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Farm Management

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Researches
in
Farm Management:
1923 to 1950

By

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to the Secretary, Wye College, near Ashford, Kent.*

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FOREWORD

THIS report is based upon the results obtained from the Investigation into Farming costs of Production and Financial Results which was commenced in 1923 on my appointment as Advisory Agricultural Economist and Head of the newly created Department of Economics and which was wound up 27 years later on my retirement in 1950. A total of 26 reports (852 pages) have already been published, namely, six on Milk Production, three on Sheep, two on Pigs, two on Poultry, four on Corn Crops, three on Potatoes, Sugar Beet, Mangels, etc., one on Hay and Grazing, three on Horse Labour and Tractor work and two on the General Financial Results. Each of the sectional reports dealt in considerable detail with the results for a particular enterprise for a period of from four to eight years. In this report, some of the principal broad, general conclusions emerging from the investigation are exemplified and discussed, chiefly by reference to the results on 15 farms which were under investigation for periods of from 7 to 26 years.

J.W.

CHAPTER I

INTRODUCTORY

THE period covered by these case studies, 1923/4 to 1949/50, has been one of revolutionary changes in British farming. Before the war, systems of farming had been gradually adapted, by sheer force of circumstances, to meet the prevailing conditions; during the war, radical changes in both cropping and livestocking became necessary and were rigorously enforced under statutory authority. The farmer could no longer make his plans entirely on the basis of self-interest; horses, sheep, pigs and poultry either disappeared from the farming scene or were kept in much reduced numbers; the crops to be grown were decided by an all-powerful but not all-wise County W.A.E.C.; the provision of sufficient labour to cope with the additional acreage of tillage land was a perpetual worry; mechanization gradually became one of the most potent forces, especially on large farms; and so on. Since the war ended in 1945, a large measure of control over his activities has been restored to the farmer; his cropping programme is now in his own hands and he is no longer discouraged from keeping beef cattle, sheep, pigs and poultry; mechanization has continued on an ever-growing scale, even on small and medium-sized farms; the need for making the farm more self-supporting as regards foodstuffs has been emphasized, not always with a full appreciation of all that such a policy implies, and this has resulted in much greater attention being given to increasing the output from our grassland. In particular, the farmer, as opposed to the horticulturist, has been granted, under the Agriculture Act of 1947, the inestimable benefits of guaranteed prices and assured markets for the great bulk of his produce. Nevertheless, the farmer's mind is full of uncertainty about the future. Costs and prices have reached very high levels and however much farmers may be concerned about the relationship between costs and prices in 1954 and 1955 they are more concerned about what the position is likely to be five and ten years hence. Since 1939, costs and prices have risen steeply but more or less gradually; is there any assurance that when the tide turns, as it must surely do, they will also fall gradually though steeply?

One further change has occurred during this period—a change of profound importance to the farmer's financial interests. Before the war, the farmer had many worries but Income Tax was seldom one of them. He had the privilege, not given to any other class of business people, of basing his assessment for Income Tax upon either the current rental value of his farm or his profit, whichever was the lower, that is, he could allow himself to be assessed on his rental value and then, if desirable, produce accounts to show that his profit was less than his rent. Early in the war (1941), however, farmers were assessed for Income Tax on their actual profits, as shown by properly kept accounts, and they were also subject to the excess profits tax. An exception was made in the case of farms with rental values of not more than £100 per annum, these being assessed on three times the rental value or the actual profit whichever was the lower, but this concession was withdrawn in 1949.

This was indeed a revolutionary change. For the first time since Income Tax was introduced, farmers were compelled to keep proper accounts or pay the penalty of being assessed for taxation purposes according to the whim of an Inland Revenue official. This was bad enough; what was even worse was the heavy rate of income tax and super-tax which had to be paid. It is not suggested that farmers should not pay their fair share of the national taxation; merely that in so doing they were compelled to undertake

a task which few of them had ever undertaken before—to keep systematic accounts of their yearly financial transactions.

One other feature of this period must be mentioned. It is common knowledge that since 1939 there has been a great change in the purchasing power of the £1. In April, 1951, the Chancellor of the Exchequer announced in the House of Commons: "On the basis of the cost-of-living index, the value of the pound had fallen from 20s. in 1914 to 12s. 10d. in 1938. Between 1938 and 1950, on the basis of the price index given in the National Income White Paper for all consumers' goods and services, the value of the pound fell further to 6s. 8d." It is not proposed to pursue this very complicated and highly controversial subject. It is sufficient for the present purpose to point out and to emphasize that, in so far as the farmer's ultimate objective is to maintain the standard of living of himself and his family at the highest possible level, a profit of £6 per acre in 1950 was no better than one of £3 in 1938—many farmers would say that it was not so good.

