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Apples Cost of Production

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ECONOMICS OF FRUIT FARMING. REPORT #2

The Cost of Growing Apples

By

R. R. W. FOLLEY

DEPARTMENT OF AGRICULTURAL ECONOMICS

ECONOMICS OF FRUIT FARMING

Report No. 2

The Cost of Growing Apples 1948-51

Experience of Sixteen Crop-Years on Six Farms

By

R. R. W. FOLLEY

Acknowledgments are due to Mr. J. B. Butler who initiated this project and was actively concerned in it up to 1951

Copies of this Report may be obtained, price 5/- *post free, on application to the Secretary, Wye College, near Ashford, Kent*

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NOTE.—It is regretted that two whole years have separated the end of the costing period and the publication of the costs. Total costs in 1953 would be 5 per cent. higher than those shown as the 1951-equivalent.

SUMMARY

Cost accounting of apple growing was carried out for six farms between 1948 and 1951. The apple orchards were of various types, were all in full bearing and, with one exception, were on mixed farms: they totalled 311 acres. A total cost of growing apples has been built up from the costs of the successive operations on the crop, together with full overhead charges and allowances for orchard replacement (pp. 8-10). The separate charges for labour, materials and services have been shown in the full cost for each major yearly operation, but only a single full cost for minor and occasional operations.

Outlays on apples were at the rate of £100 per acre in bearing. On the bearing acres alone, taking all the orchards together (i.e. including both culinary and dessert varieties) a mean total cost of £98 8s. per acre (6s. 7d. per picked bushel of 40 lb.) was made up of: pruning, £9 15s.; spraying, £20 17s.; cultivations, £5 16s.; manuring, £17 18s.; other operations, £3 8s.; picking, £17 11s.; operational overheads, £11 3s.; administration, £4 5s.; provision for replacement, £5 6s.; other costs, £2 9s. (p. 32)

A fairly uniform structure was noted in the average yearly operational costs for the orchards although they differed greatly in type. Certain near-constant ratios were calculated (pp. 34-6).

Later, costs for dessert-type and culinary-type orchards were separated and compared. Dessert varieties on bush trees (largely Cox's Orange Pippin) were 30 per cent. more expensive to grow than culinary varieties, by reason of greater care of the trees and higher manuring: culinary varieties on taller trees (largely Bramley's Seedling) were more expensive to prune and to pick. On average, 268 picked bushels of dessert apples per acre cost £98 (7s. 3½d. a bushel), including 313·5 hours of manual labour, and 332 bushels of culinary apples per acre cost £93 (5s. 7d. a bushel), including 320 hours of manual labour (p. 37).

All comparisons of costs are made on the basis of an average of at least two years' work, with 1951 prices applied throughout.

INTRODUCTION

There is an increasing demand for economic information about top-fruit growing. Many fruit growers feel that in recent years the tide of commercial events has turned against horticulture generally. Newcomers to the industry, who lack previous experience, are seeking some reasonable standard of performance or efficiency, against which to judge their own efforts; whilst many established growers who now have much-expanded interests in top fruit are beginning to look more critically and more carefully into their own management practices. Advisers in fruit-growing are also becoming more interested in the financial repercussions of the technical advice they give.

There can be little doubt that economic aspects of fruit-growing will become more important to growers as national production expands. When managerial decisions have to be made, the issue of: "How is this new step going to affect my profits?" will come more into the foreground. As supplies increase, prices must fall and market premiums be pared down, while the planting-up of dessert varieties of apples can be expected to go on until the average net return per acre about equals that from culinary varieties —or, for that matter, from pears, plums or cherries. It will be increasingly desirable for growers to know more of the general economic situation in the top fruit industry. Even so, to know a current situation may not be enough: with so long a wait between planting and cropping, it is *future* situations which are most relevant to present plans.

Against this background, this report can do little more than start a breach. Henry V's exhortation before the walls of Harfleur will have to be invoked many times before a serviceable fund of economic knowledge can be built up. The report provides facts and figures about working costs, in terms of operations, in relation to type of tree, cultural practice and yield of fruit, and its chief use is to give growers wider acquaintance with other—possibly alternative—types of production, and with recorded facts, not hearsay.

Through the goodwill of certain growers, the Economics Department has been preparing annual cost accounts for selected fruit farms since 1948. The present report covers progress up to the end of the 1951 harvest and summarizes the experience of sixteen crop-years. In effect, this marks the end of the experimental stage in the enquiry. Since 1951 the costing system has been standardized; no farms have fallen out, and the work is now on a satisfactory long-term basis.

THE TYPE OF FARMS COSTED

There were 311 acres of bearing apple trees in 1951 on the six farms concerned. One farm is entirely given over to top fruit. The remainder are farms on which top fruit production is the major enterprise though it is combined with either other horticultural crops or with general farming. This explains the use of cost accounts, as only with this approach can the results for top fruit be separated from the total farm results. Some of the growers have apples, pears, plums and cherries, but the one specialist is an apple specialist and all growers rely largely upon apples for their income. Plums and cherries do not feature strongly on the farms and have not been costed in the same detail. Pears are a subsidiary interest to apples, but on the three fruit farms for which pear costs are available the plantations are immature and the results therefore do not merit inclusion in this report.

The figures presented, then, refer to mature plantations of culinary and dessert apples which are the most important sources of income on the farms in question. It is also important to emphasize that the results, whether expressed as annual outlay or cost of growing, should not be unthinkingly applied to specialized farms. They are a guide to the costs of growing apples on mixed farms.

Objections can be raised against the idea of calculating a yearly production cost for a crop that has many years' life and is also, from the standpoint of management, in a state of flux for long periods (for example, when tree numbers are periodically being reduced). Similarly, there may be objections to this attempt to define working costs for a relatively narrow range of circumstances (for one thing all the farms are in Kent or Sussex) when apple growing as a whole embraces wide differences in type of tree, size of orchard, cultural system and care in husbandry. Finally, it will be noted that late spring frosts were not serious between 1948 and 1951 in their effects on the costs of production.

These objections have been met by reporting on at least two years' experience on each farm and by including farms of different character. Thus, different types of orchard on the same farm have, in some cases, been made the unit for costing where it was thought there was anything to gain by treating them separately. Few fruit farms are just one block of the same sort of trees, and the costs per farm given in this report are, in effect, average costs of several different plantations. The actual range in type of orchard covered is therefore wider than might be thought at first from the description of the farms, whilst the cost figures are correspondingly less specific to one type of production. Results for the separate plantations are not reported.

It must be repeated that the costed unit featuring in this report is all the bearing apples on the farm. This may mean that the costs ascribed to growing dessert varieties conceal the (different) costs on a few trees of early cookers on a similar rootstock, and that pollinators and a few other trees on a predominantly-cookers farm may be dessert varieties of different age and habit of growth. In actual fact, acreages of culinary apples on the dessert-type farms are not so large as acreages of dessert apples on culinary-type farms, and the typical Kentish style of production—standard trees of culinary varieties in grass—is only lightly represented. No grazing sheep nibbles off the sward on these farms, nor any rabbit.

Together with the change of seasons there has been a change in the prices of the things fruitgrowers need to buy. Till 1951, the change in all these prices was always upward, often substantially so. Between 1949 and 1952 the average increase was 7 per cent. a year. Taking labour cost as 45 per cent. of the total cost of growing apples,

manures as 12 per cent., spray materials as 20 per cent., and services and sundries as 23 per cent., a weighted average index price of purchases for each calendar year (1948 = 100) would run:

1948	1949	1950	1951	1952
100	102·3	108·6	125·1	129·0

To help in the interpretation of the costs, a physical description of the farms to which the figures relate has been given. The co-operating growers desire to remain anonymous, but they have agreed to the publication of these basic particulars of their farms.

Many readers will look in vain in this report for some disclosure of the income from apple-growing and the profit levels to be found in the various circumstances. As the figures cannot speak for themselves, let it be added that income exceeded expenditure on these farms in fifteen years out of the sixteen, and that the costs as given, though showing considerable range, are believed to be moderately high in each case for the type of production undertaken. In other words, the growers are all farming fairly intensively in their own way.

Generally speaking, there is at present more possibility of gain by spending rather heavily in order to secure the best price for the fruit than in withholding expenditure for the sake of producing at lowest total cost. With a valuable apple, growers can still regard cost as second in importance to the attainment of maximum market revenue. Cost of production comes more into the picture with a relatively low-priced apple, when no amount of spending will add much to the market value. But cost is merely one factor in the determination of profit; and in any case, from the management point of view, it is not a total cost already shown to exist so much as the net result of a little more or little less cost that is important.

The study of profitability will inevitably grow out of economic research into production. It may be possible, by close observation of circumstances and faithful recording of results in commercial practice—by extending, as it were, the technique of the laboratory into the practical sphere—to sort out the unprofitable practices: but these developments are for the future.

HOW THIS REPORT MAY BE FOUND USEFUL

Most growers in their lifetime come to know the workings of only one farm, and many of these are satisfied to know that the farm as a whole is paying reasonably well: they take no account of the contribution which the separate plantations or enterprises make to the whole. There are other growers who like to "manage" their farms, and they may find interest in the records of other types of practice, and in the broad issues as between, say, dessert and culinary varieties, half-standard and bush trees.

In general, the costs as presented—divorced as they are from revenues—have no direct or simple implications for management. There is no implied suggestion, for example, that the highest-cost grower should give heed to the cost distribution of a lower-cost grower with the aim of reducing his own costs, or that a lower yield on one farm could be raised to that on another farm by adopting the latter's manuring standards. What may be learned from looking at the variations in cost is roughly by how much a bushel the cost goes up as the yield per acre goes down: from this position the value of different methods of raising yield can be better assessed. A working knowledge of the relationship between yield per acre and cost per bushel will surely help the grower who receives an offer for his apples "at the foot of the ladder".

Any benefit the report may have on farms will probably be found in the following features:

(*a*) *working costs and employment of labour* provide examples of profitable levels of expenditure.

(*b*) *costs of operations* show the relative importance of each operation, in different circumstances, enabling a better appreciation of how worth while each one is—fruit thinning, for example.

(*c*) *cultural costs* together with picking costs, when subtracted from total costs, indicate the size of the "overhead" burden that has to be carried, irrespective of the size or quality of the crop.

(*d*) *composition of the cost of operations*, separating costs of labour, materials, and services of capital equipment, shows:

(i) which is the expensive element in operations, and

(ii) how changes in the use of one element would affect the cost of the operation: for example, the labour and machine time required to spread 15 cwt. artificials per acre is very little more than that for spreading 3 cwt. per acre;

(iii) how the total cost of an operation can be gauged from the cost of labour. The cost of pruning, for instance, is almost exclusively the cost of labour, but the piece-rate per bushel for picking may be only 85 per cent. of the full cost of picking when tractor, trailer and container expenses are added.

(*e*) *hours of manual labour* (unless there is a change in policy in growing) show only small fluctuations, and this suggests

(i) that the idea of "standard time" may have some bearing on fruit-growing, and

(ii) that extra time on one job is compensated for by withdrawals elsewhere. When a balance is struck for 1953, the extra time on scab control will be found to have been taken largely from other work, and the costs during the year will not be increased by the full amount of the cost of the additional spraying.

(*f*) *outlays on occasional operations* may help to give an appreciation of the financial advantages of, say, grassing down in borderline cases; for a great deal of levelling and preparation might be necessary before a good "take" could be assured.

