 2, SCOTLAND

BRACKEN ERADICATION TRIALS IN BOWMONT AND KALE VALLEYS

1951 AND 1952 - AN INTERIM REPORT

by W.B. DUTHIE

INTRODUCTION

An interim report[§] was prepared by this Department on the Costs of the Bracken Eradication Trials in Bowmont Valley for the 1951 season. This present report deals with the 1952 season when the same four machines after covering the ground gone over twice in 1951 moved on to attack further areas of bracken in the adjoining Kale Valley. Once again the areas treated were gone over twice, the first "cut" commencing on June 11th and lasting for three to four weeks while the second "cut" started on July 16th and continued until each machine had covered its particular area for a second time. This lasted from two to four weeks.

The four machines were radically the same as those used in 1951. They comprised two cutting machines - the Henderson Slasher and the Ferguson Mower - and two bruising machines - the Holt Breaker and the Cuthbertson Crusher. Small modifications were carried out at the Scottish Machinery Testing Station to the two cutting machines between the close of the 1951 season and the start of the 1952 season. The same types of tractors were utilised in 1952 as in the previous year, i.e. 3 Ford Fergusons to pull the Henderson Slasher, the Ferguson Mower and the Holt Breaker while a Fordson Major half-track was concerned with hauling the Cuthbertson Crusher.

However, after consultation with those concerned, a slightly different costings procedure has been evolved which it is thought represents a decided improvement on the practice adopted in 1951. Because of the prime necessity of comparing the costs and performance of the four machines under similar conditions and the fact that in 1951 charges were inserted for tractor repairs carried out during the "cutting" period which were not always entirely due to bracken eradication, it has now been decided to charge a flat rate per hour for the use of the tractor in each case. These and other smaller points are fully explained in the following section headed "Costs and Performance". To provide a fair comparison between the two seasons, figures for 1951 have been re-worked on a similar basis, thereby eliminating the calculations dealt with in the previous report.[§]

COSTS AND PERFORMANCE

For reasons indicated below, certain basic assumptions have been made in compiling these costs etc. tables.

1. Tractor Work

In accordance with the decision of the Scottish Conference of Agricultural Economists the following rates per hour have been charged for the use of the tractors concerned (exclusive of the tractor driver's wage):-

	<u>1951 Season</u>	<u>1952 Season</u>
Wheeled tractors (Ford-Fergusons)	4/3 per hour	4/6 per hour
Fordson Major half-track tractor	4/9 " "	5/- " "

It is thought that the use of these standard rates will give as accurate a comparison as possible between the costs of the bracken cutting /

cutting machines themselves by eliminating fluctuations in tractor charges due more particularly to the inexperience of the driver and sometimes to normal wear and tear not entirely caused by bracken eradication. These charges have been agreed upon on the assumption, confirmed by experience, that haulage and power work on these areas of bracken which were treated was no harder on the tractors concerned than average cultivations carried out under more arable conditions.

2. Working Hours

The number of working hours charged in the costs both for the tractors and the tractor drivers' wages consists of:-

- (a) actual "cutting" time i.e. time spent actually working at the "cutting" face plus
- (b) travelling time i.e. the number of hours spent in travelling between the fuel centre and the "cutting" face.

Other time spent on the job (see Table III. on page 6) has been omitted to give a fairer comparison between the actual working of the four machines. Tractor and machine breakdowns, for example, have been left out on the assumption that if these occurred on a normal farm the driver would be put to some other task; so, too, has idle time which consists mainly of time lost due to wet weather and time spent on tractors hauling each other out of bogs and ditches. These hours are not all lost because of the bracken machines, so have been omitted from the calculations of costs.

3. Depreciation

Depreciation of the bracken machines has been calculated as follows:- The two cutting machines i.e. the Henderson Slasher and the Ferguson Mower have been depreciated at 25% and the two bruisers i.e. the Holt Breaker and the Cuthbertson Crusher at 15%. All four machines were new at the commencement of the 1951 season but no Initial Allowance has been charged nor has the additional quarter added to the standard rates in Inland Revenue Wear and Tear calculations.

