Tractors O.S.

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TRACTOR COST INVESTIGATION 1954-55

BY

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TRACTOR COST INVESTIGATION 1954-55

OBJECT AND METHOD OF THE INVESTIGATION

The principal object, when recording was started in autumn 1953, was to obtain clearer information on the running costs of diesel powered tractors, then just beginning to be common, in comparison with the vaporising oil driven tractors then prevalent. This information is of use in judging which sort to buy and whether to change; and it is also relevant as an item in the changing costs of farm products which this Department studies. In this report the records are summarised and the significance of the figures in these respects briefly considered.

The method of recording was by the driver using a log book, for daily entry of hours run by the engine, fuel and oil put in and type of work done, with weekly entry of man hours spent servicing and cleaning the tractor, petrol put in (to V.O. tractors), grease used and the nature of any repairs or renewals. The cost of repairs and of insurance etc. were obtained periodically from the farmer.

SUMMARY OF RECORDS

The investigation covered 58 tractors in 1954. Of these 32 were driven by vaporising oil, 25 by diesel fuel and 1 by petrol. The year-end dates were mostly in November and December 1954, but some were as late as April 1955. Records were continued for a second year for 16 diesel tractors and 1 vaporising oil tracklayer. Details of work done and fuel and oil cost are given for each tractor in Appendix I.

Variable Costs

Average figures for broadly comparable groups of vaporising oil and diesel tractors are given in Table I. Reference to the Appendix will show what types of tractor are included in the averages and also the figures for the excluded tractors which do not fit into the classification. The figures averaged are the pence per hour for each tractor-year, every recorded tractor-year (whether 1954 or 1955) being given equal weight. Fuel and oil are priced at the rates given in the Appendix. The use of constant prices, which are averages from a number of 1954 records, make it possible to calculate quantities from the values given, and simplify comparisons.

The cost of grease was not available continuously for all tractors. The average consumption per 1000 hours, in the available records (32 tractor-years) is 18.4 lb. which at 13 pence per lb. equals 0.24 pence per hour. This figure is included with the average oil cost of each of the four groups. The amount consumed does not seem to depend on type of tractor but rather type of driver.

To complete the variable costs, the man hours of servicing labour in each tractor-year (the 74 years listed in the appendix), expressed per 1000 running hours, were listed, the average being 80.0, or 0.08 hour per hour run. This includes all the servicing and cleaning, filling etc. normally done by the driver. Farm workshop labour on repair jobs is included among repairs. The 0.08 hour valued at 36.5 pence[*] is added to each of the four groups in the table. This item is an allocated cost, not a direct cash outlay.

Table I

Average Variable Costs: 62 Tractor Years in 4 Groups

	Light & Light-medium Tractors		Medium & Heavy Tractors	
	V.O.	Diesel	V.O.	Diesel
No. of 'tractor years'	13	20	18	20
Average hours run	1193	1292	747	1321
Pence per hour on:				
Fuel				
V.O. or Diesel	10.7	5.3	17.9	7.4
Petrol	2.8		4.1	
Oil and Grease	1.6	1.5	2.0	1.4
Total Fuel & Oil	15.1	6.8	24.0	8.8
Repairs	7.3	5.5	6.7	8.0
Total 'variable outlays'	22.4	12.3	30.7	16.8
Farm Labour	2.9	2.9	2.9	2.9
Total variable costs	25.3	15.2	33.6	19.7

Annual Costs

The average cost of all 74 tractor years is shown in Table II, Column 1. The 'variable' items given on an hourly basis in Table I are here repeated in the form of averages of the annual figures for each tractor year: and to these are added the fixed annual costs, comprising the relatively small cash outlays in insurance and tax and the major item of depreciation, or proportion of the tractor's original cost allocated against this year of use.

It would be reasonable when considering a single tractor, especially a tractor which there is no intention of selling for a long time, to regard annual depreciation as to some extent variable according to amount of use of the tractor: but for the purpose of an average, at least, it is satisfactory to regard it as a fixed cost.