LIMITATIONS

That is the background against which the case studies presented in this report should be considered. It shows at once one of the limitations imposed upon the results obtained. The broad purpose of this investigation was to study the efficiency of the management under a variety of farming conditions but obviously the impact of a world war made it impossible to maintain straightforward yearly comparisons right through the whole period. Nevertheless, there is so much confusion and misunderstanding about the financial results in farming during the war and post-war years that long-term data for even a small number of farms are not without value. It may be objected that the farmers taking part in such an investigation are all likely to be Grade A. This may be a valid objection if the results are used as representative of the whole farming industry—a way in which they should *not* be used—but it has no relation to the main purpose of the investigation.

A second limitation is concerned with the identity of the individual farms. An investigation into the management of any farm must be based upon mutual trust and goodwill: until the farmer is satisfied that he can trust the investigator he is likely to withhold information which may be essential to a proper understanding of his management problems—information which must be regarded as highly confidential. There are, therefore, solid grounds for taking all possible steps to conceal the identity of the individual farms and it is possible that this has been done so effectively that the individual farmers will not recognize their own farms.

Thirdly, in order to keep this report within manageable dimensions, severe condensation has been imperative and attention has been concentrated in each case upon the results that appeared to be significant from the management point of view. Hence, the grouping of the results has varied from farm to farm; in one case, the time-groups are 1923/39 and 1939/49, in another they are 1925/32, 1932/39, 1939/44 and 1944/49, because in the first case the general policy remained much the same before 1939 and again after 1939, whereas in the second there were important changes in policy not dictated by war conditions.

DEFINITIONS AND METHOD OF PRESENTATION

Nothing causes greater confusion in discussions on the financial aspects of farm management than the lack of uniform and standardized meanings for the terms that are commonly used. For example, the vital word "profit" is generally used as if it had a one-and-only precise meaning, whereas in fact it has a dozen different meanings; there is not one method but several methods of computing the farm "output"; and so on.

ACREAGE

In only a few cases has any adjustment been made in the actual farm acreages, on account of rough grazings, etc., and it is on this very simple issue that the validity of direct farm to farm comparisons is apt to break down. An acre of land always consists of 4,840 square yards but its productive capacity varies tremendously. Hence, to say that on one farm the yearly profit averages £10 per acre and on another £5 per acre may have no bearing whatsoever on the managerial efficiency of these two farmers. In some cases, such as extensive hill sheep farming and intensive pig and poultry farming, computations based upon the acreage of land are almost meaningless; and in all cases comparisons between farms on an acreage basis must be done circumspectly and never unthinkingly. As a unit of measurement the acre is indispensable, but just as the purchasing power of the pound varies considerably from decade to decade so the producing power of the acre varies immensely from farm to farm and district to district.

STOCKTAKING VALUATIONS

During pre-war years, the annual stocktaking valuations were made on fairly conventional lines: the livestock were generally valued at more or less standard prices for cows, sows and the various age groups of ewes and young stock, the condition being that the standard prices should never be appreciably lower than the market prices; the machinery and implements were valued by writing off the appropriate allowance for depreciation or wear and tear; the harvested crops for sale were valued at market price less the estimated cost of threshing, dressing, etc., and the harvested crops for home-consumption on the basis of their production costs; and so on. Broadly speaking, during these years, the stocktaking valuations gave a fairly reliable indication of what it would have cost to take over the farm on a "lock, stock and barrel" basis, the amount being considerably higher on a cropping farm at Michaelmas than at Lady Day. Hence, the stocktaking valuations did provide a basis on which the *capital* required to take over any farm could be calculated with a reasonable degree of accuracy.

On the outbreak of war, the stocktaking valuation soon became of crucial importance in farming finance. Farmers were now under a legal obligation to be assessed for Income Tax, Super-Tax and Excess Profits Tax according to their actual profits as shown by properly kept accounts and not, as in pre-war years, according to the rent or rental value of their farms. In the event, it was the valuation of the livestock which came under acute review—the method of valuing machinery and implements, harvested and growing crops, tillages, consumable stores and so on remained very much unchanged and the amount of the valuations tended to follow the rise of costs and prices. Even in the case of livestock intended for sale shortly after the date of the valuation, the valuation price was not really very important; for example, the total profit on a lot of bacon pigs will be the same no matter whether they are valued at Michaelmas at £10, £12 or £16 apiece. Further, in the case of herds of cows and of sows, flocks of ewes and of hens, which were maintained entirely or mainly by the purchase of the necessary replacements, there was a very strong argument in favour of raising the herd and flock valuations per head so that the valuations tended to follow the upward trend in the prices of the replacements. For example, on farm 6 the average valuation price per head of the ewe flock in 1944 was 78s. 7d. compared with 46s. 5d. in 1938. In short, it was with self-supporting herds of cows and flocks of ewes that the real valuation problem arose.