(*g*) *costs of location* (special costs) expressed as an additional charge per bushel may help in the assessment of the economic value of any site for planting. If capital is available and capital costs are discounted, the costs of location are not severe so far as growing the fruit is concerned, but marketing facilities can also be important.

(*h*) *proprietor's sacrifice** may help intending growers to get a better perspective upon their likely outlays of capital.

WHAT ARE "COST" AND "TOTAL COST"?

It is difficult from any one set of accounts to follow all the changes for better or worse that result from twelve months' operation of a farm. A Profit and Loss Account

* See page 11.

and Balance Sheet together summarize in financial terms the net effect over the year as the change in "net worth" of the grower: but the grower senses, nevertheless, that these accounts fail to give the whole story, and that his dispositions over the year have been more (or less) to his advantage than the accounts show.

In something of the same way, growers are apprehensive about "cost" figures. They know what their expenditure has been during the year, they see the "cost" subsequently reported, and it is lower (generally) than they expected. The main reason for any disparity is that these cost statements try only to measure and account for the actual value lost (exhausted or sacrificed) in the process of creating a new and larger fund of value, in this case the apple crop: more than other accounts they try to exclude any element of improvement; and since most growers, perhaps unconsciously, try to leave their farms in a better state than when they took them, it is not surprising that "costs" are as a rule lower than expenditures.

When applied to the labour involved in apple production, this policy for establishing "cost" means that only the hours actually spent, directly and indirectly, on the apples are included, even though it may be necessary to employ regular staff for longer than the apple work alone warrants in order to get the desired amount of work done on the apples. In the case of materials, the record of amounts used is preferred to that of amounts bought. In the case of services—possibly the most vexed component in costs—the best estimate obtainable of the actual value lost during use is preferred to the current Inland Revenue scale of allowances. A tractor, for example, is conventionally depreciated without regard to the amount of actual wear and tear on the machine, but it is the actual wear and tear that interests the economist, and for which he tries to make precise compensation in the form of provision for repair and replacement. Over the whole life of the machine, both approaches must give the same result, but in any single year the economist's and the accountant's approaches may produce quite different results. Where Inland Revenue allowances serve the present purpose, they have of course been used.

The same "cost" principle is also applied to fixed capital: but as capital exists in the business from year to year and if not duly depreciated (when it becomes a "service") is kept at par, the cost of "pure" capital is simply the interest due on it plus any administrative charge made for providing it.

On the other hand "total cost" may include some items for which no expenditure is shown during the year or period in question, either because it has still to be incurred, or has been incurred sometime in the past, or else because it is concealed from the grower for relatively long periods (e.g. eventual replacement). If the expenditure is scheduled for some future date, then the yearly "cost" is in the nature of a reserve being built up year by year so that a fund of the right size shall nominally exist at the time it is wanted. If the expenditure was incurred some time ago, then the yearly cost is in the nature of a lingering amortization charge. The next paragraph shows this principle in practice.

Looking over the figures for the six farms, it will be seen that they are in different positions as regards the time when operations like grassing down, thinning-out trees and grubbing trees were carried out. There may be heavy expenditure in one year in grassing down part of the farm, the benefit of which will be felt for a period of years, and the orchards may thereafter stay in grass. In this case the yearly cost of grassing-down a given acreage would be represented as the outlay per acre divided by the estimated number of years' life of the sward, and this yearly cost would, in principle, be levied on the orchard during each year of the sward's estimated life. Another farm may show heavy expenditure on thinning-out trees. To bring its total costs into line with other farms which are not presently engaged in thinning-out but must include the operation sometime in the future, thinning-out costs have been entered as a yearly fraction of the actual outlay. This principle of spreading the cost of occasional major operations

over the whole period of benefit gives the nearest practicable estimate of their contribution to the annual "cost of growing" figure which is being sought—at least, until a costed orchard is finally removed and its entire life cost then revealed (in retrospect) for division by the number of its years of bearing.

The cost tables were originally seen to lack uniformity in another, though less important way. Total costs were higher in some cases because they included charges of a special nature. Costs of operations were not affected, but overhead costs were increased because they included a wider range of activity. These additional costs were the outcome of introducing fruit-growing into new areas, and were mainly concerned with making provision for the accommodation of the greater number of regular men required as compared with general farming. These costs are stated separately, not because they are big enough to be important in their own right, but because doing so means that the other categories of non-cultural cost can refer to a uniform range of supervisory and maintenance activity.

Where "total cost" is expressed, then, it includes the following components:

(*a*) costs of major and minor annual cultural operations;

(*b*) costs of picking;

(*c*) costs of major occasional operations;

(*d*) costs of maintaining orchards and premises, and other non-operational work;

(*e*) costs of the "business side" of growing;

(*f*) costs of using capital;

(*g*) costs of taking apple growing into relatively new areas.

For the sake of uniformity, all total costs take each crop as far as an assumed assembly point *on the farm*. Initial marketing costs have been recorded, but are not included in the cost of growing. These are some of the whole costs of marketing and distribution which the grower bears, but they are incurred after the fruit has been harvested. True, the process of producing a consumable article does not really cease until the article is in the shops where it is wanted.

The information upon marketing costs is less complete than that for growing costs, and so, regrettably, it has not been included in total cost. For this reason there is no reference in this report to a full *cost of production* of apples. As counterweight to including only part of total production costs, it must be stressed that "total cost" figures in this report by no means represent the complete *cost of supplying the (wholesale) market*. The grower who pays directly or by subtraction for grading, transport to market, market charges and salesman's charges, would often find little more than half of all his costs accounted for at the end of the "growing" process.

A final point must not be overlooked. Wherever a cost per bushel is given in this report, it refers to the total cost divided by the number of bushels *picked*. The effective cost per bushel is the total cost divided by the number of bushels *marketed to advantage*. Average cost per bushel marketed will rise as the proportion of cull fruit rises.

THE FORM OF THE ACCOUNTS

Three statements have been prepared for each farm: Tables I, II and III.

Table I is meant to express the annual outlay per acre and per bushel—the actual level of outlay which the grower incurs on current account: it presents the routine annual operational charges on a cost basis, plus the actual expenditure on occasional operations. The costs, as it were, follow the crop round the year from the time of pruning to the time of picking. One point arises in connexion with the occasional operations. It should be realized that *expenditure per acre* shown is not the expenditure per acre actually treated: it is the outlay on the operation divided by the whole costed acreage.

All that the calculated figure shows is the size of the burden the operation throws upon the orchard costs as a whole.

Following industrial practice, the contribution of labour, raw materials and services to the cost of each major operation, has been given separately. Labour cost—and the figures for hours of manual labour similarly—covers both regular and casual workers, piece-rate earnings (as in fruit picking) having been converted to hours by dividing piece-earnings by the rate per hour for day work; the hours total shown is likely to be slightly over-stated as a result. The time of labour hired along with equipment, has not been included in the man-hours shown: this is negligible as an item of cost, and is, moreover, technically a "service". The services component measures the contribution of those means of production other than labour which are not entirely dissipated in the production of the one crop: it is the cost of tractor labour, and of the use of machinery, implements, trailers or lorries, pressure mains installations, orchard trays and ladders, and so on.

A word should be added about the cost of cultivations, which is admittedly over-simplified, for it may include costs on both arable and grass plots. Where both types of management exist on the same farm, and the costs on each have to be reduced to a cost per acre of bearing orchard on the farm, the costs accredited to each are not the true comparative costs of the two systems (unless the acreage of each happens to be the same). They are liable, however, to be thus interpreted, and this would be misleading. Comparative costs—and indeed actual levels of costs—of these two contrasting types of soil management are a matter of great interest and the cultivations data has been analysed to a greater degree later in the report (p. 39).

Considerable care has gone into the compilation and allocation of the non-operational costs, in order to show how this part of the total cost is distributed between items incidental to growing apples other than management, and those incidental to conducting the farm business, including paid management. *Operational overheads* are all incurred on some point of farming practice: they relate to the organization of production apart from the cultural operations and packing. Two groups of costs are included: first, the complete costs of routine non-cultural operations, like hedge trimming, maintaining boundary wire and minor repairs to buildings, together with complete costs of some non-routine operations like mole-draining; and secondly, the genuinely incidental, non-routine tasks like fetching and carrying by farm transport, tidying up, sawing logs, and wet weather time.

Administration covers office expenses, the cost of off-the-farm services like insurance and accounting, and also a due share of the manager's private car. As always, management is the hardest activity on which to put a price. On the farms as a whole there are many combinations between the extremes of the absentee director-proprietor and the residential working proprietor-manager. To cope with this situation, no charge has been made for top management, but where a foreman has supervisory duties, his declared time on supervising has been included in administration. Where a proprietor either works full-time or part-time, only the amount of his manual-labour time has been included, and if this work is general in nature—e.g. lending a hand where one is needed—the cost has been included in operational overheads.

Proprietor's sacrifice. This item is not to be found among a grower's actual expenses, but it is not fictitious. The trees had to be brought into a profitable condition, and they have ultimately to be replaced; when this happens, part of the investment (the trees) can be considered to be exhausted. A wasting asset of this sort is usually accounted for by some system of depreciation allowances, but replacement of trees *in situ* can make nonsense of the idea that an orchard as a whole does depreciate. In addition, replacement policies of the farms, and the range in age of the several plots, made the calculation of true depreciation allowances most difficult, and the attempt

directly to measure the yearly loss of value by a uniform formula was abandoned.

Instead, an estimate was made of the probable initial investment in the fruit farm, excluding packing and storing facilities, and a calculation made of the yearly charge necessary to provide the grower, fifty years after he began the venture, with a due repayment of his initial investment. This yearly charge is the proprietor's sacrifice —he could maintain his capital in trees by paying this sum every year as a contribution to an endowment insurance policy.

There are two parts in the full charge shown under this heading. Half the initial investment was likely to have been in land and buildings, which are permanent, and half in the trees (at the point of bearing), which are semi-permanent. Accordingly, the first part of the charge is interest at 3·5* per cent. a year on the assumed value of the farm premises, and the second part is an amount of money which, if laid away each year for forty-two years (i.e. whilst the trees are between 9 and 50 years old) and allowed to accumulate at 3·5 per cent. interest, will recreate (*a*) the money value of the tree-capital, (*b*) simple interest at 3·5 per cent. a year on this capital, and (*c*) the cost of grubbing the trees.

Special costs, as mentioned before, are additional costs to which the location of the farm gives rise.

Table II is meant to express a *cost of growing* apples. This is not the same quantity as a cost of production of apples, for it excludes costs incurred in marketing. This cost of growing is superior to cost of production as a means of comparing costs on different farms because the production cost can be very much affected by the way in which the apples are handled once they have been hauled to the farmstead. Particularly is this so if most of the costs of marketing which the grower bears are paid for by deduction from his market revenue. In this Table, the annual share of occasional operations replaces the actual outlay reported in Table I. For this purpose a grass sward has been given a "life" of 20 years and thinning-out and grubbing costs have been averaged over 40 years.

There are two other modifications of the figures in Table I to be found in Table II. First, the results for the separate years have been condensed into an average (more correctly a mean) result. In this connexion the money aspect of the result is less important than the averaging of the orchard work over two, three or four seasons as the case may be, so as to get a better idea of the "normal" annual requirement. If there were distinct trends in the labour or other requirements in orchard work, an average figure would of course tend to be less accurate as regards current practice than the most recent figure available, but in fact no trends were evident in the period covered and an average of several seasons can serve a useful purpose.