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[*] Standard rate for 1954

The method of allocation used here is 28⅛% of cost in the first year and the same percentage of remaining value in subsequent years. This is the standard rate allowable in the farm account (disregarding initial or investment allowances), and the final effect of its operation appears reasonable as it reduces the remaining value to an 'old-tractor' or semi-scrap level of 10% of initial cost at the end of the 7th year.

Table II

Average Annual Costs: 74 Tractor Years

	£ per Annum		Pence per Hour of Average Hours (1133)		%
Fixed Outlays:					
Insurance	3.10		0.7		
Tax	2.00		0.4		
		5.10		1.1	3
Fixed allocated cost: Depreciation		74.50		15.8	41
TOTAL FIXED COSTS		79.60		16.9	
Average variable costs:					
Fuel & Oil	54.96		11.6		30
Repairs, wheeled tractors only	32.03		6.8		18
Labour	14.35		3.0		8
TOTAL VARIABLE COSTS		101.34		21.4	
TOTAL COSTS		180.94		38.3	100

The repair cost quoted is the average of the wheeled tractors only. The tracklaying tractor incurred an average repair cost in the two years of £240 a year on tracks alone. Inclusion of this would increase the average by £7 a year.

Column 2 of the table is derived from Column 1 by dividing by the average hours worked in the 74 tractor years.

DIESEL VERSUS VAPORISING OIL

(a) Meaning of Cost per Hour The hours run are engine hours, not hours worked, and it needs to be remembered that on certain jobs the diesel engine will be switched off for a proportion of the time when a vaporising oil engine (owing to the inconvenience of starting it) would be left running. Therefore the diesel tractor is a little more economical, relatively, than these figures show. This difference, averaged over all work, might be of the order of 10%. That is, when a vaporising oil tractor's engine runs during the year, doing a normal selection of farm jobs, for 1000 hours, the engine of a diesel tractor doing similar jobs for the same number of working hours might run for only 900 hours.

(b) Fuel and Oil The relative cheapness of the diesel tractors as regards fuel is clearly demonstrated. In both comparisons of Table I the cost of the vaporising oil is at least double that of the diesel fuel; and in the case of the heavier groups, when the rather high petrol and oil costs are added the vaporising oil group shows nearer three times the fuel and oil cost of the diesel group.

(c) Repairs The differences shown in Table I between the repair costs in the several groups are not very significant. They prove nothing and suggest very little. Repair costs on a sample of tractors in any one year vary so very widely that differences of this order in groups of this size can quite easily occur by chance. Of the 72 tractor years (wheeled tractors) 12 had repairs of less than 1d. per hour and 8 of over 15 pence: with another 6 under 2d. and another 8 over 1/-. The similarity between the four repair figures does however suggest that the total repair costs of the different types are not widely different.

Fears have been expressed that engine repairs might prove very heavy for diesel engines used on farms since the expensive and delicate fuel pumping and injection system is easily wrecked by dirty fuel. However, the engines studied here seem on the whole to be standing up fairly well to farm conditions; although it must be admitted that we are likely to have a sample of 'good' drivers. It is also a fact that the majority of the diesel engines date from 1952 or 1953, while nearly all the vaporising oil engines are older. There is a gap in our knowledge here which can only be remedied by surveying the repair costs of a number of older diesel tractors. It must be pointed out however that engine repair costs would have to be heavily increased before they would make much impression on the tremendous gap in fuel and oil costs.

This becomes clearer if the division of repairs by type of repair is considered. Of the total (wheeled tractors) repair costs, 32% relate to tyres, 31% to other non-engine repairs (starting, transmission, body, lift, filters, batteries, servicing) 23% to engine rebore or decarbonising and 14% to other engine repairs. There is no significant difference between the diesel and vaporising oil 'tractor years' in respect of the last item: but clearly even supposing that as time went on, it was doubled or trebled for the diesel tractors, this would add only 14% or 28% to the repair cost of about 7d. per hour: 2d. at the most.