For the purposes of this report, it is sufficient to say that it became an established practice on these farms to maintain the valuation prices for dairy cows, for the different age-groups of young dairy stock and for breeding ewes at, or very nearly at, the pre-war levels. Hence, during and after the war it was usual to find a herd of cows valued at £20 to £25 apiece when they were in fact worth £50 to £60 apiece in the market, while the

young dairy stock were valued at correspondingly low prices. It may be added that these valuation figures were accepted by all the Tax Inspectors concerned.

The relevant point is that the valuations on farms with self-supporting herds of cows and flocks of ewes no longer bore much relation to the amount of capital that would have been required to take over such farms on a lock, stock and barrel basis. For example, on farm 12, the average of the valuations for the years 1946/7 to 1949/50 was about £23 per acre, whereas the average for 1949/50, adjusted on the basis of market prices for the dairy stock and ewe flock, was about £37 per acre, and since these were Lady Day valuations the total amount of capital required to finance this farm, with its 1949/50 system of farming and at 1949/50 prices, was not less than £40 an acre.

EXPENDITURE AND REVENUE

In conventional accounting, the final statement usually takes something like the following form:

DR.		CR.
Opening valuations	× Revenue for year (in detail)	×
Expenditure for year (in detail)	× Closing valuations	×
Profit for year	× [or Loss for year]	×

This statement is supported by a Balance Sheet and a Capital Account.

Such a method of presentation has the advantage of simplicity but it does not permit direct comparison of the results from year to year on the same farms or from farm to farm in the same year or period of years. For example, in the case of purchased foodstuffs, manures, seeds, fuel and oil and all other consumable stores, the relevant comparative figure is not the cost of what has been purchased but the cost of what has been *used* during the year and this can be easily found by adding together the opening valuation and the expenditure and deducting the closing valuation. Similarly, the cost of depreciation on the machinery and implements can be found by adding together the opening valuations and the expenditure on new machines and deducting the sum of the closing valuations and the revenue from machines sold. It is these *net* expenditures as they might be called which represent the true yearly *input* for consumable stores and machinery and implements.

On the other side of the account, the *net* revenue or *output* for each class of live-stock can be found by deducting the sum of the opening valuations and purchases from the sum of the closing valuations and the sales, while the *net* revenue or output for crops, either individually or in total, consists of the sum of the closing valuations and sales, less the opening valuations.

Briefly, what happens is that the statement of revenue and expenditure and the balance sheet are reduced to one single statement of net revenue or output and net expenditure or input and it is in this sense that the terms revenue and expenditure are used throughout this report.

It is sometimes urged that in computing the farm output allowance should be made for purchased foodstuffs and seeds, on the ground that these are part of the output on other farms, either at home or abroad. This procedure is quite sound in calculating the output of the national farm but it is not suitable for the individual farm: it is no more logical to say that the individual farm output is high because of the liberal use of artificial manures than that it is high because of the heavy expenditure on purchased foodstuffs and high-quality seeds.

PROFIT

The profit is, of course, the difference between the revenue and the expenditure and in some cases it is a minus quantity, that is, a loss. Interest charges on bank over-

drafts and other borrowed money have *not* been included in the expenditure, nor has any charge been made as managerial salary for the farmer. In a few cases, the farmer has been allowed a wage, at current rates for hired workers, for the ordinary manual work done by him but the fact that no such charge has been made does not necessarily mean that the farmer has not done any ordinary manual work. In two cases, where there was a paid manager fully responsible for running the farm, his salary has not been included—for the purposes of this report he has been regarded as the farmer—but the wages of bailiffs or managers with only limited authority have been included. On the revenue side, credit has been given to the farm for the value of farm produce used in the farmer's household as well as for the value of the farmhouse as the farmer's private residence.

The profit here shown is, therefore, the surplus available to recompense the farmer, first, for the capital invested in the farm, including interest charges on bank overdrafts, etc., actually paid; second, for the work he has done as manager of the farm; and, third, in some cases for ordinary manual work done by him.

In theory, the direct charges on the year's profit are: first, interest on bank overdrafts and loans; second, reasonable living expenses of the farmer and his household; and, third, taxation payments; but during the war and post-war years a disturbing factor has been the expenditure on new machinery and implements which received high priority on the farmer's bank account. In fact, there was a marked tendency for farmers to buy machinery and make long-term improvements to roads, buildings, etc., in the belief that they were thereby reducing their tax liabilities. This was quite true, but it was not uncommon to find that, as a result of the expenditure on machinery and improvements, there was insufficient cash left in the bank to meet the reduced tax assessments.

CAPITAL INVESTED

Subject to what has already been said, the capital invested has been reckoned as the average of the annual valuations for the period, whether one year or five years. It must be repeated that capital figures for the war and post-war years should not be taken to represent the capital that would actually be required to finance these farms at war or post-war prices. For example, farm 12 yielded an average yearly profit for the four years 1946/7 to 1949/50 of £8 4s. per acre, equivalent to 35·6 per cent. per annum on a "capital" of £23 2s. per acre, but it would be highly misleading to suggest that it would be possible to take over this farm at current prices and earn a profit of 35·6 per cent. on the capital that would be required to finance it.