To incorporate a variety of seasons and crops, however, involves dealing with a variety of cost levels. Since 1948, all the items the fruit-grower uses have increased in price. So having first "normalized" the cultural work on the farm, the next step is to "modernize" the costs—to express the normalized operational schedule in terms of its cost in the latest year. To this end, the four categories of cost—labour, spray materials, fertilizers, services and miscellaneous items—for each year have been revalued using 1951 prices, before the average (mean) cost was found. This average is the "Equivalent 1951" cost of growing.

Table III handles the same material as Table II but in a different way. The most important categories of cost are shown in total and not as distributed among the operations. The basis of costing here is the cost factor, not the operation. The "equivalent 1951" cost is again the cost of labour, manures or any other factor, with its average use in the period priced up as for 1951 conditions. It is in this form that changes in total cost can most easily be gauged from changes in the cost of separate factors.

* The investments were made at times when interest rates were higher than is the rule to-day.

INDIVIDUAL FARM COSTS

ANNUAL OUTLAYS AND AVERAGE ANNUAL COST

WITH PARTICULARS OF THE FARM AND COMMENTS ON ITS ORGANIZATION

FARM A

PARTICULARS OF FARM

Size group:	75-100 acres.
Percentage area in top fruit:	23.
Percentage area of bearing apple trees in top fruit acreage:	86.
Percentage of dessert varieties in bearing apple acreage:	22.
Age of bearing dessert orchards:	14 years (in 1951).
Predominant variety and type:	Cox's Orange Pippin. Bush. M.II.
Average number of trees per acre:	97.
Type of soil management:	Short grass sward, gang-mown.
Percentage of culinary varieties in bearing apple acreage:	78.
Age of bearing culinary orchards:	Over 35 years (in 1951).
Predominant variety and type:	Bramley's Seedling. Half-standard.
Average number of trees per acre:	90.
Type of soil management:	Short grass sward.
Spraying system:	Mobile pull-through.
Other top fruit grown:	Cherries.
Remainder of land devoted to:	Soft fruit, hops, pasture.

TABLE I

Current Outlays on Growing Apples in 1948 and 1949

Operation		1948 crop			1949 crop		
		per acre £ s.	per bushel s. d.	hours man labour per acre	per acre £ s.	per bushel s. d.	hours man labour per acre
Pruning:	Labour ..	14 7	7·1	132	8 7	8·4	82
	Services ..	2	—	—	—	—	—
	Total ..	14 9	7·1		8 7	8·4	
Spraying:	Labour ..	3 10	1·7	29	3 0	3·0	27
	Materials ..	19 1	9·4	—	20 6	1 8·6	—
	Services ..	5 4	2·6	—	6 5	6·3	
	Total ..	27 15	1 1·7		29 11	2 5·9	
Cultivations:	Labour ..	5 7	2·6	45	3 18	3·9	36
	Services ..	2 14	1·3	—	1 3	1·2	—
	Total ..	8 1	3·9	—	5 1	5·1	—
Manuring:	Labour ..	16	0·4	6	1 6	1·3	11
	Materials ..	9 19	4·9	—	5 10	5·6	—
	Services ..	10	0·2	—	10	0·5	—
	Total ..	11 5	5·5	—	7 6	7·4	—
Other operations:							
	Apple thinning	—	—	—	1 3	1·2	14
	Propping ..	—	—	—	12	0·6	4
	Replacing trees	—	—	—	1	—	1
	Grafting ..	—	—	—	—	—	—
	Total ..	—	—	—	1 16	1·8	19
Total annual cultural costs ..		61 10	2 6·2	212	52 1	4 4·6	175
Picking:	Labour ..	19 5	9·5	167	18 16	1 7·0	172
	Services ..	1 17	0·9	—	2 0	2·0	—
	Total ..	21 2	10·4	—	20 16	1 9·0	—
Operational overheads:							
	Labour ..	5 14	2·8	44	6 0	6·1	49
	Other	7 4	3·5	—	3 10	3·6	—
	Total ..	12 18	6·3		9 10	9·7	
Administration		3 15	1·9	—	4 5	4·3	—
Proprietor's sacrifice		4 1	2·0	—	4 1	4·1	—
Special costs		—	—	—	—	—	—
Total annual growing costs ..		103 6	4 2·8	423	90 13	7 7·7	396
Grassing down		—	—	—	—	—	—
Grubbing		—	—	—	—	—	—
New Plantations (3 acs.)		2 5	1·1	16	1 6	1·3	9
Total, additional outlay ..		2 5	1·1	16	1 6	1·3	9
Initial marketing costs:							
	Labour ..	9 5	4·5	86	13 6	1 1·4	121
	Other	4 17	2·4	—	6 6	6·4	—
	Total ..	14 2	6·9	—	19 12	1 7·8	—
Total annual outlay ..		119 13	4 10·8	525	111 11	9 4·8	526
Bushels picked per acre ..			487			237	

FARM A

TABLE II

Operational Costs

Average 1948-9 and Equivalent 1951 Costs

	Average 1948-9					Equivalent 1951	
	Total £ s.	per acre £ s.	per bushel s. d.	per cent.	hours man-labour per acre	per acre £ s.	per bushel s. d.
Pruning	211 3	11 8	8	11	107	12 11	9
Spraying	529 16	28 13	1 10	31	28	36 5	2 2
Cultivations	121 8	6 11	4½	6	40	7 5	5½
Manuring	171 7	9 6	6½	9	9	12 11	9
Other operations	17 2	18	0½	0·5	9	1 0	0½
Total annual cultural costs	1,050 16	56 16	3 5½	57·5	193	68 12	4 2
Picking	387 13	20 19	1 3½	22	170	23 2	1 5
Operational overheads	207 9	11 4	8	11	46	12 10	9
Administration	73 19	4 0	3	4	—	4 1	3
Proprietor's sacrifice	75 0	4 1	3	4	—	4 1	3
Special costs	—	—	—	—	—	—	—
Total annual growing costs	1,794 17	97 0	5 11	98·5	409	112 6	6 10
Annual share of:							
Grassing down	13 10	15	0½	1·5	—	1 16	1
Grubbing	12 19	14	0½				
Thinning out	6 10	7					
Total all growing costs	1,827 16	98 16	6 0	100	—	114 2	6 11

FARM A

TABLE III

Factor Costs

	Average 1948-9				Equivalent 1951	
	Total £ s.	per acre £ s.	per bushel s. d.	per acre	per cent. £ s.	per bushel s. d.
Manual labour	906 7	49 0	3 0	50	52 16	3 2½
Manures	143 5	7 15	5½	8	10 17	8
Spray materials	363 13	19 13	1 2½	20	25 3	1 6½
Machinery and equipment services	227 1	12 5	9	12·5	14 12	10½
Maintenance of investment	107 10	5 17	4	5·5	5 17	4
Administration and sundries	79 11	4 6	3	4	4 17	3½
Total	1,827 16	98 16	6 0	100	114 2	6 11

Comment

This farm has the smallest area of apples, and is in process of replacing culinary varieties with dessert varieties. Particular care is taken to produce an Extra Fancy crop of show standard, and on a small acreage this is bound to be a relatively expensive type of production.

The cost of spraying is higher than on the other farms and would seem to be high also for a predominantly culinary crop. No doubt the £35 5s. equivalent in 1951 would have forced itself upon the grower's notice if the practice had continued. As compared with Farm E and Farm F, and taking the difference in size of farm into account, the extra outlay on crop cleanliness meant an additional cost per bushel produced of about 9d., which would not be a serious matter with a pack-out of 85 per cent. or better.

Another result which must be ascribed to the small size of the farm is the figure of 409 hours of manual labour per acre: but this was probably well within the margin of safety in the years in question because this farm had not to provide work for the proprietor and was run with comparatively light overheads.

The labour figures for 1948 and 1949 are not accidentally transposed, as may be thought after looking at the yields. In 1948 the regular farm staff was still in the making. In 1949 labour efficiency improved and there is evidence of the re-emergence of the policy of "good growing".

FARM B

PARTICULARS OF FARM

Size group:	50-75 acres.
Percentage area in top fruit:	100.
Percentage area of bearing apple trees in top fruit acreage:	94.
Percentage of dessert varieties in bearing apple acreage:	79.
Age of bearing dessert orchards:	16 to 26 years (in 1951).
Predominant variety and type:	Cox's Orange Pippin. Bush. M.I. Crab.
Average number of trees per acre:	200.
Type of soil management:	Short grass sward, gang-mown.
Percentage of culinary varieties in bearing apple acreage:	21.
Age of bearing culinary orchards:	16 to 26 years (in 1951).
Predominant variety and type:	Bramley's Seedling. Half-standard. M.XIII.
Average number of trees per acre:	70.
Type of soil management:	Short grass sward.
Spraying system:	Pressure mains.
Other top fruit grown:	None.
Remainder of land devoted to:	——

TABLE I

Current Outlays on Growing Apples in 1948 and 1949

Operation		1948 crop			1949 crop		
		per acre £ s.	per bushel s. d.	hours man labour per acre	per acre £ s.	per bushel s. d.	hours man labour per acre
Pruning:	Labour ..	8 11	11·1	92	7 9	1 5·7	66
	Services ..	8	0·5	—	1	—	—
	Total ..	8 19	11·6	—	7 10	1 5·7	—
Spraying:	Labour ..	2 3	2·8	17	2 9	5·8	20·5
	Materials ..	5 6	6·9	—	6 19	1 4·5	—
	Services ..	2 6	3·0	—	3 3	7·5	—
	Total ..	9 15	1 0·7	—	12 11	2 5·8	—
Cultivations:	Labour ..	3 7	4·3	29	2 5	5·3	21·5
	Services ..	3 9	4·6	—	3 1	7·3	—
	Total ..	6 16	8·9	—	5 6	1 0·6	—
Manuring:	Labour ..	12	0·8	4·5	3 1	7·2	29·5
	Materials ..	14 14	1 7·1	—	17 19	3 6·6	—
	Services ..	11	0·8	—	1 5	3·0	—
	Total ..	15 17	1 8·7	—	22 5	4 4·8	—
Other operations:							
	Apple thinning	4 5	5·5	40	5 3	1 0·2	55
	Mulching (1949 grafting) ..	2 1	2·7	2·8	8	1·0	2·5
	Replacing trees	1 6	1·7	9·8	15	1·9	5·5
	Removing suckers	15	1·0	7·4	—	—	—
	Total ..	8 7	10·9	60	6 6	1 3·1	63·0
Total annual cultural costs ..		49 14	5 4·8	202·5	53 18	10 8·0	200·5
Picking:	Labour ..	12 14	1 4·5	117	7 13	1 6·1	78·5
	Services ..	2 8	3·2	—	1 17	4·5	—
	Total ..	15 2	1 7·7	—	9 10	1 10·6	—
Operational overheads:							
	Labour ..	8 0	10·4	59	4 3	9·8	34·5
	Other	5 1	6·6	—	1 5	3·0	—
	Total ..	13 1	1 5·0	—	5 8	1 0·8	—
Administration		3 7	4·4	—	2 18	6·9	—
Proprietor's sacrifice ..		5 3	6·7	—	5 3	1 0·2	—
Special costs		2 13	3·4	—	2 13	6·3	—
Total annual growing costs ..		89 0	9 8·0	378·5	79 10	15 8·8	313·5
Grassing down	1948, 21 acs. / 1949, 15 acs.	2 16	3·6	12	3 14	8·7	22·5
Grubbing		—	—	—	—	—	—
New Plantations		—	—	—	—	—	—
Total, additional outlay ..		2 16	3·6	12	3 14	8·7	22·5
Initial marketing costs:							
	Labour ..	—	—	—	—	—	—
	Other	—	—	—	—	—	—
	Total ..	—	—	—	—	—	—
Total annual outlay		91 16	9 11·6	390·5	83 4	16 5·5	336
Bushels picked per acre ..			184			101	