(d) Depreciation Included Total costs apart from depreciation, then, show a difference between the two types of 10d. an hour for the smaller tractors and 1s. 2d. an hour for the larger ones. Table II however shows depreciation to be 41% of total costs: and the diesel engine is inevitably somewhat more expensive

to produce. But taking this difference to be about £100 or say 18% of initial cost and working from the pence per hour figures in Table II, it is evident that the vaporising oil tractor will save in the long run only something like 3d. (18% of 15.8 pence) on this score, compared with the additional other costs of approximately 1/-: and the resulting net difference (9d.) is over 20% of average total cost as given in Table II.

If the same kind of rough balance between variable and initial cost is struck separately for the two sizes of tractor, the advantage of the diesel engine in the smaller tractor is less than in the larger, not only because we are reckoning on an hourly basis and the total variable cost with both engines is lower in the smaller tractor, but also because the extra initial cost of the diesel engine is somewhat higher for the smaller tractors. Reckoning extra hourly depreciation in the same proportion to extra purchase price as the 15.8d. in the table is to the average original purchase price of these tractors (approximately £450), the smaller diesels cost 4.2d. extra and the larger diesels 3.2d. Then the net advantage of the smaller diesel tractors is 10.1 - 4.2 = 5.9 pence per hour and of the larger tractors 13.9 - 3.2 = 10.7 pence per hour. These figures converted to an annual basis amount to £28 and £51 respectively. The saving, expressed as a percentage of the cost of running a vaporising oil tractor, amounts to 14% and 21%.

These rough estimations give a strong indication confirming the rightness of the course which nearly every farmer takes when buying a new tractor to-day, in choosing diesel.

The advantage is dependent on the price of the fuels per gallon remaining much the same and also to some extent on the petrol for starting the vaporising oil tractor remaining heavily taxed. A tax of about 1s. 5d. or 1s. 9d. respectively per gallon of diesel fuel would apparently wipe out the advantages in total cost per running hour of the smaller and larger diesel tractors respectively.

(e) Individual Problems The above calculations are based on the cost over the whole life of the tractor; they do not cover the question of the real cost to the farmer of the additional capital required; and they do not answer such questions as whether it is better to dispose, (at any particular price) of a satisfactory vaporising oil tractor and replace with a new diesel one, or the opposite question whether a great difference in second-hand price should not induce a second-hand purchaser to choose a cheap vaporising oil tractor. The answers to such questions for any particular farmer are also liable to depend on the effect of the various possible courses on his income tax liability. Broadly, for an

individual paying at standard rate, this reduces the net effect of any change in costs by nearly 50%: and in the long run it affects running costs and capital outlays in exactly the same way - apart from the short-lived investment allowance. In many cases its effect on balancing calculations of the kind made here is not very great.

It may be worthwhile to consider a few examples of such individual questions. For instance, how long is the purchaser of a new diesel tractor compared with a new vaporising oil tractor out of pocket? The answer suggested by these figures is that a small tractor may save an additional price of £120 in about 2800 hours (at 10.1 pence per hour) and a medium tractor an additional price of £90 in 1550 hours (at 13.9 pence per hour). In view of the heavy use of many diesel tractors, this is not long to wait. If this is a fair measure of capital requirement, that is to say about £100 diminishing to nothing in one or two years, the prospective deferred return of £50 and more a year on running costs thereafter would seem an adequate return. At the same time for a farmer short of capital for expansion of productive enterprises the real cost of tying some of it up in machinery, even only temporarily, may be high.