Two modifications were carried out to the two cutting machines before the start of the 1952 season. In the case of the Ferguson Mower the difference between the replacement cost and the part replaced was negligible but in the case of the Henderson Slasher £5 has been added to the written down value before calculating depreciation for the 1952 season (see Table V. on page 8). The total annual depreciation of the machines has been apportioned between the two cuts per season according to the number of hours spent in every case.

4. Repairs and Maintenance

The final item of cost, repairs and maintenance of the machines covers all repairs carried out during the respective "cutting" seasons plus charges for normal maintenance and repairs carried out by the staff of the Scottish Machinery Testing Station between the end of one season and the start of the next. Thus any repairs and maintenance carried out between the start of the 1951 "cutting" season and the start of the 1952 season have been charged against the 1951 costs on the assumption that they were caused by the 1951 usage.

5. Management Salary

No charge has been made in the costs for the managerial work of the resident technical manager as his duties are largely on the experimental side though where he replaced a tractor driver at the "cutting" face for various reasons his time has been charged at the tractor driver's rate of wages.

Tables I. and II. which follow show the operating costs for 1951 and 1952 respectively (1) per cut, (2) per season and (3) per cent for (A) the Holt Breaker, (B) the Henderson Slasher, (C) the Cuthbertson Crusher and (D) the Ferguson Mower.

TABLE I.(A) OPERATING COSTS OF THE HOLT BREAKER : 1951 SEASON

	1st Cut	2nd Cut	Total for Season	Per Cent
	£ s. d.	£ s. d.	£ s. d.	%
Tractor Charges @ 4/3d. per hour	14. 16. 5	11. 7. 4	26. 3. 9	56.4
Wages of Tractor Driver	8. 2. 9	6. 4. 10	14. 7. 7	30.9
Depreciation of Machine	2. 14. 10	2. 1. 2	4. 16. -	10.3
Repairs and Maintenance of Machine	1. -. 6	-. 1. 6	1. 2. -	2.4
TOTAL OPERATING COSTS	£26. 14. 6	£19. 14. 10	£46. 9. 4	100.0%

TABLE I.(B) OPERATING COSTS OF THE HENDERSON SLASHER : 1951 SEASON

	1st Cut	2nd Cut	Total for Season	Per Cent
	£ s. d.	£ s. d.	£ s. d.	%
Tractor Charges @ 4/3d. per hour	17. 17. -	15. 10. 3	33. 7. 3	40.1
Wages of Tractor Driver	10. 3. -	8. 16. 5	18. 19. 5	22.8
Depreciation of Machine	4. 13. 9	4. 13. 9	9. 7. 6	11.3
Repairs and Maintenance of Machine	9. 19. 5	11. 9. 11	21. 9. 4	25.8
TOTAL OPERATING COSTS	£42. 13. 2	£40. 10. 4	£83. 3. 6	100.0%

TABLE I.(C) OPERATING COSTS OF THE CUTHBERTSON CRUSHER : 1951 SEASON

	1st Cut	2nd Cut	Total for Season	Per Cent
	£ s. d.	£ s. d.	£ s. d.	%
Tractor Charges @ 4/9d. per hour	26. 12. -	19. 8. 4	46. -. 4	46.7
Wages of Tractor Driver	13. 1. 4	9. 10. 9	22. 12. 1	22.9
Depreciation of Machine	17. 2. -	11. 8. -	28. 10. -	28.9
Repairs and Maintenance of Machine	-. 14. 6	-. 14. 6	1. 9. -	1.5
TOTAL OPERATING COSTS	£57. 9. 10	£41. 1. 7	£98. 11. 5	100.0%

TABLE I.(D) OPERATING COSTS OF THE FERGUSON MOWER : 1951 SEASON

	1st Cut	2nd Cut	Total for Season	Per Cent
	£ s. d.	£ s. d.	£ s. d.	%
Tractor Charges @ 4/3d. per hour	11. 6. 4	10. 2. 11	21. 9. 3	30.4
Wages of Tractor Driver	6. 4. 3	5. 11. 7	11. 15. 10	16.7
Depreciation of Machine	9. 5. -	9. 5. -	18. 10. -	26.2
Repairs and Maintenance of Machine	13. 4. 2	5. 12. 6	18. 16. 8	26.7
TOTAL OPERATING COSTS	£39. 19. 9	£30. 12. -	£70. 11. 9	100.0%