OWNER-OCCUPIED FARMS

Most of the farms included in this report were occupied by tenants and in the few cases where they were owned by the occupiers they have been treated as if they had been rented by the farmers, as owners, to themselves, as tenants, that is, the freehold value has not been included in the valuations, a fair rental value has been charged in the farm accounts and all expenditure and revenue concerning the owner rather than the tenant have been excluded from the farm accounts.

GENERAL RELATIONSHIPS

A report of this kind is inevitably based upon a great many tables, drawn up in parallel columns and conveying an invitation to compare the figures in the different columns. But direct comparisons over a long period of time or over a number of different farms are not possible, without numerous qualifications.

In a case study, all the data are tabulated and summarized in such a way as to throw as much light as possible on that particular case. Hence, the summary periods

vary from farm to farm. In each case, the chief obstacle to long-term comparisons between column and column is the gradual change in the purchasing power of the pound, while the change in the basis of the stocktaking valuations as regards livestock also invalidates some comparisons. The possibility of a complete revision of the financial data which would have eliminated these two disturbing factors has been considered and rejected, partly because of the very large amount of work that would have been required but chiefly because the revised data would have appeared highly unrealistic in the eyes of the farmers concerned. It is not much comfort to the farmer called upon to pay £36 per ton for a dairy cake to tell him that, in terms of the 1914 pound, the price is really only £12.

THE FARMS

This report deals with the results on 15 farms, each of which has been selected because it has some special features. Hence, the emphasis is on *differences* rather than similarities. From the point of view of managerial efficiency, therefore, comparisons are not likely to be very helpful; it is not much use to the hundred-acre farmer to be shown what is done on a three-thousand acre farm and it would be unwise for the farmer with 3,000 acres of second-rate land on the top of the downs to aim at the same cropping targets as the farmer with 300 acres of highly fertile brick-earth. On the other hand, several of the cases demonstrate beyond all question what can be accomplished by good management; several of the farms were taken over in a semi-derelict condition and brought back to a high state of productivity and profitability by sheer good farming.

Comparisons based upon widely different farms provide an opportunity of testing the soundness of some generally accepted economic principles in good farming. For example, if it be true that the farm profit depends more upon the revenue or output than upon the expenditure or input then it should be possible to demonstrate the soundness of this principle on individual farms differing widely from one another. Further, a study of individual farms provides the strongest possible case against over-simplification of the farming problem, against those facile generalizations based upon mythical "average" farms and "average" farmers. The most that can be said in favour of comparisons between an individual and an average farm is that they may help to rouse the farmer's interest, although one of his first reactions may be a strong distrust of all such comparisons.

Table I gives the approximate acreage of each farm, the period of investigation and the special features. The acreage is given in round numbers because from a management point of view there is no material difference between 350 and 450 acres or between 140 and 180 acres. Where two or more acreage figures are given, the farms have increased in size during the period of investigation and it is worth noting that this is true in 10 out of the 15 cases. In one case, the investigation covered three farms occupied successively by the same farmer; in other cases, additions were made to the original farm. It should also be mentioned that in 10 of the 15 cases, the investigation commenced from the date at which the farm was rented or purchased. Three of the farmers have co-operated for the full period of the investigation—26 years; two have co-operated for 7 years and 10 for periods ranging from 11 to 22 years.

One general observation may be made at this point. The impact of the war on the cropping plans was very different on different farms. Farms 1, 4, 6, 9 and 11 were already geared to fairly intensive arable farming and no radical changes in the cropping policy were necessary, although there was, of course, some change in the emphasis placed on the various arable crops. On farms 3, 5 and 7, however, the war caused an upheaval in the pre-war cropping: the land was "difficult", especially for farmers with only limited experience of, and still more limited man power and machinery for, arable farming, and the cropping results were often disappointing. There was never any doubt

about the necessity for such cropping but a tremendous amount of effort was expended for quite meagre returns. On farm 15, the changeover from mainly grassland milk production to large scale corn growing and milk production was quite revolutionary but the general conditions were favourable to full scale mechanization, a very substantial addition was made to the national larder and the financial reward for the farmer's immense efforts was not unsatisfactory.