FARM B

TABLE II

Operational Costs

Average 1948-9 and Equivalent 1951 Costs

	Average 1948-9					Equivalent 1951	
	Total £ s.	per acre £ s.	per bushel s. d.	per cent.	hours man-labour per acre	per acre £ s.	per bushel s. d.
Pruning	607 10	8 5	1 2½	9·5	79	9 2	1 4½
Spraying	802 12	11 3	1 9	14	19	12 18	1 11½
Cultivations	435 16	6 1	11	7	25	6 16	1 0½
Manuring	1,370 16	19 1	3 1	24	17	26 1	3 11
Other operations	514 12	7 6	1 1	8·5	61·5	8 1	1 2½
Total annual cultural costs	3,731 6	51 16	8 0½	63	201·5	62 18	9 6
Picking	887 12	12 6	1 9	14	98	13 12	2 0½
Operational overheads	663 3	9 4	1 3	10	46	10 5	1 6½
Administration	225 6	3 3	5½	3	—	3 9	6
Proprietor's sacrifice	372 10	5 3	9½	6	—	5 3	9½
Special costs	192 10	2 13	5	2·5	—	2 13	5
Total annual growing costs	6,072 7	84 5	12 8½	98·5	345·5	98 0	14 9½
Annual share of:							
Grassing down	46 16	13	1	1·5	—	2 3	3½
Grubbing	63 0	17	1½				
Thinning out	45 0	13	1				
Total all growing costs	6,227 3	86 8	13 0	100		100 3	15 1

FARM B

TABLE III

Factor Costs

	Average 1948-9				Equivalent 1951	
	Total £ s.	per acre £ s.	per bushel s. d.	per cent.	per acre £ s.	per bushel s. d.
Manual labour	2,683 18	37 5	5 6	43	40 15	6 2
Manures	1,175 13	16 6	2 5	19	22 16	3 5½
Spray materials	441 16	6 3	11	7	7 17	1 2
Machinery and equipment services	911 1	12 12	1 11	15	14 4	2 1½
Maintenance of investment	719 16	10 0	1 7½	11·5	10 0	1 6
Administration and sundries	294 19	4 2	7½	4·5	4 11	8
Total	6,227 3	86 8	13 0	100	100 3	15 1

FARM B

Comment

This is a specialist apple farm, and is of fairly popular size for commercial working, though the trees are by no means uniform as regards variety and rootstock. The aim in production is a high quality sample, that will grade well. Unfortunately, the average crop was disappointing during the two years the farm was being costed.

Annual cultural costs on this farm are higher in relation to total costs than on the other farms. The low cost of picking helps to accentuate this distinction, but more important in this connexion are the minor operations which average 60 hours per acre —and are, of course, part of the cost of inducing the desired uniformity in the crop. Efficient performance of major operations and modesty in non-essentials help to keep total costs and costs per acre within bounds.

The relatively high charge for labour and materials in manuring in 1949 is due to greater use of organics. Labour use was scaled down in 1949 as befitted the crop, but the thinning proved remarkably expensive and when spread over the apples that were left, amounted to more than 1s. a bushel. In spite of the general retrenchment, 3 hours' labour went into every bushel produced in 1949 for every 2 hours in 1948.

FARM C

Particulars of Farm

Size group:	50-75 acres.
Percentage area in top fruit:	71.
Percentage area of bearing apple trees in top fruit acreage:	60.
Percentage of dessert varieties in bearing apple acreage:	100.
Age of bearing dessert orchards:	16 years (in 1951).
Predominant variety and type:	Cox's Orange Pippin. Bush. M.II.
Average number of trees per acre:	150.
Type of soil management:	Clean cultivation.
Percentage of culinary varieties in bearing apple acreage:	None.
Age of bearing culinary orchards:	——
Predominant variety and type:	——
Average number of trees per acre:	——
Type of soil management:	——
Spraying system:	Pressure mains plus mobiles.
Other top fruit grown:	Pears, plums, cherries.
Remainder of land devoted to:	Market garden and farm crops.

TABLE I

Current Outlays on Growing Apples in 1950 and 1951

Operation		1950 crop			1951 crop		
		per acre £ s.	per bushel s. d.	hours man labour per acre	per acre £ s.	per bushel s. d.	hours man labour per acre
Pruning:	Labour ..	6 15	5·7	70	6 1	3·8	55
	Services ..	15	0·6	—	4	0·1	—
	Total ..	7 10	6·3	—	6 5	3·9	—
Spraying:	Labour ..	1 11	1·3	14	1 17	1·1	16
	Materials ..	7 4	6·0	—	14 10	9·0	—
	Services ..	7 0	6·0	—	7 5	4·5	—
	Total ..	15 15	1 1·3	—	23 12	1 2·6	—
Cultivations:	Labour ..	2 7	2·0	21	2 2	1·2	19
	Services ..	4 15	4·0	—	6 14	4·2	—
	Total ..	7 2	6·0	—	8 16	5·4	—
Manuring:	Labour ..	9	0·4	4	13	0·4	6
	Materials ..	14 1	11·8	—	11 6	7·0	—
	Services ..	12	0·5	—	16	0·5	—
	Total ..	15 2	1 0·7	—	12 15	7·9	—
Other operations:							
	Apple thinning	1 9	1·2	15	3 17	2·4	32
	Anti-canker ..	—	—	—	10	0·3	3
	Replacing trees	4	0·2	2	—	—	—
	Grafting ..	12	0·5	5	—	—	—
	Total ..	2 5	1·9	22	4 7	2·7	35
Total annual cultural costs ..		47 14	3 4·2	131	55 15	2 10·5	131
Picking:	Labour ..	13 12	11·4	149	20 1	1 0·4	201
	Services ..	1 0	0·9	—	1 2	0·7	—
	Total ..	14 12	1 0·3		21 3	1 1·1	—
Operational overheads:							
	Labour ..	7 5	6·1	70	6 2	3·8	53
	Other	8 6	7·0	—	5 12	3·5	—
	Total ..	15 11	1 1·1	—	11 14	7·3	—
Administration		4 6	3·4	—	4 6	2·7	—
Proprietor's sacrifice ..		5 2	4·3	—	5 2	3·1	—
Special costs		—	—	—	—	—	—
Total annual growing costs ..		87 5	6 1·3	350	98 0	5 0·7	385
Grassing down		—	—	—	—	—	—
Grubbing		—	—	—	—	—	—
New Plantations (1·3 acs.)		—	—	—	7 17	4·8	12
Total, additional outlay ..		—	—	—	7 17	4·8	12
Initial marketing costs:							
	Labour ..	13	0·5	6	1 13	1·0	15
	Other	2 5	1·9	—	2 4	1·4	—
	Total ..	2 18	2·4		3 17	2·4	
Total annual outlay ..		90 3	6 3·7	356	109 14	5 7·9	412
Bushels picked per acre ..			285			387	

FARM C

TABLE II

Operational Costs

Average 1950-1 and Equivalent 1951 Costs

	Average 1950-1					Equivalent 1951	
	Total £ s.	per acre £ s.	per bushel s. d.	per cent.	hours man-labour per acre	per acre £ s.	per bushel s. d.
Pruning	182 10	6 18	5	7·5	62	6 19	5
Spraying	521 14	19 13	1 2	20·5	15	19 17	1 2½
Cultivations	210 11	7 19	5½	8	20	8 2	6
Manuring	369 6	13 18	10½	15·5	5	15 5	11
Other operations	87 1	3 6	2½	3·5	29	3 9	2½
Total annual cultural costs	1,371 2	51 14	3 1½	55	131	53 12	3 3
Picking	473 15	17 18	1 0½	18·5	175	18 0	1 1
Operational overheads	360 19	13 7	10	14·5	61	13 17	10
Administration	114 5	4 6	3	4·5	—	4 7	3
Proprietor's sacrifice	135 10	5 2	4	6	—	5 2	4
Special costs	—	—	—	—	—	—	—
Total annual growing costs	2,455 11	92 7	5 7	98·5	367	94 18	5 9
Annual share of:							
Grassing down	7 16	6					
Grubbing	21 8	16	1	1·5	—	1 8	1
Thinning out	7 6	6					
Total all growing costs	2,492 1	93 15	5 8	100		96 6	5 10

FARM C

TABLE III

Factor Costs

	Average 1950-1				Equivalent 1951	
	Total £ s.	per acre £ s.	per bushel s. d.	per cent.	per acre £ s.	per bushel s. d.
Manual labour	997 0	37 11	2 3½	40·5	37 14	2 3½
Manures	336 6	12 13	9	13	14 3	10
Spray materials	287 2	10 16	8	12	10 16	8
Machinery and equipment services	474 18	17 18	1 1	19	18 12	1 2
Maintenance of investment	172 0	6 9	4½	6·5	6 10	4½
Administration and sundries	224 15	8 8	6	9	8 11	6
Total	2,492 1	93 15	5 8	100	96 6	5 10

FARM C

Comment

Although this farm produces several kinds of fruit, and market garden crops as well, its apple enterprise is the most uniform. Only dessert varieties have been planted, and three-quarters of these are the Cox-Worcester combination on the same kind of rootstock. Here again the grower strives to produce a first-class grading sample, and does so very efficiently.

Costs of operation are relatively low for this type of production, and despite fairly generous manuring, cultural costs per acre are well below average. A rewarding level of yields brings cultural costs per bushel down to the lowest figure recorded here for dessert fruit. In fact up to the point of picking this farm is growing dessert varieties at the same cost per bushel as culinary varieties on the other farms. Taking the results as a whole, two items are relatively (and only relatively) costly—spraying and picking. The rather excessive "services" component in cost of spraying is due to the luxury of having both pressure mains and mobile equipment; the picking cost is associated with the tray technique. Both items are no doubt regarded as a good insurance for a clean and unbruised crop.

In all respects but the picking, labour is very efficiently used. This is probably due in part to a dry climate and in part to having worthy alternative employment always available. Up to the point of picking this smaller farm competes hour for hour with the larger farm, Farm F. On both farms the finished crop (on the trees) has been produced with only half an hour's labour per bushel. Some of this advantage is seen to be lost "below the line" in the overheads section, where the smaller farm is at a natural disadvantage.

FARM D

PARTICULARS OF FARM

Size group:	25-50 acres.
Percentage area in top fruit:	63.
Percentage area of bearing apple trees in top fruit acreage:	63.
Percentage of dessert varieties in bearing apple acreage:	3·5 (in mixed plantations).
Age of bearing dessert orchards:	Over 45 years (in 1951).
Predominant variety and type:	Worcester Pearmain. Standard.
Average number of trees per acre:	52.
Type of soil management:	Grass sward.
Percentage of culinary varieties in bearing apple acreage:	96·5.
Age of bearing culinary orchards:	Over 45 years (in 1951).
Predominant variety and type:	Bramley's Seedling.
Average number of trees per acre:	52.
Type of soil management:	Grass sward.
Spraying system:	Mobile pull-through.
Other top fruit grown:	Pears.
Remainder of land devoted to:	Soft fruit and farm crops.