TABLE II.(A) OPERATING COSTS OF THE HOLT BREAKER : 1952 SEASON

	1st Cut	2nd Cut	Total for Season	Per Cent
	£ s. d.	£ s. d.	£ s. d.	%
Tractor Charges @ 4/6d. per hour	20.10. 7	19.11. 6	40. 2. 1	58.5
Wages of Tractor Driver	11.11.11	11. 1. 2	22.13. 1	33.0
Depreciation of Machine	2. -.10	2. -. 9	4. 1. 7	5.9
Repairs and Maintenance of Machine	-. 7. 5	1. 7. 8	1.15. 1	2.6
TOTAL OPERATING COSTS	£34.10. 9	£34. 1. 1	£68.11.10	100.0%

TABLE II.(B) OPERATING COSTS OF THE HENDERSON SLASHER :
1952 SEASON

	1st Cut	2nd Cut	Total for Season	Per Cent
	£ s. d.	£ s. d.	£ s. d.	%
Tractor Charges @ 4/6d. per hour	23.11. 5	17. 3. 1	40.14. 6	46.7
Wages of Tractor Driver	13.14.11	10. -. 2	23.15. 1	27.3
Depreciation of Machine	4.19. 5	3. 6. 3	8. 5. 8	9.5
Repairs and Maintenance of Machine	2. 5. 5	12. 1. 6	14. 6.11	16.5
TOTAL OPERATING COSTS	£44.11. 2	£42.11. -	£87. 2. 2	100.0%

TABLE II.(C) OPERATING COSTS OF THE CUTHBERTSON CRUSHER :
1952 SEASON

	1st Cut	2nd Cut	Total for Season	Per Cent
	£ s. d.	£ s. d.	£ s. d.	%
Tractor Charges @ 5s. per hour	29.12. 6	18. 2. 6	47.15. -	46.8
Wages of Tractor Driver	15. 1. 2	9. 4. 3	24. 5. 5	23.8
Depreciation of Machine	14.10. 8	9.13.10	24. 4. 6	23.7
Repairs and Maintenance of Machine	2.18. 9	2.18. 9	5.17. 6	5.7
TOTAL OPERATING COSTS	£62. 3. 1	£39.19. 4	£102. 2. 5	100.0%

TABLE II.(D) OPERATING COSTS OF THE FERGUSON MOWER :
1952 SEASON

	1st Cut	2nd Cut	Total for Season	Per Cent
	£ s. d.	£ s. d.	£ s. d.	%
Total Charges @ 4/6d. per hour	21. 7. 6	19.14.10	41. 2. 4	44.9
Wages of Tractor Driver	12. 1. 5	11. 3. 1	23. 4. 6	25.3
Depreciation of Machine	6.18. 9	6.18. 9	13.17. 6	15.1
Repairs and Maintenance of Machine	1.15. 2	11.13. 4	13. 8. 6	14.7
TOTAL OPERATING COSTS	£42. 2.10	£49.10. -	£91.12.10	100.0%

The main figures in these two tables are brought together in Table V. on page 8 so it will suffice to state here that in every case except that of the Ferguson Mower in 1952 (Table II.(D)) where repairs were high the second "cut" cost less than the first one. The hours spent on "cutting" and travelling were less in the second cut than the first in every case in both years because of shorter bracken and more ease in spotting obstructions; hence the cost of the second cut should be less than the first. However, on both the cutting machines repairs and maintenance which varied from 14.7 per cent to 26.7 per cent of the operating costs per season often appeared to be heavier during the second cut than the first. On the other hand repairs and maintenance of the two bruising types of machine varied from only 1.5 per cent to a maximum of 5.7 per cent of the costs for the season.