TABLE I
Summary of Farms

Case No.	Acreage (approx.)	Period	No. of Years	Special features
1	400	1923/4-1948/9	26	Highly intensive, including hops, orchards and seed crops. A "one-farm" business. At Michaelmas, 1949, only livestock on farm were three horses and a few hens.
2	300-400	1935/6-1945/6	11	Downland farm, extended during war on heavy clay. Dairy stock; sheep given up.
3	150-200	1931/2-1949/50	19	Upland and valley farm with steep slopes. Hops. War-time cropping not successful. Useful dairy herd built up: new cowshed.
4	250-400	1936/7-1948/9	13	Intensively farmed: corn, sugar beet, potatoes and green vegetables. Dairy herd.
5	150	1923/4-1946/7	24	Pre-war: all-grass dairy farm producing highest grade of milk successfully. War-time cropping not very successful.
6	350-450	1926/7-1947/8	22	Typical East Kent mixed farm: corn, potatoes, canning peas, leys. Dairy stock and breeding flock.
7	100-150-200	1923/4-1948/9	26	Pre-war farms: mainly all-grass milk production. War-time cropping not very successful.
8	40-80	1937/8-1949/50	13	Mainly all-grass milk production. High-class dairy herd built up very cheaply. New cowshed.
9	200-250	1925/6-1948/9	24	Cash cropping and milk production on good land.
10	150	1936/7-1949/50	14	Highly intensive cash cropping and milk production.
11	250	1923/4-1948/9	26	Mixed cash cropping and milk production: new cowshed. Very poor layout.
12	200-450	1936/7-1949/50	14	Cash cropping, milk production and sheep breeding on light land.
13	200-300	1942/3-1948/9	7	Cash cropping and sheep breeding.
14	1,000	1943/4-1949/50	7	Fully mechanized corn and milk farm. Very poor layout. Hilly land. Much improved.
15	2,000-4,000	1933/4-1949/50	17	Fully mechanized corn and milk farm. Very much improved.

CHAPTER II

RESULTS FROM FINANCIAL ACCOUNTS

DISCUSSION of the financial results on these farms can take place under two heads: first, the results from the ordinary financial accounts showing the profit or loss from the farm as a whole and, secondly, the results from the cost accounts showing the profit or loss from the different sections or enterprises, as well as from the farm as a whole. Table II brings together some of the principal relationships on each farm and is worthy of study column by column and line by line: it represents a concentration of a mass of statistical data.

First of all, it should be emphasized that there is no question of comparing the managerial efficiency of these 15 farmers on the strength of these results; in this respect, each case stands by itself. Secondly, as already pointed out, comparisons between farm and farm on an acreage basis are invalidated because from a management point of view an acre of land is a very flexible measuring stick. Attention may be drawn to the following features of Table II:

1. The marked increase in the average yearly profit per acre on most of the farms during the war and post-war compared with the pre-war years—an increase which was generally more than sufficient to offset the reduced purchasing power of the pound. For example, farm 1 had an average yearly profit in 1923/39 of only about 15s. per acre compared with £12 15s. in 1939/49; farm 4 made an average yearly profit of about £9 per acre in 1944/9 against only 14s. in 1937/9; and farm 12 averaged only about £1 per acre per annum in 1936/41 and fully £8 in 1946/50. There were, however, one or two striking exceptions to the general tendency: farm 5 averaged a yearly profit of about 50s. per acre in 1927/39 but made a small loss in 1939/47, and on farm 7 the yearly profit was about 44s. per acre in 1937/43 and only 30s. in 1943/9—in both cases the war-time cropping on what were mainly all-grass farms before the war was far from profitable. Nevertheless, in several cases, there was a marked improvement in the yearly profit per acre even in pre-war years: farm 5 converted a yearly loss of 44s. per acre in 1923/27 into a profit of 52s. in 1927/31, and on farm 6 there was a yearly profit of 77s. per acre in 1932/8 against only 6s. in 1926/32.
2. In most cases, the percentage of arable land increased substantially during the war years: on farm 2 from 39·7 to 79·5, on farm 3 from 28·9 to 54·6, on farm 12 from 29 to 75·2, on farm 15 from 12·9 to 62·6; and so on.
3. There was, of course, a considerable increase in the wages per acre during the war and post-war periods, partly because of the increased tillage cropping and partly because of the increased wage rates. Further, the percentage of wages in the total expenditure showed a considerable increase on every farm: from 47·5 to 59·2 on farm 1, 36·9 to 43 on farm 2, 37·6 to 47·9 on farm 3, 32·5 to 39·9 on farm 4, and so on.

Several other aspects of this table are discussed later on.

Table II is headed financial relationships rather than financial results and it does support very strongly the idea that the ultimate result—profit—is determined by the relationship between a good many variables. There is nothing very profound in saying that, taken by itself, the cost of labour per acre has little or no significance in terms of the profit per acre or that the output of any farm must always be judged alongside the input. Nevertheless, it is doubtful if it is generally recognized how wide the relationship may be between the output and the profit or between the wages and the profit per acre. Consider the examples from Table II outlined in Table III.