The economics of changing over is a more practical question for many. Possibly a common case would be a four year old vaporising oil tractor with a second-hand value of £150, which can be expected to last another 3 years and then be worth £40. Would a farmer be well advised to replace with a diesel tractor now rather than in 3 years' time, on account of possibly £60 a year which he will save in fuel and oil, plus possibly £15 a year in repairs because the tractor is newer? To decide this we must do yet more guessing and suppose that the diesel tractor costing £650 is worth £250 after 3 years. Then the difference in his tractor costs for the 3 years, as a result of changing now, will be an extra £290 depreciation partly compensated by a gain of £225 on running. It is true that his subsequent depreciation costs will be lower for a time but on the other hand he will have had to provide £500 of capital 3 years in advance. This seems a lot to pay for diesel convenience plus being in the fashion. It may be that the assumed figures are unduly unfavourable to the diesel tractor. If it is valued at the end according to the milder depreciation system suggested in Appendix II, this will improve its position by about £100. But even if the 3 years' costs are about the same, the capital aspect may often be of vital importance.

Similar calculations may often show that the cheap second-hand vaporising oil tractor is a good buy, more particularly for the light user who is often the second-hand purchaser. His savings on fuel per annum will be only in proportion to use and may often not compensate for the need to find the extra price of a diesel tractor and to write part of it off annually.

Appendix I: Individual Results

Work done and fuel and oil costs per hour: 58 tractors for one year, ending between November 1954 and April 1955 and 16 of these for a second year (Yr.2).

Vaporising Oil is reckoned at 16.75 pence per gallon, Diesel Fuel at 14.375 pence per gallon, oil at 11.0 pence per pint, petrol at 6.38 pence per pint.

The divisions between the four sizes mentioned are at 45, 35 and 31 brake h.p.

Code No.	Type of work done: % of tot. eng. hrs. Plough	Cult.	Cart	Belt	Other	Total Engine Hours	Fuel and Oil Costs: Pence per Hour V.O.	Oil	Petrol	TOTAL	£ per annum total
V.O. TRACTORS											
Eight Light Tractors:											
9	12	11	46		31	1175	9.23	1.10	2.82	14.15	69
15	5	8	68		19	1187	8.82	1.04	2.68	12.54	62
29	13	8	42		37	1209	10.54	2.20	3.62	16.36	75
32	22	17	46		15	1124	11.23	1.48	2.54	15.25	71
46	29	17	30		24	784	10.82	1.46	3.53	15.81	52
48		8	83	1	8	1636	9.65	1.62	3.87	15.14	103
61	17	14	39		30	1097	10.04	1.25	2.31	13.60	62
67	28	19	37		16	1318	10.63	1.53	2.44	14.60	80
(8)	15	12	52		21	1191	10.12	1.58	2.98	14.68	72
Five Light-medium Tractors:											
17	5	7	67	1	20	1227	15.28	1.64	4.62	21.54	110
37			77	22	1	1091	10.50	0.67	1.24	12.41	56
38	18	16	41	5	20	1331	10.27	1.19	1.80	13.26	73
41	32	8	31		29	1146	14.32	1.04	1.70	17.06	81
36	23	13	33	2	29	1188	7.89	.55	2.73	11.17	55
(5)	16	9	49	6	20	1197	11.65	1.02	2.42	15.09	75
Twelve Medium Tractors:											
3	28	18	24	14	16	537	18.00	2.11	3.76	23.87	53
10	25	17	38	10	15	795	12.51	1.00	7.73	21.24	70
11		21	66	4	9	384	11.73	1.78	4.86	18.37	29
14	28	30	21	12	9	875	18.03	.88	3.46	22.37	81
16	3				97	216	14.19	1.32	4.03	19.54	18
25	22	14	24	1	39	1300	20.08	2.45	4.17	26.70	154
31		12	70	7	11	750	23.20	2.64	3.85	29.69	93
42		88		12		82	31.27	1.61	4.05	36.93	13
60		10	88	1	1	668	22.59	.89	3.75	27.23	76
71	23	5	55		17	1625	13.22	.94	3.07	17.23	117
68	19	22	42		17	1326	20.84	3.60	3.02	27.46	151
64	19	15	25	11	30	1050	15.88	1.21	3.18	20.27	89
(12)	18	16	41	5	20	801	18.46	1.70	4.08	24.24	79
Five Older Medium Tractors:											
22			66	28	6	894	15.00	1.38	3.23	19.61	73
35		21	79			263	12.60	1.67	7.58	21.85	24
43	3	11	67	17	2	680	14.61	1.36	4.79	20.76	59
55		27	73			676	17.86	1.87	2.60	22.33	63
4	38	19	8	19	16	269	23.22	4.58	5.05	32.85	37
(5)	4	13	64	15	4	556	16.66	2.17	4.65	23.48	51