TABLE I

Current Outlays on Growing Apples in 1949, 1950 and 1951

Operation	1949 crop			1950 crop			1951 crop		
	per acre £ s.	per bushel s. d.	hours man labour per acre	per acre £ s.	per bushel s. d.	hours man labour per acre	per acre £ s.	per bushel s. d.	hours man labour per acre
Pruning: Labour	5 0	5·6	34	4 5	3·0	34	8 7	6·9	52
Services	4	0·2	—	4	0·1	—	13	0·5	—
Total	5 4	5·8	—	4 9	3·1	—	9 0	7·4	—
Spraying: Labour	2 14	3·0	18	1 4	0·9	9	15	0·7	7
Materials	8 17	10·0	—	6 17	4·9	—	7 7	6·0	—
Services	4 14	5·3	—	3 15	2·6	—	3 18	3·2	—
Total	16 5	1 6·3	—	11 16	8·4	—	12 0	9·9	—
Cultivations: Labour	2 11	2·9	17	1 0	0·7	7	17	0·7	8
Services	1 18	2·1	—	1 0	0·7	—	2 1	1·7	—
Total	4 9	5·0	—	2 0	1·4	—	2 18	2·4	—
Manuring: Labour	6	0·4	2	2	0·1	1	2	—	1
Materials	2 1	2·3	—	1 3	0·8	—	1 19	1·6	—
Services	1	—	—	1	—	—	2	—	—
Total	2 8	2·7	—	1 6	0·9	—	2 3	1·7	—
Other operations:									
Apple thinning	—	—	—	—	—	—	—	—	—
Replacing trees	—	—	—	—	—	—	1 2	0·9	4
Total	—	—	—	—	—	—	1 2	0·9	4
Total annual cultural costs	28 6	2 7·8	71	19 11	1 1·8	51	27 3	1 10·3	72
Picking: Labour	19 14	1 10·2	122	15 12	11·0	130	12 16	10·5	111
Services	11	0·6	—	1 4	0·9	—	1 9	1·2	—
Total	20 5	1 10·8	—	16 16	11·9	—	14 5	11·7	—
Operational overheads:									
Labour	5	0·3	2	2 17	2·0	23	4 13	3·8	37
Other	4 3	4·7	—	2 4	1·5	—	11 7	9·3	—
Total	4 8	5·0	—	5 1	3·5	—	16 0	1 1·1	—
Administration	5 5	6·0	—	3 5	2·3	—	7 14	6·3	—
Proprietor's sacrifice	6 19	7·7	—	7 11	5·4	—	7 18	6·5	—
Special costs	—	—	—	—	—	—	—	—	—
Total annual growing costs	65 3	6 1·3	195	52 4	3 0·9	204	73 0	4 11·9	220
Grassing down	—	—	—	—	—	—	—	—	—
Grubbing (4 acs.)	1 15	2·0	11	1 6	0·9	9	11 15	9·6	11
New Plantations (10 acs.)	2 7	2·6	6	16 13	11·7	20	10 19	9·0	53
Total, additional outlay	4 2	4·6	17	17 19	1 0·6	29	22 14	1 6·6	64
Initial marketing costs:									
Labour	1 7	1·5	13	1 19	1·4	15	2 10	2·1	26
Other	1 19	2·2	—	3 1	2·1	—	14 5	11·7	—
Total	3 6	3·7	—	5 0	3·5	—	16 15	1 1·8	—
Total annual outlay	72 11	6 9·6	225	75 3	4 5·0	248	112 9	7 8·3	310
Bushels picked per acre		213			339			292	

FARM D

TABLE II

Operational Costs

Average 1949-51 and Equivalent 1951 Costs

	Average 1949-51					Equivalent 1951	
	Total £ s.	per acre £ s.	per bushel s. d.	per cent.	hours man-labour per acre	per acre £ s.	per bushel s. d.
Pruning	143 7	6 4	5½	9·5	40	6 8	5½
Spraying	314 0	13 8	1 0	21	11	15 18	1 2
Cultivations	73 10	3 3	3	5	11	3 4	3
Manuring	45 13	1 19	2	3·5	1·5	2 5	2
Other operations	7 19	6	—	—	1·5	7	0½
Total annual cultural costs	584 9	25 0	1 10½	39	65	28 2	2 1
Picking	402 4	17 2	1 3½	27	121	17 11	1 3½
Operational overheads	192 19	8 10	7	12	21	8 15	8
Administration	125 1	5 8	5	8·5	—	5 11	5
Proprietor's sacrifice	174 0	7 9	6½	11	—	7 9	6½
Special costs	—	—	—	—	—	—	—
Total annual growing costs	1,478 13	63 9	4 8½	97·5	207	67 8	5 0
Annual share of:							
Grassing down	—	—	—	—	—	—	—
Grubbing	22 0	19	1	2·5	—	1 6	1
Thinning out	8 10	7	0½	—	—	—	—
Total all growing costs	1,509 3	64 15	4 10	100	—	68 14	5 1

FARM D

TABLE III

Factor Costs

	Average 1949-51				Equivalent 1951	
	Total £ s.	per acre £ s.	per bushel s. d.	per cent.	per acre £ s.	per bushel s. d.
Manual labour	649 8	27 19	2 1	44	30 4	2 3½
Manures	40 10	1 15	1½	2·5	2 2	2
Spray materials	180 0	7 15	7	12	8 3	7
Machinery and equipment services	205 2	8 16	8	13·5	9 10	8½
Maintenance of investment	204 10	8 16	8	13·5	8 15	7½
Administration and sundries	229 13	9 14	8½	14·5	10 0	8½
Total	1,509 3	64 15	4 10	100	68 14	5 1

FARM D

Comment

This is one of the smaller farms, and more than one-third of the orchard area is under young trees and so escapes attention in this report. As the young orchards mature more of the old orchards will be grubbed up. Grubbing has already been in progress for at least three years. There has not been the same incentive to fairly intensive production methods on this farm, as many varieties grown are not of high market calibre. The general policy has been a high return per unit of outlay rather than maximum return irrespective of outlay. Nevertheless, the importance of a clean crop is fully realized in both principle and practice, and the crop is graded on the farm.

The costs reflect the lower levels of expenditure, particularly on labour. Declining vigour in the trees and light manuring combine to make pruning a relatively inexpensive operation; but on the small acreage cultivation costs cannot be reduced in like degree. Consequently cultural costs (at less than 2s. an acre) and labour inputs (more than four bushels per man-hour) are both lower than on any of the other farms. And, in fact, costs up to picking are only two-fifths of total cost.

By contrast, non-cultural costs are a relatively big handicap and show how much total cost is increased when the fruit enterprise has to carry the full burden of proprietorship of a small farm, for 32 per cent. of total cost is genuinely "overhead" in nature. In these circumstances costs per bushel would be lowered if three times the present outlay of manuring (say £6 per acre) increased the mean crop by more than 20 bushels per acre.

In interpreting the rising trend in cost as shown in the annual figures, it is important to remember that the productive area is being reduced year by year.

FARM E

PARTICULARS OF FARM

Size group:	250-300 acres.
Percentage area in top fruit:	36.
Percentage area of bearing apple trees in top fruit acreage:	75.
Percentage of dessert varieties in bearing apple acreage:	28.
Age of bearing dessert orchards:	17 years (in 1951).
Predominant variety and type:	Cox's Orange Pippin. Bush. M.II.
Average number of trees per acre:	100.
Type of soil management:	Short grass sward.
Percentage of culinary varieties in bearing apple acreage:	72.
Age of bearing culinary orchards:	25 to 44 years (in 1951).
Predominant variety and type:	Bramley's Seedling. Standard.
Average number of trees per acre:	38.
Type of soil management:	Clean cultivation.
Spraying system:	Pressure mains.
Other top fruit grown:	Pears, cherries, plums.
Remainder of land devoted to:	Dairy farming.

TABLE I

Current Outlays on Growing Apples in 1949, 1950 and 1951

Operation	1949 crop per acre £ s.	1949 crop per bushel s. d.	1949 crop hours man labour per acre	1950 crop per acre £ s.	1950 crop per bushel s. d.	1950 crop hours man labour per acre	1951 crop per acre £ s.	1951 crop per bushel s. d.	1951 crop hours man labour per acre
Pruning: Labour ..	13 5	8·4	130	11 16	6·1	108	16 5	1 1·2	135
Services ..	7	0·2	—	9	0·2	—	13	0·5	—
Total ..	13 12	8·6	—	12 5	6·3	—	16 18	1 1·7	—
Spraying: Labour ..	1 5	0·8	12	1 18	1·0	17	2 16	2·5	21
Materials ..	10 0	6·3	—	16 0	8·3	—	18 0	1 2·6	—
Services ..	2 16	1·8	—	3 2	1·6	—	3 5	2·6	—
Total ..	14 1	8·9	—	21 0	10·9	—	24 1	1 7·5	—
Cultivations: Labour ..	2 17	1·8	27	3 2	1·6	30	1 10	1·2	15
Services ..	1 17	1·8	—	3 9	1·8	—	1 19	1·6	—
Total ..	5 14	3·6	—	6 11	3·4	—	3 9	2·8	—
Manuring: Labour ..	18	0·6	8	14	0·4	6	8	0·4	4
Materials ..	6 17	4·3	—	15 1	7·8	—	10 5	8·3	—
Services ..	1 0	0·6	—	14	0·4	—	12	0·5	—
Total ..	8 15	5·5	—	16 9	8·6	—	11 5	9·2	—
Other operations:									
Apple thinning	—	—	—	—	—	—	—	—	—
Replacing trees	7	0·2	3	18	0·4	9	1	—	1
Grafting ..	3	0·1	2	14	0·4	8	14	0·6	7
Total ..	10	0·3	5	1 12	0·8	17	15	0·6	8
Total annual cultural costs ..	42 12	2 2·9	182	57 17	2 6·0	178	56 8	3 9·8	183
Picking: Labour ..	10 0	6·3	120	18 2	9·4	155	18 8	1 3·0	113
Services ..	1 0	0·6	—	2 0	1·0	—	2 6	1·9	—
Total ..	11 0	6·9	—	20 2	10·4	—	20 14	1 4·9	—
Operational overheads:									
Labour ..	3 2	2·0	37	1 15	1·0	15	1 12	1·3	10
Other	3 16	2·4	—	7 1	3·6	—	3 6	2·7	—
Total ..	6 18	4·4	—	8 16	4·6	—	4 18	4·0	—
Administration	3 0	1·9	—	3 9	1·8	—	3 19	3·2	—
Proprietor's sacrifice ..	4 7	2·8	—	4 7	2·2	—	4 7	3·5	—
Special costs	—	—	—	—	—	—	—	—	—
Total annual growing costs ..	67 17	3 6·9	339	94 11	4 1·0	348	90 6	6 1·4	306
Grassing down	—	—	—	—	—	—	—	—	—
Thinning out	—	—	—	2 16	1·4	13	10	0·4	4
New Plantations (14 acs.)	1 6	0·8	5	19	0·4	—	7 3	5·8	25
Total, additional outlay ..	1 6	0·8	5	3 15	1·8	13	7 13	6·2	29
Initial marketing costs:									
Labour ..	5 11	3·5	57	2 4	1·1	23	} 10 4	8·3	—
Other	3 7	2·1	—	4 6	2·1	—			
Total ..	8 18	5·6	—	6 10	3·2	—	10 4	8·3	—
Total annual outlay	78 1	4 1·3	401	104 16	4 6·0	384	108 3	7 3·9	335
Bushels picked per acre ..		379			463			295	