TABLE II
Some Financial Relationships

Case No.	Period	Per cent. arable	Per 100 acres				Per cent. profit on capital	Wages	
			Revenue (Output)	Expenditure (Input)	Profit	Capital		Per 100 acres	Per cent. of input
1	1923/39	95.8	£ 1,558	£ 1,485	£ 73	£ 2,136	3.4	£ 706	47.5
	1939/49	96.3	4,384	3,110	1,274	2,711	47.0	1,841	59.2
2	1935/40	39.7	1,112	944	168	1,338	12.5	348	36.9
	1940/6	79.5	1,910	1,457	453	1,716	26.4	627	43.0
3	1931/8	28.9	995	1,041	(-)46	1,038	(-)4.4	390	37.6
	1938/44	38.6	1,750	1,335	415	1,138	36.5	575	43.1
	1944/50	54.6	2,682	2,198	484	1,643	29.5	1,054	47.9
4	1937/9	69.3	1,360	1,291	69	1,439	4.8	419	32.5
	1939/44	82.2	2,670	1,925	745	1,961	38.0	737	38.3
	1944/9	92.9	3,722	2,821	901	2,870	31.4	1,126	39.9
5	1923/7	11.5	1,836	2,056	(-)220	2,488	(-)8.8	658	32.0
	1927/31	0.0	2,394	2,132	262	2,492	10.5	664	31.1
	1931/9	0.0	1,884	1,640	244	2,224	11.0	588	35.9
	1939/47	35.9	2,369	2,379	(-)10	2,313	(-)0.4	1,008	42.4
6	1926/32	61.3	1,062	1,031	31	2,182	1.4	469	45.5
	1932/8	61.8	1,427	1,040	387	1,739	22.3	415	39.9
	1938/44	78.1	2,213	1,320	893	1,818	49.1	666	50.4
	1944/8	81.6	2,500	2,060	440	2,052	21.4	1,080	52.1
7	1923/30	24.1	874	850	24	1,368	1.8	321	37.8
	1930/7	11.1	777	681	96	1,214	7.9	282	41.6
	1937/43	22.4	1,085	866	219	1,233	17.8	387	44.8
	1943/9	59.5	1,568	1,420	148	1,454	10.2	754	53.2
8	1937/40	0.0	2,141	1,512	629	2,051	30.7	370	24.5
	1940/5	12.8	2,616	1,829	787	2,055	38.3	637	34.8
	1945/50	7.7	3,127	2,778	349	2,996	11.7	904	32.5
9	1925/32	48.7	1,151	1,299	(-)148	2,392	(-)6.2	412	31.7
	1932/9	45.2	1,247	1,212	35	1,844	1.9	429	35.4
	1939/44	59.6	2,157	1,568	589	1,852	31.8	601	38.3
	1944/9	70.8	2,864	2,273	591	2,145	27.6	1,031	45.4
10	1936/43	60.5	2,275	1,576	699	2,206	31.7	539	34.2
	1943/50	85.0	4,461	3,567	894	3,307	27.0	1,378	38.6
11	1923/31	75.4	1,448	1,231	217	2,575	8.4	462	37.5
	1931/9	86.1	1,292	1,168	124	2,206	5.6	466	39.9
	1939/44	89.7	2,370	1,887	483	2,554	18.9	806	42.7
	1944/9	89.7	3,221	2,923	298	2,299	13.0	1,514	51.8
12	1936/41	29.0	1,087	982	105	1,530	6.9	313	31.9
	1941/6	68.6	1,690	1,327	363	1,638	22.2	561	42.3
	1946/50	75.2	2,992	2,170	822	2,311	35.6	976	45.0
13	1942/5	88.1	2,713	1,870	843	1,778	47.4	587	31.4
	1945/9	93.8	3,355	2,477	878	2,839	30.9	831	33.5
14	1943/7	73.9	1,650	1,149	501	1,719	29.1	391	34.0
	1947/50	80.5	2,517	1,537	980	2,088	46.9	474	30.9
15	1933/40	12.9	1,127	894	233	1,087	21.4	218	24.4
	1940/5	51.8	1,551	1,326	225	1,633	13.8	412	31.1
	1945/50	62.6	2,561	2,208	353	2,748	12.8	786	35.6

The first four cases had an average yearly profit per acre of around £9 but the revenue (output) varied from about £25 to about £45 per acre and the wages from about £5 to about £14. Cases 8 and 11 also had a comparatively high output per acre but the profit was only about £3 per acre per annum and the wages amounted to about £9 per acre in one case and £15 in the other. These wide variations are not in any way exceptional; they are, in fact, normal to farming activities and they are due, of course, to the extremely diverse conditions under which farming is carried on.

TABLE III
Relationship between Revenue, Profit and Wages per acre

Case No.	Period	Per 100 acres			Revenue per £100 Wages
		Revenue	Profit	Wages	
		£	£	£	£
4	1944/9	3,722	901	1,126	331
10	1943/50	4,461	894	1,378	324
13	1945/9	3,355	878	831	404
14	1947/50	2,517	980	474	531
8	1945/50	3,127	349	904	346
11	1944/9	3,221	298	1,514	213

Now let us consider what light, if any, Table II can throw upon two different conceptions of "farming efficiency": first, the output per acre, and, secondly, the output per man.