Appendix I (Contd.)

Code No.	Type of work done: % of tot. eng. hrs. Plough	Cult.	Cart	Felt	Other	Total Engine Hours	Fuel and Oil Costs: Pence per Hour V.O.	Oil	Petrol	TOTAL	£ per annum total
One Heavy Wheeled Tractor:											
45		35	65			1047	17.09	1.09	2.03	20.21	88
One Heavy Tracklayer Tractor:											
50	43	24	9		24	1010	12.24	2.21	1.67	16.12	74
Yr.2	36	17	33		14	735	15.05	3.40	1.08	19.53	60
PETROL TRACTOR							Petrol				
18		1	85		14	389	34.40	1.56		35.96	58
DIESEL TRACTORS							Diesel Fuel				
5	13	15	39	3	30	1154	4.85	1.81		6.66	32
Yr.2	26	13	29	3	29	1350	4.75	1.69		6.44	36
51	22	13	24		41	1362	5.73	1.12		6.85	39
53	18	16	29	8	29	1618	5.74	1.15		6.89	46
Yr.2	9	11	42	2	36	1495	4.68	1.32		6.00	37
54	33	21	32	1	13	1399	4.82	0.98		5.80	34
56	24	12	39	1	24	1538	4.65	1.76		6.41	41
Yr.2	26	8	36	1	29	1652	4.95	1.38		6.33	44
57	8	14	56		22	1249	5.04	1.13		6.17	32
Yr.2		11	69		20	1676	5.82	1.10		6.92	48
62	45	31	20		4	896	5.49	1.11		6.60	25
65	27	16	38		19	1063	5.19	1.24		6.43	29
Yr.2	26	13	43	1	17	1186	4.34	1.27		5.61	28
70	19	13	35	7	26	1381	5.39	1.22		6.61	38
72	25	19	44		12	1304	3.65	1.46		5.11	28
Yr.2	23	19	45		13	1273	4.34	1.09		5.43	29
80	17	4	46	9	24	815	4.50	1.31		5.89	20
Yr.2	18	30	30	4	18	819	6.85	0.46		7.31	25
(18)	21	15	39	2	23	1291	5.05	1.26		6.31	34
One Light-medium Tractor:											
66	4	8	45	32	11	1261	7.95	1.36		9.31	49
Yr.2	34	7	35	9	15	1354	6.71	1.18		7.89	45
Thirteen Medium Tractors:											
59	4	8	45	32	11	1992	6.07	1.19		7.26	60
Yr.2	8	4	47	35	6	1308	7.30	0.76		8.06	44
24	26	14	21	2	37	1434	8.01	0.81		8.82	53
Yr.2	37	10	28		25	1459	7.78	1.15		8.93	54
26	25	26	29	1	19	1144	5.78	1.84		7.62	36
27	21	21	31	8	19	1722	7.26	1.02		8.28	60
30	22	18	26		34	1137	7.53	0.78		8.31	39
Yr.2	26	15	30	2	27	1351	8.30	0.68		8.98	51
34	20	25	32		23	1284	6.79	0.92		7.71	41
Yr.2	28	20	31		21	1342	6.59	0.98		7.57	42

Appendix I (Contd.)