FARM E

TABLE II

Operational Costs

Average 1949-51 and Equivalent 1951 Costs

	Average 1949-51					Equivalent 1951	
	Total £ s.	per acre £ s.	per bushel s. d.	per cent.	hours man-labour per acre	per acre £ s.	per bushel s. d.
Pruning	983 2	14 5	9½	17	124	14 13	9½
Spraying	1,360 19	19 15	1 1	23	17	20 11	1 1½
Cultivations	360 17	5 4	3	5·5	24	5 11	3½
Manuring	837 12	12 3	8	14	6	14 8	9½
Other operations	66 7	19	0½	1	10	19	0½
Total annual cultural costs	3,608 17	52 6	2 10	60·5	181	56 2	3 0½
Picking	1,191 16	17 5	11	19·5	122	17 15	11½
Operational overheads	473 6	6 17	4	7	21	7 0	4½
Administration	240 7	3 9	3	5·5	—	3 11	2½
Proprietor's sacrifice	301 10	4 7	3	5·5	—	4 7	3
Special costs	—	—	—	—	—	—	—
Total annual growing costs	5,815 16	84 4	4 7	98	324	88 15	4 10
Annual share of:							
Grassing down	12 10	4					
Grubbing	63 15	19	1	2	—	1 11	1
Thinning out	26 10	8					
Total all growing costs	5,918 11	85 15	4 8	100	—	90 6	4 11

FARM E

TABLE III

Factor Costs

	Average 1949-51				Equivalent 1951	
	Total £ s.	per acre £ s.	per bushel s. d.	per cent.	per acre £ s.	per bushel s. d.
Manual labour	2,587 15	37 10	2 0½	44	38 3	2 1
Manures	738 18	10 14	7	12·5	12 19	8½
Spray materials	1,011 16	14 13	9½	17	15 8	10
Machinery and equipment services	732 5	10 12	7	12·5	11 6	7½
Maintenance of investment	404 5	5 18	4	7	5 18	4
Administration and sundries	443 12	6 8	4	7	6 12	4
Total	5,918 11	85 15	4 8	100	90 6	4 11

FARM E

Comment

A feature of this farm, which the single set of figures conceals, is the range in type of orchard within the apple enterprise. It contains both the largest and the smallest trees costed. The farm, originally relatively large, has pre-war plantings of Cox and Worcester, but the older culinary trees are still profitable and are being kept on. In relation to most of the other farms extensive production methods are employed here: the frills have been cut out and the aim is a sample of high commercial value.

By virtue of its size, by concentrating 80 per cent. of total cost upon operations, and by moderately high yields this farm is able to produce its mixed output at the lowest total cost per bushel, 4s. 11d. Notable here is the high cost of pruning, and the high labour figures for picking and for pruning. These two operations, both involving ladder work, account for 76 per cent. of all manual labour on the crop. On the other hand, none of the other farms compares with this one in economy of operation; operational and administrative overheads together amount to only 7d. a bushel: this is one of the virtues of being able to share the overheads with other lines of production.

In the first year of costing a good deal of untrained labour had to be used; but the actual use of labour is shown to be remarkably steady in the aggregate for the same range of operations (indeed this phenomenon occurs on most of the farms) though there are distinct variations in the time on single operations. It has obviously been progressively more expensive to keep pests and diseases in check on this farm.

FARM F

PARTICULARS OF FARM

Size group:	150-200 acres.
Percentage area in top fruit:	60.
Percentage area of bearing apple trees in top fruit acreage:	96.
Percentage of dessert varieties in bearing apple acreage:	86.
Age of bearing dessert orchards:	16 to 20 years (in 1951).
Predominant variety and type:	Cox's Orange Pippin. Bush. M.II.
Average number of trees per acre:	151.
Type of soil management:	Short grass sward.
Percentage of culinary varieties in bearing apple acreage:	14.
Age of bearing culinary orchards:	16 to 20 years (in 1951).
Predominant variety and type:	Grenadier.
Average number of trees per acre:	115.
Type of soil management:	Short grass sward.
Spraying system:	Pressure mains.
Other top fruit grown:	None.
Remainder of land devoted to:	Dairy farming.

TABLE I

Current Outlays on Growing Apples in 1948, 1949, 1950 and 1951

Operation	1948 crop			1949 crop			1950 crop			1951 crop		
	per acre £ s.	per bushel s. d.	hours man labour per acre	per acre £ s.	per bushel s. d.	hours man labour per acre	per acre £ s.	per bushel s. d.	hours man labour per acre	per acre £ s.	per bushel s. d.	hours man labour per acre
Pruning: Labour ..	6 4	4·6	47	6 19	9·5	63	9 9	6·1	61	10 10	9·3	61
Services ..	—	—	—	—	—	—	5	0·2	—	7	0·3	—
Total ..	6 4	4·6	—	6 19	9·5	—	9 14	6·3	—	10 17	9·6	—
Spraying: Labour ..	2 8	1·8	17	2 1	2·8	18	1 19	1·3	12	2 2	1·9	15
Materials ..	20 0	1 2·7	—	9 12	1 1·0	—	18 7	11·9	—	10 3	8·9	—
Services ..	12	0·5	—	1 7	1·9	—	2 8	1·5	—	2 4	1·9	—
Total ..	23 0	1 5·0	—	13 0	1 5·7	—	22 14	1 2·7	—	14 9	1 0·7	—
Cultivations: Labour ..	1 5	0·9	9	1 1	1·4	9	1 2	0·7	9	2 7	2·1	18
Services ..	2 12	1·9	—	1 9	2·0	—	2 6	1·5	—	2 6	2·0	—
Total ..	3 17	2·8	—	2 10	3·4	—	3 8	2·2	—	4 13	4·1	—
Manuring: Labour ..	1 11	1·1	13	1 16	2·4	16	1 18	1·3	16	2 19	2·6	23
Materials ..	16 15	1 0·4	—	11 11	1 3·7	—	39 5	2 1·3	—	37 4	2 8·8	—
Services ..	15	0·5	—	13	1·0	—	2 13	1·7	—	3 0	2·6	—
Total ..	19 1	1 2·0	—	14 0	1 7·1	—	43 16	2 4·3	—	43 3	3 2·0	—
Other operations:												
Apple thinning	4 15	3·5	46	5	0·4	3	4 6	2·8	38	2 10	2·2	22
Orchard heating	6	0·2	—	2 9	3·3	3	6	0·2	2	1 6	1·1	3
Replacing trees	2 16	2·1	—	—	—	—	1 18	1·2	11	3 12	3·2	—
Total ..	7 17	5·8	46	2 14	3·7	6	6 10	4·2	51	7 8	6·5	25
Total annual cultural costs ..	59 19	3 8·2	132	39 3	4 5·4	112	86 2	4 7·7	149	80 10	5 10·9	142
Picking: Labour ..	13 11	10·0	137	8 1	11·0	73	16 19	10·8	148	10 10	9·3	88
Services ..	1 13	1·3	—	1 0	1·4	—	2 12	1·7	—	4 5	3·7	—
Total ..	15 4	11·3	—	9 1	1 0·4	—	19 11	1 0·6	—	14 15	1 1·0	—
Operational overheads:												
Labour ..	2 6	1·7	20	1 14	2·3	16	2 13	1·7	23	3 5	2·9	25
Other	13 1	9·6	—	8 7	11·4	—	15 8	10·0	—	7 12	6·7	—
Total ..	15 7	11·3	—	10 1	1 1·7	—	18 1	11·7	—	10 17	9·6	—
Administration	4 4	3·1	—	4 14	6·4	—	5 14	3·7	—	3 4	2·8	—
Proprietor's sacrifice ..	5 14	4·2	—	5 14	7·7	—	5 14	3·7	—	5 14	5·0	—
Special costs	1 7	0·9	—	1 7	1·8	—	1 7	0·9	—	1 7	1·1	—
Total annual growing costs ..	101 15	6 3·0	289	70 0	7 11·4	201	136 9	7 4·2	320	116 7	8 6·4	255
Grassing down (36 acs.)	19	0·7	1	—	—	—	—	—	—	1 19	1·8	3
Thinning out trees (10·5 acs.)	4 6	3·2	41	4 2	5·5	28	—	—	—	(23 acs.)	—	—
New Plantations (4 acs.)	—	—	—	(6 acs.)	—	—	3 16	2·5	11	—	—	—
Total, additional outlay ..	5 5	3·9	42	4 2	5·5	28	3 16	2·5	11	1 19	1·8	3
Initial marketing costs:												
Labour ..	1 9	1·1	13	14	1·0	7	1 14	1·1	15	1 10	1·4	12
Other	12	0·4	—	1 0	1·4	—	1 12	1·0	—	2 4	1·8	—
Total ..	2 1	1·5	—	1 14	2·4	—	3 6	2·1	—	3 14	3·2	—
Total annual outlay	109 1	6 8·4	344	75 16	8 7·3	236	143 11	7 8·8	346	122 0	8 11·4	270
Bushels picked per acre ..		325			176			371			272	

FARM F

TABLE II

Operational Costs

Average 1948-51 and Equivalent 1951 Costs

	Average 1948-51					Equivalent 1951	
	Total £ s.	per acre £ s.	per bushel s. d.	per cent.	hours man-labour per acre	per acre £ s.	per bushel s. d.
Pruning	876 3	8 9	7	7·5	58	8 17	7½
Spraying	1,902 12	18 6	1 3½	17	15·5	20 11	1 5½
Cultivations	374 15	3 12	3	3	11	3 16	3
Manuring	3,120 14	30 0	2 1	27	17	37 0	2 7½
Other operations	637 5	6 2	5	5·5	32	6 9	5½
Total annual cultural costs	6,911 9	66 9	4 7½	60	133·5	76 13	5 5
Picking	1,522 17	14 13	1 1	14	112	15 8	1 1
Operational overheads	1,413 1	13 12	1 0	13	21	14 10	1 0
Administration	463 1	4 10	4	4·5	—	4 13	4
Proprietor's sacrifice	597 0	5 14	5	5·5	—	5 14	5
Special costs	140 0	1 7	1	1	—	1 7	1
Total annual growing costs	11,047 8	106 5	7 6½	98	266·5	118 5	8 4½
Annual share of:							
Grassing down	46 10	9	—	—	—	2 12	2
Grubbing	117 10	1 2	1	1	—		
Thinning out	109 8	1 1	1	1	—		
Total all growing costs	11,320 6	108 17	7 8½	100	—	120 17	8 6½

FARM F

TABLE III

Factor Costs

	Average 1948-51				Equivalent 1951	
	Total £ s.	per acre £ s.	per bushel s. d.	per cent.	per acre £ s.	per bushel s. d.
Manual labour	3,449 19	33 3	2 4	30·5	34 6	2 5
Manures	2,723 14	26 4	1 10	24	33 0	2 4
Spray materials	1,512 16	14 11	1 0½	13·5	16 4	1 2½
Machinery and equipment services	1,326 14	12 15	11	11·5	14 6	1 0
Maintenance of investment	1,009 18	9 13	8	9	9 13	8
Administration and sundries	1,297 5	12 11	11	11·5	13 8	11
Total	11,320 6	108 17	7 8½	100	120 17	8 6½

FARM F

Comment

This farm has the largest acreage under apples and has, moreover, relatively uniform orchards. Both dessert and culinary apples are grown, but there is no great range in the size of the heads of the trees. As in Farm C, a first-class grading sample is a prime requirement, and it is found here in association with a relatively intensive production. Greater than usual reliance is placed upon management as a technique in both husbandry and finance. But the response from the trees is less than on Farm C, the environment being inferior.