OUTPUT PER ACRE

As regards the output per acre there can be no doubt about the theoretical answer. A large proportion—up to 60 or 70 per cent.—of the farm expenditure consists of "overheads" which are not much influenced by the yield per acre, per cow, per ewe, and so on. There is, therefore, a strong presumption that the profit will depend more upon the total output than upon the total expenditure. But this is an over-simplification of the problem. For one thing, even in times of fairly stable costs and prices, the output does not increase exactly in proportion to the amount of manure applied or to the amount of a "production" ration fed to a cow or fattening bullock. In general, expenditure on non-overheads—manures, some cultivations, spraying, etc.—tends to give a reduced output per unit of expenditure and this may offset, to a greater or lesser extent, the reduction in the cost per unit of the overheads as the output is increased. For another thing, in a period of steeply rising prices it may happen that the rate of increase in the costs is greater than that in the prices, in which case the profit will be dominated by the expenditure rather than by the output. This would also happen in the event of prices falling more rapidly than costs.

A careful scrutiny of Table II leaves the impression that on these farms, the profit was related more closely to the revenue than to the expenditure, but there are one or two notable exceptions; for example, in case 6, the reduction in the profit between 1938/44 and 1944/8 was not due to a falling off in the revenue but to a very marked increase in the expenditure.

Table IV gives the three-yearly moving averages of revenue, expenditure and profit for farms 1 and 6. By taking three-yearly averages, the somewhat fortuitous differences in the yearly results are smoothed out.

TABLE IV
Three-year moving averages: Cases 1 and 6

Three years ending	Case 1			Case 6		
	Revenue per 100 acres	Expenditure per 100 acres	Profit per 100 acres	Revenue per 100 acres	Expenditure per 100 acres	Profit per 100 acres
1925/6	£ 1,768	£ 1,612	£ 156	£ —	£ —	£ —
1926/7	1,763	1,630	133	—	—	—
1927/8	1,472	1,527	(-) 55	—	—	—
1928/9	1,509	1,427	82	1,232	1,208	24
1929/30	1,414	1,384	30	1,195	1,093	102
1930/1	1,369	1,362	7	1,032	962	70
1931/2	1,239	1,340	(-) 101	894	858	36
1932/3	1,367	1,368	(-) 1	836	833	3
1933/4	1,608	1,460	148	1,005	874	131
1934/5	1,768	1,493	275	1,207	932	275
1935/6	1,741	1,510	231	1,395	994	401
1936/7	1,620	1,515	105	1,532	1,078	454
1937/8	1,545	1,543	2	1,654	1,150	504
1938/9	1,498	1,556	(-) 58	1,689	1,175	514
1939/40	1,723	1,597	126	1,819	1,170	649
1940/1	2,033	1,693	340	2,012	1,219	793
1941/2	2,809	1,998	811	2,252	1,284	968
1942/3	3,572	2,226	1,346	2,317	1,360	957
1943/4	4,096	2,612	1,484	2,405	1,420	985
1944/5	4,172	2,790	1,382	2,438	1,497	941
1945/6	3,901	2,995	906	2,430	1,648	782
1946/7	4,563	3,253	1,310	2,316	1,883	433
1947/8	5,653	3,925	1,728	2,508	2,200	308
1948/9	6,405	4,583	1,822	—	—	—

Case 1 shows a close relationship between the revenue and the profit. Up to 1939/40, the margin between revenue and expenditure was never large but the fluctuations in the margin were caused mainly by fluctuations in the revenue. After 1939/40, there was a substantial increase in both revenue and expenditure but whereas the expenditure increased fairly regularly, year by year, the increase in the revenue was much less regular.

Case 6 shows a fairly close relationship between the profit and the revenue until 1944/5, after which expenditure takes control over the profit. This is of particular interest since there was a change in the management on this farm in 1944—a profit of £10 2s. per acre in 1943/4 was converted into a loss of 3s. in 1946/7.

The general conclusions must be: first, that on individual farms *under good management* the profit depends more upon the revenue or output than upon the expenditure or input; secondly, that should anything go wrong with the management, by a change in personnel or by the introduction of a system of farming which the management cannot cope with, the expenditure may increase so rapidly that the revenue cannot keep pace with it; and, thirdly, that on different farms the same profit per acre may result from very different levels of expenditure and revenue.

OUTPUT PER MAN

There is probably no financial aspect of farming about which there is so much confused thinking, talking and writing as the so-called "output per man". British farmers are told that the output per man in U.S.A. farming is three or four times greater than in this country and all sorts of conclusions are then drawn, reflecting on the comparative "efficiency" of British farmers. It is, of course, admitted that the output per acre is

substantially higher in this country than in the U.S.A. but, curiously enough, this is not usually taken as an indication of the higher efficiency of British farmers.