Code No.	Type of work done: % of tot. eng. hrs.					Total Engine Hours	Fuel and Oil Costs			
							Pence per Hour			£ per annum total
	Plough	Cult.	Cart	Belt	Other		Diesel Fuel		TOTAL	
73		12	47	11	30	740	7.50	0.91	8.41	26
74	9	22	57		12	1118	7.76	0.99	8.71	41
71a	23	16	39		22	1298	6.44	0.55	6.99	38
Yr. 2	25	16	41	1	17	1616	6.80	0.68	7.48	50
8	36	9	23	28	4	1281	9.72	2.35	12.07	64
13	20	18	50		12	952	8.99	1.84	10.83	43
Yr. 2	30	24	32	1	13	932	8.37	1.30	9.67	38
33	18	25	32		25	1619	6.91	1.52	8.43	57
Yr. 2	17	14	48	3	18	1725	6.95	1.94	8.89	64
39	29	11	45		15	970	7.34	0.68	8.02	32
(20)	21	16	37	6	20	1321	7.41	1.14	8.55	47

Appendix II: Depreciation

In this report, depreciation allocations for individual tractor years are not shown, either in total or in the form of an hourly cost. The omission is made deliberately because of the artificiality of the resulting figure. This results from two causes. The first is invariability of the allocation according to amount of use, so that a tractor used for 300 hours in a year appears to cost four times as much per hour for depreciation as a tractor used for 1200 hours. The second is the effect of the system by which declining allocations are secured, which makes tractor work appear very expensive in the first year or two compared with the middle and later part of a tractor's life. The following suggestions are a contribution to discussion of the problem of arriving at a fair cost for an individual tractor hour.

Varying according to Use A part of the real cost of providing the tractor in the first place should certainly be allocated according to mere lapse of time. Some parts (e.g. tyres) deteriorate in any normal storage-between-use, and improvements in design of new tractors steadily reduce the relative value of old ones. Nevertheless, engine wear, structural wear, liability to accident are related to the amount and conditions of use. Therefore it might be reasonable to vary an allocation based on time, by regarding some of it (say half) as variable proportionally to hours worked. Thus if the standard rate were charged for 1100 hours, a 100 hour variation in either direction would alter the depreciation charged by one-twenty second. The effective rate on this basis would be 17.9% for a tractor worked 300 hours, 23.0% for 700 hours, 28.1% for 1100 hours and 33.25% for 1600 hours. Applying to these rates the test, how long would they take to reduce the value to 10% of original, the answers are approximately $11\frac{3}{4}$, $8\frac{3}{4}$, $6\frac{3}{4}$ and $5\frac{1}{2}$ years. This result would appear to accord with commonsense.

Levelling the Decline Here again there is no doubt that even from the point of view of the continuing owner (that is, apart from the contingency of sale, for second-hand price quickly drops away below new price, owing to the element of risk to the purchaser) allocations should decline. One reason is that as the tractor gets out of date it becomes steadily less useful in relation to what is currently expected of a tractor, so that a smaller cost per hour should fairly be allocated to its later hours of use. Another is the low cost of maintaining a tractor in

the first year or two. A larger allocation of the purchase price is a recognition that it covers repairs in these years. Another very practical reason is that the life of the tractor is unknown: it will certainly provide service in its first and second years but while it could provide almost equal service in its eleventh and twelfth years, it is just as likely to provide none at all. This increasing uncertainty has to be allowed for.

But all these points together do not mean that a farmer owning new tractors need consider that they cost 3/1d. per hour in depreciation, while in the fourth year they are down to 1/2d. and in the sixth year to 7d. - which is the effect of the system followed here. The particular shape of the 'curve' of decline is the result of a method of calculation adopted because it happens to fit moderately well with the usual shape of the decline of market value. From a costing point of view, where ownership is expected to continue, it is open to the criticism that a very heavy allocation is made in the first year, after which allocations too rapidly become very small. To bring the shape under control, it might be better to use a series of declining percentages of the original price, which under this system would remain the basis of calculation. An example of such a series is given below. Final 'tailing off' after the 9th year could be by the present system.