Total cost per acre is considerably higher than on the other farms—particularly so in view of the area of the farm—but operation by operation it is seen to be very well organized, and the only relative excess is in the use of manures, both organics and inorganics being applied heavily. With normal manuring it is obviously possible to grow an apple crop in these conditions with less than 100 hours of manual labour per acre. As it is, none of the farms with a comparable quality of output uses labour to such good effect: the second best is no less than 24 per cent. higher in manual labour requirement. Labour and machinery together account for only 42 per cent. of total costs.

One feature of the management of the fruit enterprise on this farm is the degree of control exercised over total cost. One of the most stable quantities recorded over the whole period of four years is the total cost per bushel. Yields fluctuate from one year to another, and if the cost per bushel is to be steady, the cost per acre must be allowed—or induced—to fluctuate also. The effect of this policy can be seen in the changes year by year in (*a*) costs of operational overheads, (*b*) costs of minor operations, (*c*) cost of spraying, particularly of the "materials" component.

There may be a pointer to an attribute of the bush tree revealed in the labour requirement for picking; that is, as compared with the standard or half-standard tree, a thin crop can be relatively cheap to pick, whether by time-work or piece-work. The hours, of course, are derived from the piece-rate earnings; and if the rate in each year be adjusted to that of 1951, the cost of picking per bushel is: 1948, 1s. 0·7d.; 1949, 1s. 1·1d.; 1950, 1s. 0·8d.; 1951, 1s. 1·0d.—the half crop is picked for only ½d. a bushel more than the full crop.

In fact the labour requirement as a whole is tailored to the size of the crop. The bushels per man-hour figure varies only between 1·2 and 1·1, by less than 10 per cent.

Note.—Mean values of some of the quantities in Tables I, II and III are as under:

	£ s.
Table I. Average annual outlay per acre (spread over the bearing acres)	100 0

Table II. Equivalent 1951 annual growing costs per acre:

Pruning	9 15
Spraying	20 17
Cultivations	5 16
Manuring	17 18
Other operations	3 8
Picking	17 11
Operational overheads	11 3
Administration	4 5
Orchard replacement	5 6
Other costs	2 9
Total ..	£98 8
Cost per bushel of apples *picked*	6s. 7d.
Hours of manual labour per acre ..	320

Table III. Equivalent 1951 factor costs:

	per acre £ s.	per bushel s. d.	per cent.
Manual Labour	39 0	2 7	39·6
Manures	15 19	1 1	16·2
Spray materials	13 18	11	14·1
Machinery and equipment services	13 15	11	14·1
Maintenance of investment	7 16	6	7·9
Administration and sundries	8 0	7	8·1
	£98 8	6 7	100·0

WHAT THESE FARMS HAVE IN COMMON

The foregoing figures will have different meaning to different people; growers may consider them either provocative, misleading, instructive or inconclusive. At their face value they appear to one observer who knows all the farms and sees their outward differences, to be remarkable for the constancy shown in many of the calculated quantities. It is often loosely taken for granted that costs do vary greatly as between farms for reasons largely unknown. It now appears that the element of mystery in this situation can often be explained away if more than one season can be brought into the discussion, and if care is taken to define the kind of cost alleged to be affected.

Seasonal variations in total cost differ in apparent importance according as to whether many or few farms are affected. If large numbers of farms experience exceptional shoot growth or exceptional pest resilience in the same season, their costs will be affected in the same way at the same time. Other types of mischance affect farms singly and then appear to the grower concerned to be more important; in reality large numbers of farms are still affected by similar mischances, but at different times.

Enduring *variations in cost per acre* arise from the different physical characteristics of farms and particularly from differences in type of tree. Pruning, spraying and picking all tend to be more costly the larger the tree. Apart from this, other variations in cost per acre between good commercial growers arise from differences in (i) the size of farm, (ii) the care in growing, (iii) the number of production processes undertaken on the farm, (iv) the income standard of the proprietor, and (v) limitations imposed by the site.

Piece-rate working being widespread and at uniform rates, the management factor is not included in the above list: it need not be an enduring influence, either.

Some indication of the different scales on which different growers use the various factors in production can be given by listing their costs per acre for each factor:

	Farm A	Farm B	Farm C	Farm D	Farm E	Farm F
	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
Manual labour	52 16	40 15	37 14	30 4	38 3	34 6
Manures	10 17	22 16	14 3	2 2	12 19	33 0
Spray materials	25 3	7 17	10 16	8 3	15 8	16 4
Machinery and equipment services	14 12	14 4	18 12	9 10	11 6	14 6
Maintenance of investment	5 17	10 0	6 10	8 15	5 18	9 13
Administration and sundries	4 17	4 11	8 11	10 0	6 12	13 8

Variations in the cost per bushel have to be accepted when the same distribution and level of cost per acre will produce a different yield in different situations, but the popular argument has not been conducted in terms of costs per bushel, a knowledge of which is not usually available to growers.

It is the evidence of stability in these lists of working costs, and not the many small variations, which is now exposed.

Before trying to formulate facts of wide application on the basis of the present evidence it must be repeated that the features noted will only hold good for the middle range of practice and yield in apple growing. Few prescriptions are applicable to all the farms and in the present instance exceptions have been noted where an unusual practice has been employed. It may prove to have been good policy to forget temporarily about the impact of market returns and to concentrate upon the economic aspects of *growing* fruit, as knowing the rigidities in the farm costs will help in the understanding of the financial instability induced by the fluctuations in market returns.

Tendencies towards constant quantity have been found in the following:

1. Discounting Farm D, the exceptional farm in this respect, it is usual for cultural costs to be about 60 per cent. of total costs. The actual range for the farms is between 57·5 per cent. and 63 per cent., and in eleven of the thirteen years costed the figure falls between 55 per cent. and 65 per cent.

Proportion of cultural cost to total cost

Farm A	Farm B	Farm C	Farm E	Farm F	Average
57·5%	63·0%	55·0%	60·0%	60·0%	59·1%

2. When the proportion of total cost due to picking is added—that is, when all costs other than those of overhead nature are taken together, a more useful and at the same time more constant figure is developed. The range is now narrowed to between 80 per cent. and 73·5 per cent. around an average of 76·8 per cent.

Proportion of cultural and picking costs to total costs

Farm A	Farm B	Farm C	Farm E	Farm F	Average
79·5%	77·0%	73·5%	80·0%	74·0%	76·8%

3. Discounting Farm F (for its presently high level of manuring) labour cost is shown to approximate to 45 per cent. of total cost. If this figure is subsequently substantiated in other enquiries it will indicate that apple growing is about 12·5 per cent. more labour-intensive than general farming. In the separate years labour cost is between 40 per cent. and 50 per cent. of total cost in eleven cases out of twelve.

Proportion of labour cost to total cost

Farm A	Farm B	Farm C	Farm D	Farm E	Average
50·0%	43·0%	40·5%	44·0%	44·0%	44·3%

4. At this point it is interesting to see whether a lower dependence upon labour is compensated for by a higher dependence upon machinery. In the absence of a disturbing factor, services costs show a tendency to come within 12·5 per cent. and 15 per cent. of total costs, but they also are complementary to the labour component and the proportion of labour and services costs combined shows only a 5 per cent. difference between five of the farms, with an average of 60 per cent.

Proportion of labour and services costs to total cost

Farm A	Farm B	Farm C	Farm D	Farm E	Average
62·5%	58·0%	59·5%	57·5%	62·5%	60·0%

Services costs per acre show more variation than services costs per bushel.

5. No smooth or decisive trend towards greater efficiency in machinery as the farms increase in size is at first evident. Services costs per acre do not diminish as the area of the orchards increases—which suggests that 25 acres of orchard can be powered as economically as 100 acres, and that (possibly) mechanization of large-scale production has still to come. Services costs per bushel are more sensitive to the type of apple grown than to orchard area. And it is only when a final calculation of "bushels per £1 machinery cost" is made that the degree of advantage becomes apparent, and this in turn must be the result of higher yields per acre.

Services costs and productivity *

	Farm A	Farm B	Farm C	Farm D	Farm E	Farm F
Proportion of services cost to total cost	12·5%	15·0%	19·0%	13·5%	12·5%	11·5%
Services cost per acre	£12·5	£12·6	£17·2	£8·2	£10·1	£12·2
Services cost per bushel ..	9d.	23d.	11d.	8d.	7d.	11d.
Bushels per £1 services cost ..	24·8	11·3	18·1	29·6	33·5	20·0

The costs of administration and of provision for the maintenance of the investment are of minor importance: these show pronounced variation for what is essentially the same service, but with little effect upon the final result.

Grassing down, thinning-out and grubbing are seen to impose a "cost" not exceeding £2 12s. an acre, or the equivalent of up to 2d. a bushel with normal yields.

Special costs are shown to be relatively unimportant as far as growing is concerned: there may, of course, be additional charges to be borne in the marketing sphere. Capital requirement is affected to a greater extent than cost. The 1 to 2 per cent. extra cost shown under this heading means about 10 per cent. extra capital required. Given adequate capital, a good growing situation, though as yet undeveloped, would seem to be a good risk for the larger grower.

The similarities noted in the results are admittedly those of ratios rather than those of actual single quantities: single quantities do vary, but when combined in the aggregate with other quantities they show relative constancy. This indicates the presence of a ruling system in commercial apple-growing, which is understandable considering the widespread adoption in the industry of recommendations made by research scientists.

The system would appear to exercise its grip through the labour requirements of the apple crop. On the one hand there is a certain fund of regular labour on each farm which has to be employed throughout the year, and there is also a certain routine of major cultural operations to be got through for the sake of the trees. This situation leads to a relatively inflexible labour use on each farm up to the picking stage: this use is shown to be more constant between one year and the next than might be expected on mixed farms.

Hours of manual labour on cultural tasks

	Farm A	Farm B	Farm C	Farm D	Farm E	Farm F
1948	212	202·5	—	—	—	132
1949	175	200·5	—	71	182	112
1950	—	—	131	51	178	149
1951	—	—	131	72	183	142

Most of the variation in labour use occurs in the picking and overheads components.

On the other hand, two operations alone—pruning and picking—consume at least 55 per cent. of all man-hours and, together with the expense of spraying, provide the inflexible part of the system. With so much decided for him, there is little opportunity left for a grower to make innovations which will appreciably affect the overall result, and one basis for success must surely be to see that value for money emerges from the necessary expenditure. When so high a proportion of total costs falls into the category of fixed costs it would seem to be logical to push variable costs to the economic limit.

* The "cost" basis of depreciating tractors will work to the advantage of the smaller farms, but it cannot be this one factor which gives the table its unusual character.

Turning for a moment to differences in cost; when all yearly costs are expressed at their 1951 equivalent, the range in cost per bushel is (with one exception) just as great between different years on the same farm as between different farms in the same year. Each farm is on its own average cost level, but so changeable is the weight of crop on a farm in any one year that the farm may be temporarily a high-cost or low-cost producer per unit of output. This may be important in so far as growers are led to let financial results govern their purchases of materials in each year. Is it better policy to withhold expenditure after the short crop so as to minimize the untoward financial effect, or should the trees be managed solely from the biological standpoint and a relatively steady yearly expenditure kept up on all items? The second alternative would help to make sure that the next year's crop did not suffer and if the present short crop were due to some limitation, there is more likelihood of its being overcome.

The exception mentioned above is Farm F. When 1951 prices are used for inputs instead of those actually current at the time, a notable degree of cost control is demonstrated.