While it is unfair to compare annual costs per cut incurred in 1951 with those of 1952 because of the increased acreage covered in the latter year, it is interesting to note that, except for the isolated case whereby the Cuthbertson Crusher's second cut costs in 1952 were less than the second cut in 1951 because of reduced hours even with increased acreage, the 1952 costs exceeded the 1951 costs per cut for three main reasons - increased tractor charge rates per hour, increased number of hours worked on account of bigger acreages treated, and increased wage rates of the tractor drivers. These increases more than offset the decreased depreciation charged in 1952.

Table III., set out overleaf, details the allocation of the time spent per machine, per cut, per season and per cent.

The divisions of the time spent have already been described under (2) in the section headed "Costs and Performance". In every instance the amount of actual "cutting" time spent on the second cut was less than in the first cut for reasons already stated. The number of hours spent "cutting" increased in 1952 compared with 1951 because of the larger acreages covered. Tractor breakdowns were not excessive, never being greater than 9.5 per cent of the total time spent on the job while machine breakdowns varied from nil to a maximum of 8.9 per cent of the time spent in the case of the two crushing machines. A different tale is to be told, however, in the case of the two cutting machines where the time lost in machine breakdowns varied from 13.8 per cent to 29.9 per cent of the total time spent. Idle time increased in 1952 compared with the previous year largely since it included the time spent in going from farm to farm, and in 1952 this was understandably greater because of the extension of the experimental area to the adjacent Kale Valley.

The most encouraging feature of this table is the fact that the percentage of time lost through breakdowns of the four machines decreased in 1952 compared with 1951, quite appreciably in some cases. The Ferguson Mower now seems to have got over its teething troubles - a marked contrast from the first cut in 1951 - when more time was spent out of action than actually cutting. With neither of the two cutting machines did the time spent actually cutting exceed 50 per cent of the total time spent in either year whereas in the case of the two crushing machines it varied from 52.4 per cent to 65.8 per cent of the total time.