	Suggested System			Present System		
YEAR	% of Orig. Cost	% Remaining	Pence per hour: £600 Tractor 1100 hrs. p.a.	% of Orig. Cost	% Remaining	Pence per hour: £600 Tractor 1100 hrs. p.a.
1	18	82	24	28	72	37
2	16	66	21	20	52	26
3	14	52	18	15	37	20
4	12	40	16	11	26	14
5	10	30	13	7	19	9
6	8	22	10	5	14	7
7	6	16	8	4	10	5
8	4	12	5	3	7	4
9	2	10	3	2	5	3

The principle that it is sound business to write off heavily and early is of course not questioned: and the recognition of this principle by the Income Tax rules is most desirable. But where any costing is being done and the relative cheapness or dearness of production on any particular farm or enterprise is in question, a more flexible scheme may give a more useful answer.

Appendix III: When to Sell?

One suggestion implicit in the foregoing discussion is that a policy of replacing tractors with new at the age of 2 or 3 years is an expensive way of securing reliability. This depends of course partly on the second-hand price which happens to be in fact obtainable: and it also depends partly on the normal curve (rise or fall according to age) of repair costs.

On this last point it would be unwise, for the reason given earlier, to make any very firm deductions from the evidence we have. So far as it goes however it is a fair summary to say that repair costs (per hour of running) seem to rise until some point in the second year (1200 - 2200 hours), after which there is no distinguishable relationship between their level and the age of the tractor.

If this is in fact the shape of the normal curve of repair costs and if the obtainable second-hand price declines by a smaller amount each year, it is clear that the total cost of keeping and using a tractor an additional year before selling it becomes less year by year and that the older the tractor the lower will be its average repair-plus-depreciation cost per year (or hour) of its life. The conclusion suggested is that from a cost point of view a tractor (an average tractor) should usually be kept as long as it effectively performs the tasks required of it.

There still remains the possibility that it might pay to sell while the curve is rising, that is before repairs start occurring to any great extent. For this to be so, repairs would have to be rising faster than market value depreciation was going down. This is a condition which has to be satisfied before it is worth while, on the grounds we are considering, selling at an earlier rather than a later date.

This is clearer in an example. If the market value depreciation of a £650 tractor followed the curve of 28⅛% per annum, it would lose £185 in value in the first year, £130 in the second and £95 in the third: reductions of £55 and £35 respectively. Could it be the fact that normal repairs in the years in question rise faster than this? To do this, supposing they were £5 in the first year they would have to top £60 in the second year. This is the condition for a policy of sale at one year to pay better than sale at two years; and it is clear that normal repairs do not behave in this way. It is perhaps not quite so difficult to conceive that they might be say £10 in the second year and over £45 in the third year; that is, if there were a 'bump' in repair requirements at that stage. If we suppose that, it would also be fair to suppose a bump in the descent of market value

depreciation; but if there were not, and market value descended evenly as assumed, it would pay better to sell at 2 years than at 3 years. Even if this were the case however, it would still probably pay yet better to sell at 4 or 5 years, because the total repair-plus-depreciation cost-to-date per year (or hour) of life, even if it rose for a time, would start falling again.

The problem at the latter end of the tractor's life can be considered on the same basis. At this time, market value depreciation is low and is declining very slowly. A small increase in normal repairs could more than counterbalance this, and cause repair-plus-depreciation costs to start to rise. This would not indicate a policy of selling, however, until they rise above average repair-plus-depreciation costs for the farmer in question: that is, start to raise his average. As a rule, it seems that cost considerations point to retention of a tractor until the end of its effective life, or until some repair is necessary which its foreseeable life is too short to bring down (when averaged over that life) to something like the average level on the farm.