Farm F—Costs per bushel at constant prices

	1948	1949	1950	1951
Bushels picked per acre ..	325	176	371	272
Cost per bushel	7s. 8d.	8s. 8d.	7s. 8d.	8s. 6½d.

Finally, another interesting point is the relation between bushels of apples produced and the number of man-hours expended. Taking the sixteen crop-years as a whole —4,922 hours of manual labour produced 4,806 picked bushels of apples.

So it might be said that *one man-hour per bushel* would have been a profitable rate of working up to 1951.

A general result like this raises the question as to how much more labour a bushel of dessert apples requires than a bushel of culinary apples, and, indeed, how much more expensive the dessert varieties are to grow as a whole. The next section is concerned with comparative costs of the two types of production, but it does not answer the question directly: instead it offers factual information from which a reasonable inference of limited application can easily be made.

COMPARATIVE COSTS OF GROWING DESSERT AND CULINARY VARIETIES

Farm E apart, the farms are characteristic of either dessert or culinary-type production. Farm E is of a dual nature in this respect. Fortunately, the old culinary orchards and the new dessert orchards are both large enough to merit inclusion as separate enterprises (though under the same management) while the costing system produces separate costs and results for each group.

With Farm E thus partitioned, there are eight culinary crops and eleven dessert crops for which experience can be condensed: salient features in the general comparison are given below.

Comparative costs (at constant prices) of growing dessert and culinary apples, 1948-51 crops

I. CULINARY VARIETIES

	per acre			per bushel			hours labour per acre		
Farm	A	D	E	A	D	E	A	D	E
	£ s.	£ s.	£ s.	s. d.	s. d.	s. d.			
Cultural costs	68 12	28 2	58 8	4 2	2 1	3 4	193	65	182½
Total costs ..	114 2	68 14	95 19	6 11	5 1	5 5½	409	207	343½

II. DESSERT VARIETIES

	per acre				per bushel				hours labour per acre			
Farm ..	B	C	E	F	B	C	E	F	B	C	E	F
	£ s.	£ s.	£ s.	£ s.	s. d.	s. d.	s. d.	s. d.				
Cultural costs	62 18	53 12	48 17	76 13	9 6	3 3	3 2	5 5	201·5	131	177	133·5
Total costs	100 3	96 6	74 8	120 17	15 1	5 10	4 10	8 6½	345·5	367	274	266·5

Below there is set out the full comparative cost schedule for a mean cost on all the farms at the 1951 level of costs.

Comparative operational cost schedules for dessert apples (on bush trees) and culinary apples (on standard or half-standard trees), 1948-51 crops

	Culinary (average acres per farm: 32)			Dessert (average acres per farm: 55)		
	per acre £ s.	per bushel s. d.	man hours per acre	per acre £ s.	per bushel s. d.	man hours per acre
Pruning	11 13	8½	93	8 19	8	76
Spraying	24 7	1 5½	18·5	17 11	1 3½	17
Cultivations	5 1	4	24	6 11	6	22
Manuring	10 1	7	5·5	22 12	1 8	11
Other operations	14	0½	6	4 18	4½	34·5
Total annual cultural costs	51 16	3 1½	147	60 11	4 6	160·5*
Picking	20 9	1 2½	143	14 5	1 0½	116
Operational overheads	9 10	7	30	11 4	10	37
Administration	4 9	3	—	3 19	3½	—
Proprietor's sacrifice	5 6	4	—	5 2	4½	—
Special costs	—	—	—	1 0	1	—
Total annual growing costs	91 10	5 6	320	96 1	7 1½	313·5
Annual share of occasional operations	1 10	1	—	1 19	2	—
Total cost	93 0	5 7	320	98 0	7 3½	313·5
Bushels picked per acre		332			268	

Here is the answer previously sought. One man-hour has produced one bushel of culinary apples, but only 34 lb. of dessert apples. It should be added, perhaps, that the aggregate output of culinary apples consists of: 45 per cent. Bramley's Seedling, 40 per cent. Lord Derby and Newton Wonder, and 15 per cent. other varieties: while the output of dessert varieties consists of: 51 per cent. Cox's Orange Pippin, 25 per cent. Worcester Pearmain, and 24 per cent. other varieties.

This last cost table has two aspects which deserve examination: there is the question of the total cost shown for each type, and the question of the relation of the one total cost to the other.

* It is interesting that in another enquiry the amount of manual attention per acre on routine productive jobs on a specialist dessert apple farm averaged 173·5 hours for mature trees over the period 1943-7. See Folley, R. R. W.: *Economics of a Fruit Farm.* Oxford University Press, 1951.

As regards the first, average yields for both kinds of fruit are low—lower than those shown for the four years 1948-51 in this Department's Yield Census. Using Census data, an average yield for the same composition of the aggregate output would be: culinary varieties 385 bushels an acre, dessert varieties 304 bushels an acre. At this level of cropping, even with a slightly higher level of cost per acre, costs per bushel would be below those now recorded. By contrast, the average size of the orchard units costed is relatively large, and consequently the present costs can have little bearing upon costs of growing on the most popular size of orchard unit (3 to 5 acres) where, other things being equal, total costs per acre would be higher.

At least 40 per cent. of the top fruit acreage, however, is in units exceeding 20 acres, and would come within the field of reference of these figures. Their validity must depend upon the purpose for which they are required: they may serve as a standard for reasonably profitable production, but not as a guide to national costs, nor as a demonstration of the most efficient practice. Thinking over the sixteen years costed, and bearing in mind the allowances which have crept into the costs for partial crop failure, high manuring and high spraying, together with the full overheads allowed, it might be expected that the results are truly indicative of costs for good medium-scale practice on mixed farms in the south-eastern counties.

Before a single figure becomes fixed in his mind, the reader is reminded that allowance must still be made for the cull fruit; and, at the risk of labouring a point, that the frost bogey cannot yet be considered laid. The combined effect of these two factors would be to raise costs per bushel by between 10 and 25 per cent.: that is, a final pronouncement might be that the average cost over a number of years of growing a saleable bushel of Bramley's Seedling is for many growers somewhere between 6s. 1½d. and 7s. 0d., and for Cox's Orange Pippin somewhere between 8s. 0d. and 9s. 1½d.*

In regard to the relative costs of dessert and culinary apples, the same relationship between the costs per bushel would still hold if Yield Census data were used. This substantiates the case for saying that, assuming the same degree of efficiency in production, to grow a marketable bushel of Cox's costs nearly one-third as much again as a marketable bushel of Bramley's. Another qualification of the statement is now necessary. More of the Bramley's go for processing and less, proportionally, for table consumption. Using Yield Census data, the cost of a fresh market bushel would be the same for both varieties if 10 per cent. of the Cox's and 31 per cent. of the Bramley's were waste.

These figures should not allow a grower who is changing over from Bramley's to Cox's to think that he will find Cox's 30 per cent. dearer per bushel to grow. Cox's may not do so well in a situation which has suited Bramley's. The figures give the mean costs for the farms and are the least objectionable form in which a combined result can be expressed. It would be safer simply to draw from the statement on page 37 the cost features for both types of production.

These features are as follows: growing a first-class sample of dessert apples on relatively young bush trees involves higher outlays per acre; operation by operation, however, they are more cheaply worked and any extra cost is incurred either in more intensive culture (i.e. heavier manuring, more labour on thinning and summer pruning) or in higher overheads—which in practice would be accentuated by the smaller unit and greater specialization. In these circumstances a commercial sample of dessert apples will be grown for the same cost as for culinary apples if the same yield can be obtained. Growing a good market sample of culinary apples on relatively old, tall trees actually calls for a greater amount of labour per acre, by reason of the demands of pruning and picking; spraying tends to be more costly, but in general the expenses other than labour are lower; there is not the same call for incidental expenditure and the higher yield makes for significantly lower costs per bushel.

* Interest on borrowed capital can be an additional and variable cost.

One further feature is perhaps worth exposing. The contribution of casual labour (meaning people engaged to help out with a specific job, not those with a part-time engagement) is higher on the dessert farms, as shown below:

Employment of casual labour (average hours per acre)

Farm A	Farm B	Farm C	Farm D	Farm E	Farm F
6·2 (one year)	108	120	79	24	91

If these totals be now subtracted from total hours per acre on growing operations, the contribution of regular labour becomes, on average, 218 hours per acre of orchard land. By this token, allowing each man 2,220 productive day hours and a modest 70 hours' overtime during the year, these fruit enterprises are run on the scale of one regular man for every 10·5 acres of apple trees (net or tree acres) apart from thinning-out, grassing down or grubbing.

COMPARATIVE ANNUAL COSTS ON GRASSED AND CULTIVATED ORCHARDS

The only remaining item suitable for extraction from the farm figures is the costs of maintaining orchards in grass and under a system of arable cultivation. The cost data are not a very reliable guide in this connexion, for the number of years spanned per farm and the total number of farms are both too small for a fair comparison. In practice, on the same farm from year to year the costs incurred result from (*a*) the extent and duration of weed or sward growth, and (*b*) the cleaning-up operations performed: the latter having been done at odd times as occasion offered.

Omitting the years when arable plots were being seeded down, the general cost situation as between the two types of soil management is shown to be as follows:

*Costs of cultivations on orchards in grass**

[At constant (1951) prices.]

Acres in orchard	18·5	2·5	23·0	23·0	77·0
Man-hours per acre	40·2	19·8	9·5	24·1	8·1
Labour cost	£4 5s.	£2 2s.	£1 12s.	£2 12s.	£1 8s.
Services cost	£2 6s.	£5 11s.	£1 15s.	£3 18s.	£2 1s.
Cost of operation	£6 11s.	£7 13s.	£3 7s.	£6 10s.	£3 9s.

Costs of cultivations on cultivated orchards

[At constant (1951) prices.]

Acres in orchard	23·0	46·0	27·0	30·0
Man-hours per acre	20·5	24·0	21·1	23·2
Labour cost	£2 7s.	£2 11s.	£2 14s.	£2 18s.
Services cost	£6 1s.	£2 7s.	£2 13s.	£3 19s.
Cost of operation	£8 8s.	£4 18s.	£5 7s.	£6 17s.

* Mowing is of course not the only item of cost: stone picking, harrowing and rolling are included too.

The big range in size of the grassed plots confuses the issue somewhat, for labour requirements per acre on these plots are shown in some cases to exceed, and in some cases to be lower than those on arable plots. Most noteworthy, perhaps, is the relatively steady labour requirement on arable plots, and the relatively constant ratio of labour to services cost on the arable plots—which suggests that whereas management of grass has different interpretations on different farms, the management of arable plots is in more agreed terms.

Closer study of the data prompts the enumeration of these four statements on the position.

A. In a year when a lot of hand-work is done, this work will be more important in determining the cost of reducing excess vegetative growth beneath the trees than the type of soil management practised.

B. Grass cover allows more latitude in its treatment, as the amount of cutting can be varied. A frequently gang-mown grass sward will incur higher cost than an arable plot in the same circumstances, particularly if the cultivating equipment can be used elsewhere on the farm.

C. In practice, when all cultivations are included, grassed orchards are often no more costly than cultivated orchards; and at low standards of husbandry the grassed orchard will be less costly.

D. The effective cost of arable plots is increased by the greater amount of hand-work for cultural purposes: but the aesthetic trimming-up of grass orchards may also inflate the total cost of grass plots.

Wye College,
February 4th, 1954.

This page has been ruled to enable readers to make their own extractions from the farm tables, if they so desire.

Item	Farms						Total	Av.
	A	B	C	D	E	F		

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