The/

TABLE III. ANALYSIS OF WORKING TIME PER MACHINE : 1951 AND 1952 SEASONS

		HOLT BREAKER				HENDERSON SLASHER				CUTHBERTSON CRUSHER				FERGUSON MOWER			
		1951		1952		1951		1952		1951		1952		1951		1952	
		Hours	%	Hours	%	Hours	%	Hours	%	Hours	%	Hours	%	Hours	%	Hours	%
Actual "Cutting" Time	- 1st Cut	60 $\frac{1}{2}$	-	79 $\frac{3}{4}$	-	77 $\frac{1}{2}$	-	95 $\frac{1}{4}$	-	102 $\frac{1}{2}$	-	111 $\frac{1}{2}$	-	43 $\frac{1}{2}$	-	79 $\frac{1}{4}$	-
	- 2nd Cut	50	-	76	-	67	-	70	-	75 $\frac{1}{2}$	-	68	-	42 $\frac{1}{4}$	-	74	-
	- Season	110 $\frac{1}{2}$	53.3	155 $\frac{3}{4}$	52.4	144 $\frac{1}{2}$	46.0	165 $\frac{1}{4}$	50.0	178	61.8	179 $\frac{1}{2}$	65.8	85 $\frac{3}{4}$	34.7	153 $\frac{1}{4}$	41.7
Travelling Time	- 1st Cut	9 $\frac{1}{4}$	-	11 $\frac{1}{2}$	-	6 $\frac{1}{2}$	-	9 $\frac{1}{2}$	-	9 $\frac{1}{2}$	-	7	-	9 $\frac{3}{4}$	-	15 $\frac{3}{4}$	-
	- 2nd Cut	3 $\frac{1}{2}$	-	11	-	6	-	6 $\frac{1}{4}$	-	6 $\frac{1}{4}$	-	4 $\frac{1}{2}$	-	5 $\frac{1}{2}$	-	13 $\frac{3}{4}$	-
	- Season	12 $\frac{3}{4}$	6.1	22 $\frac{1}{2}$	7.5	12 $\frac{1}{2}$	4.0	15 $\frac{3}{4}$	4.8	15 $\frac{3}{4}$	5.5	11 $\frac{1}{2}$	4.2	15 $\frac{1}{4}$	6.2	29 $\frac{1}{2}$	8.0
Tractor Breakdowns	- 1st Cut	19 $\frac{3}{4}$	-	Nil	-	11	-	5 $\frac{1}{2}$	-	3 $\frac{1}{2}$	-	7 $\frac{1}{4}$	-	13	-	9 $\frac{1}{2}$	-
	- 2nd Cut	Nil	-	3 $\frac{1}{2}$	-	Nil	-	14 $\frac{1}{4}$	-	4 $\frac{3}{4}$	-	5 $\frac{3}{4}$	-	Nil	-	23 $\frac{1}{4}$	-
	- Season	19 $\frac{3}{4}$	9.5	3 $\frac{1}{2}$	1.2	11	3.5	19 $\frac{3}{4}$	6.0	8 $\frac{1}{4}$	2.9	13	4.8	13	5.3	32 $\frac{3}{4}$	8.9
Machine Breakdowns	- 1st Cut	9	-	10 $\frac{3}{4}$	-	36 $\frac{3}{4}$	-	14 $\frac{3}{4}$	-	12 $\frac{1}{4}$	-	Nil	-	64	-	20 $\frac{3}{4}$	-
	- 2nd Cut	9 $\frac{1}{2}$	-	9	-	57 $\frac{1}{4}$	-	43 $\frac{1}{2}$	-	12 $\frac{3}{4}$	-	Nil	-	32 $\frac{1}{4}$	-	29 $\frac{3}{4}$	-
	- Season	18 $\frac{1}{2}$	8.9	19 $\frac{3}{4}$	6.6	94	29.9	58 $\frac{1}{4}$	17.6	25	8.7	Nil	-	96 $\frac{1}{4}$	39.0	50 $\frac{1}{2}$	13.8
Idle Time	- 1st Cut	34 $\frac{1}{2}$	-	46 $\frac{3}{4}$	-	29 $\frac{3}{4}$	-	36 $\frac{1}{2}$	-	33 $\frac{1}{2}$	-	35 $\frac{1}{4}$	-	14 $\frac{1}{2}$	-	59	-
	- 2nd Cut	11 $\frac{1}{2}$	-	49 $\frac{1}{4}$	-	22 $\frac{1}{2}$	-	35	-	27 $\frac{1}{4}$	-	33 $\frac{1}{2}$	-	22	-	42 $\frac{1}{2}$	-
	- Season	46	22.2	96	32.3	52 $\frac{1}{4}$	16.6	71 $\frac{1}{2}$	21.6	60 $\frac{3}{4}$	21.1	58 $\frac{3}{4}$	25.2	36 $\frac{1}{2}$	14.8	101 $\frac{1}{2}$	27.6
Total Time Spent	- 1st Cut	133	-	148 $\frac{3}{4}$	-	161 $\frac{1}{2}$	-	161 $\frac{1}{2}$	-	161 $\frac{1}{4}$	-	151	-	144 $\frac{3}{4}$	-	184 $\frac{1}{4}$	-
	- 2nd Cut	74 $\frac{1}{2}$	-	148 $\frac{3}{4}$	-	152 $\frac{3}{4}$	-	169	-	126 $\frac{1}{2}$	-	111 $\frac{3}{4}$	-	102	-	183 $\frac{1}{4}$	-
	- Season	207 $\frac{1}{2}$	100%	297 $\frac{1}{2}$	100%	314 $\frac{1}{4}$	100%	330 $\frac{1}{2}$	100%	287 $\frac{3}{4}$	100%	272 $\frac{3}{4}$	100%	246 $\frac{3}{4}$	100%	367 $\frac{1}{2}$	100%

The actual acreages treated per machine per farm are shown for both years in Table IV. which follows.

TABLE IV. ACREAGES "TREATED" PER MACHINE AND PER FARM :
1951 and 1952 SEASONS

Site of Trial	HOLT BREAKER		HENDERSON SLASHER		CUTHBERTSON CRUSHER		FERGUSON MOWER	
	1951	1952	1951	1952	1951	1952	1951	1952
Kelsocleuch Farm	-	-	38.2	38.2	69.6	69.6	-	-
Cocklawfoot Farm	-	-	42.8	42.8	-	-	-	-
Mowhaugh Farm	36.0	36.0	44.8	44.8	32.6	32.6	13.9	24.7
Cliftoncote Farm	26.3	26.3	-	-	-	-	7.3	7.3
Belford Farm	52.3	52.3	-	-	-	-	27.4	27.4
Hownam Mains	34.9	41.5	-	-	-	-	7.6	11.8
Over Chatto	-	25.6	-	15.2	-	23.6	-	16.8
TOTAL ACREAGE TREATED	149.5	181.7	125.8	141.0	102.2	125.8	56.2	88.0

The acreages given in the above table are the actual surface areas treated twice each year. Thus if A equals the acreage treated in the first cut and B that of the second cut the acreages given in the table equal $\frac{A+B}{2}$ in every case. The total acreage twice-treated in 1951 was 433.7 acres but this had been increased to 536.5 acres by the end of the 1952 season, each machine having increased its output by some 15 to 32 acres per cut.

The main features of all of the foregoing tables have been brought together with a few new calculations in Table V. set out overleaf. This table gives detailed comparisons between the seasonal working of each machine for both years.

Many of the main points have been mentioned before in dealing with the other tables but the increased costs for increased acreages will be noted. The Holt Breaker with its small repair bills and small depreciation costs allied to a fast working speed made it by far the cheapest machine to operate per annum as well as per acre treated. The slower working speed in 1952 - 1.17 acres per hour twice treated as against 1.35 acres per hour in the previous year was the main cause of the increased costs per season and per acre in 1952 for this machine. The other three machines showed increased costs per season but decreased costs per acre in 1952 compared with 1951. The repair bills of the two cutting machines loomed large compared with those of the Holt Breaker and the Cuthbertson Crusher though depreciation charges in the last mentioned case formed a large item of cost. The comparatively small acreages covered by the Ferguson Mower in both years tended to increase the per acre figures to the highest of the four machines.

The number of hours spent per season varied greatly from machine to machine and from year to year. The Cuthbertson Crusher even with its increased acreage in 1952 spent 15 hours less on the job than in 1951, the Henderson Slasher took some 16 hours more in 1952 but the other two machines took almost 50 per cent more time in 1952 with their increased acreages than in 1951. The Holt Breaker worked at a much greater speed than the other three machines during both years.

TABLE V. COMPARATIVE COSTS AND PERFORMANCES : 1951 AND 1952 SEASONS

	HOLT BREAKER		HENDERSON SLASHER		CUTHBERTSON CRUSHER		FERGUSON MOWER	
	1951	1952	1951	1952	1951	1952	1951	1952
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Total Tractor Charges	26. 3. 9	40. 2. 1	33. 7. 3	40. 14. 6	46. - . 4	47. 15. -	21. 9. 3	41. 2. 4
Wages of Tractor Driver	14. 7. 7	22. 13. 1	18. 19. 5	23. 15. 1	22. 12. 1	24. 5. 5	11. 15. 10	23. 4. 6
Depreciation of Machine	4. 16. -	4. 1. 7	9. 7. 6	8. 5. 8	28. 10. -	24. 4. 6	18. 10. -	13. 17. 6
Repairs and Maintenance of Machine	1. 2. -	1. 15. 1	21. 9. 4	14. 6. 11	1. 9. -	5. 17. 6	18. 16. 8	13. 8. 6
TOTAL OPERATING COSTS	£46. 9. 4	£68. 11. 10	£83. 3. 6	£87. 2. 2	£98. 11. 5	£102. 2. 5	£70. 11. 9	£91. 12. 10
Acreage treated (twice cut or crushed)	149.5	181.7	125.8	141.0	102.0	125.8	56.2	88.0
Operating Cost per acre twice treated	6/2 ³ / ₄ d.	7/6 ¹ / ₂ d.	13/2 ³ / ₄ d.	12/4 ¹ / ₄ d.	19/3 ¹ / ₂ d.	16/2 ³ / ₄ d.	25/1 ¹ / ₂ d.	20/9 ³ / ₄ d.
Actual Cutting or Crushing Time	110 ¹ / ₂	155 ³ / ₄	144 ¹ / ₂	165 ¹ / ₄	178	179 ¹ / ₂	85 ³ / ₄	153 ¹ / ₄
Travelling Time to and from Fuel Centre	12 ³ / ₄	22 ¹ / ₂	12 ¹ / ₂	15 ³ / ₄	15 ³ / ₄	11 ¹ / ₂	15 ¹ / ₂	29 ¹ / ₂
Time lost through Breakdown of Tractor	19 ³ / ₄	3 ¹ / ₂	11	19 ³ / ₄	8 ¹ / ₄	13	13	32 ³ / ₄
" " " " " Machine	18 ¹ / ₂	19 ³ / ₄	94	58 ¹ / ₄	25	Nil	96 ¹ / ₄	50 ¹ / ₂
Idle Time due to bad weather etc.	46	96	52 ¹ / ₄	71 ¹ / ₂	60 ³ / ₄	68 ³ / ₄	36 ¹ / ₂	101 ¹ / ₂
TOTAL TIME SPENT	207¹/₂	297¹/₂	314¹/₄	330¹/₂	287³/₄	272³/₄	246³/₄	367¹/₂
Acreage treated per hour (100% Efficiency) [≠]	1.35	1.17	0.87	0.85	0.57	0.70	0.65	0.57
" " " " (Overall)	0.72	0.61	0.40	0.43	0.36	0.46	0.23	0.24
Operating Cost per hour (100% Efficiency) [≠]	approx. 8/5d.	8/9 ¹ / ₂ d.	11/6d.	10/6 ¹ / ₂ d.	11/1d.	11/4 ¹ / ₂ d.	16/5 ¹ / ₂ d.	11/11 ¹ / ₂ d.
T.V.O. consumed per acre twice treated (Overall)	(galls) 1.06	1.55	1.77	1.94	2.57	2.65	2.19	3.56
Initial Value of Machine at start of "cutting"	£32 (new)	£27. 4s.	£37. 10s. (new)	£33. 2. 6*	£190 (new)	£161. 10s.	£74 (new)	£55. 10s.
Annual Rate of Depreciation Charged	15%	15%	25%	25%	15%	15%	25%	25%

≠ 100% Efficiency indicates the performance of the machines when there are no stoppages whatever.

* Includes £5 being cost of replacement in excess of part replaced.

As regards fuel consumed per acre the Holt Breaker engaged on what might almost be termed straightforward light haulage work came out well on top, followed by the Henderson Slasher, with the Cuthbertson Crusher engaged on its heavy haulage work, and the Ferguson Mower bringing up the rear.

As a matter of interest mainly to the co-operating farmers and landlords the gross cost of bracken eradication to date has been calculated for each farm according to the type and operating costs of each machine used. These are set out, exclusive of any Bracken Eradication Grant which would otherwise have been available, in Table VI. below.

TABLE VI. THEORETICAL GROSS COSTS OF BRACKEN ERADICATION
PER FARM BY END OF 1952 SEASON

<u>Name of Farm</u>	<u>Gross Costs</u>	<u>Acres</u>	<u>Acres</u>
Kelsocleuch Farm	£172.10.11	for 107.8	treated 4 times
Cocklawfoot Farm	54.14.10	" 42.8	" " "
Mowhaugh Farm	183. 3. 6	" 127.3	" " " plus 10.8 treated twice
Cliftoncote Farm	34.17. 2	" 33.6	" " " - - - -
Belford Farm	98.18. 6	" 79.7	" " " - - - -
Hownam Mains	48. 6. 6	" 42.5	" " " plus 10.8 treated twice
Over Chatto	55.13.11	" Nil	" " " " 81.2 " "
TOTAL	£648. 5. 4	for 433.7	treated 4 times plus 102.8 treated twice

When one considers that the actual cost to the co-operating farmers is merely the cost of the fuel plus the possible inconvenience of visits of scientists and other technicians over their hill land it must be agreed that they are getting full value for their co-operation. It must be pointed out that it is impossible for any of these machines to deal with 100 per cent of the bracken even in the areas treated because of the presence of ditches, dykes, boulders and outcrops of rock near which it is impossible to bring a machine with safety. The strips of bracken surrounding these obstacles should be cleared by scythe or flame-thrower or some other method to reduce the possible spread of bracken in future years.

From Table VI. an average gross price per cut works out at $6/8\frac{1}{2}$ d. per acre, i.e. $13/4\frac{1}{2}$ d. per acre per season or £2 per acre for complete eradication working on the assumption that six cuts in three years will so weaken the bracken that it will be many years before any further action has to be taken by the farmer. These are figures for an average type of machine working under conditions whereby 100 per cent eradication is not expected for reasons already stated. For 100 per cent eradication the gross figure would be nearer £3 per acre than £2, dependent of course on the number and extent of the areas of bracken which are inaccessible to the machines; and this varies from site to site even in Bowmont and Kale Valleys.

TENTATIVE CONCLUSIONS

We have now come to the end of the second year's treatment of these areas of bracken selected for eradication in Bowmont Valley and while there has been a visible decrease in the height, strength and density./

density of the bracken in 1952 compared with its condition at the start of the trials a true appraisal of the comparative performances of the four machines as regards the measure of success at this stage lies more in the hands of the botanist than the economist.

As was the case in 1951 the time lost by the breakdowns of the two cutting machines - the Henderson Slasher and the Ferguson Mower - and the consequent heavy repair bills are serious disadvantages of this type of machine in such a short cutting season, though it is encouraging to note that this loss of time was almost halved in 1952 compared with 1951. On the other hand the two crushing machines - the Holt Breaker and the Cuthbertson Crusher - with relatively few breakdowns, were able to forge ahead unhindered. Here again the time lost on breakdowns of the machines in 1952 was reduced when treated as a percentage of the total time spent on the job.

As for total costs incurred during the season the same order has been more or less maintained during both years. The Holt Breaker at £46. 9. 4d. in 1951 and £68.11.10d. in 1952 showed up as the cheapest machine to operate followed by the two cutting machines, though their order is reversed in 1952 compared with 1951. In both years the Cuthbertson Crusher with its heavy depreciation charges was the dearest machine to operate costing £98.11. 5d. in 1951 and £102. 2. 5d. in 1952. The individual costs of the Henderson Slasher and the Ferguson Mower varied between £70.11. 9d. and £91.12.10d. over the two years.

As to the acreage twice treated per machine per annum the Holt Breaker again led followed by the Henderson Slasher, the Cuthbertson Crusher with the Ferguson Mower bringing up the rear. Over the two years the proportionate acreage twice treated works out as follows:- Holt Breaker 2.3: Henderson Slasher 1.9: Cuthbertson Crusher 1.6: Ferguson Mower 1.0 though it should be stated that the last named machine had many teething troubles during 1951 but that during 1952 with the largest number of hours spent on the job it still covered the smallest acreage of bracken of the four machines.

At this stage with the experiment only in its second year it is too soon to compare accurately the four machines from the figures and tables provided in this report. A combined analysis of the technical and botanical aspects of the problem, both of which are outside our province, will be necessary in conjunction with the costs and performances dealt with here before a true comparison can be accurately made.

ACKNOWLEDGMENT

We in this department are greatly indebted to Mr. W.J. West of the Scottish Machinery Testing Station and his colleague, Mr. C.A. Carlow, for all their help and courtesy shown us and to the farmers and tractor drivers concerned for their whole-hearted co-operation.

Inquiries regarding this report and any other recent publications of this department should be addressed to either the Secretary of the College at 13 George Square, Edinburgh or to the Provincial Agricultural Economist, 22 Rose Street, Edinburgh.