During the last few years, I have read many accounts of what is called "labour productivity" in the U.S.A., in this country and elsewhere, but I have not yet seen any comparisons that would survive half-an-hour's cross-examination by "learned Counsel". One can imagine the embarrassment of the witness when asked to explain how he has converted men and women, boys and girls, casual and piece workers, hired and family workers, contract workers and so on, into a common denominator—a "man"; and how he has allowed for the varying number of regular and overtime hours worked by the different workers per week and per annum!

But even if we assume that comparisons between the output per man in this country and in other countries could be validly made, there is some confusion between the means and the end. The farmer at least is under no delusion; to him the end point is neither the output per acre nor the output per man, but simply the maximum average yearly farm profit. Just as soon as it can be shown that there is a close relationship between the output per man and the total farm profit, he will begin to take more than an academic interest in discussions about the output per man. I am not aware that this relationship has ever been established and from what now follows it must be doubted if it exists.

The expression "output per man" contains two terms, the first monetary and the second physical. It would appear that the coiners of the phrase were so concerned about using such a flexible measuring stick as the pound that they decided on a physical standard for labour: a "man"; but they were forced to accept a monetary basis for output. This procedure is neither logical nor realistic.

There is only one practicable common denominator for the extremely varied assortment of items in the output of individual farms and that is the £1. Equally, there is only one practicable common denominator for all the different kinds of workers, all the different "working hours", which made up the total labour force on any farm and that is also the £1. So long as the comparison of £1 of output and £1 of labour is made over the same period of time, the flexibility of the measuring stick is no real drawback.

Further, the computation of revenue or output per £100 wages is perfectly straightforward and free from assumptions. The wages item can be substantiated by the wages book and the revenue or output is capable of a clear and simple definition (page 6). The only qualification that may be necessary concerns those farms on which a large proportion of the total wages consists of the "wages" allowed to the farmer for manual work done by him.

The question is: what relationship exists between the average yearly profit and the output per £100 wages? In the extracts from Table II given in Table V below it would appear that so far from there being a direct relationship between the output per £100 wages and the profit the output per £100 wages tends very definitely to fall as the profit rises.

It can hardly be merely a coincidence that in each of these nine cases an increase in the profit per 100 acres was accompanied by a reduction in the output per £100 wages. Thus, on farm 3 the profit per 100 acres increased from £415 to £484 but the output per £100 wages decreased from £304 to £254; while on farm 10, the profit increased from £699 to £894 per 100 acres but the output per £100 wages fell from £422 to only £324.

An even more striking example can be drawn from the results of the Farm Management Survey in the south-eastern counties. These are summarized in Table VI.

It will be seen that the output per £100 wages is appreciably lower in both years on the specialized than on the general mixed farms although the profit per 100 acres is nearly three times higher.

TABLE V

Relationship between Output per £100 Wages and Profit per 100 acres

Case No.	Period	Profit per 100 acres	Output per £100 wages	Per cent. Wages in total expenditure	Wages per 100 acres
2	1935/40 1940/46	£ 168	£ 320	% 36.9	£ 348
		453	305	43.0	627
3	1938/44 1944/50	415 484	304 254	43.1 47.9	575 1,054
4	1939/44 1944/9	745 901	362 331	38.3 39.9	737 1,126
6	1932/8 1938/44	387 893	344 332	39.9 50.4	415 666
9	1939/44 1944/9	589 591	359 278	38.3 45.4	601 1,031
10	1936/43 1943/50	699 894	422 324	34.2 38.6	539 1,378
12	1941/6 1946/50	363 822	301 300	42.3 45.0	561 976
13	1942/5 1945/9	843 878	428 404	31.4 33.5	587 831
15	1940/5 1945/50	225 353	377 326	31.1 35.6	412 786

TABLE VI

Relationship between Profit per 100 acres and Output per £100 wages

	1947		1948	
	General mixed farms	Specialized farms *	General mixed farms	Specialized farms *
No. of farms	168	32	171	32
Revenue per 100 acres	£ 2,550	£ 5,643	£ 2,687	£ 6,102
Expenditure per 100 acres	2,209	4,656	2,345	5,094
Profit per 100 acres	341	987	342	1,008
Output per £100 wages	273	250	292	258
Per cent. wages in total expenditure	42.3	48.5	39.1	46.4
Wages per 100 acres	935	2,259	920	2,363

* Farms devoted mainly to hops, fruit and intensive market gardening.

Now there is really nothing very surprising in this lack of relationship between the profit and the output per £100 wages. It would be fantastic and meaningless to relate the profit to the output per £100 insurances since these form less than 1 per cent. of the expenditure, but the difference between insurances and wages is only one of degree. It is true that if wages represented 90 or 95 per cent. of the total expenditure it would

be nearly true to say that the profit was the difference between the output and the wages; as it is, wages form only about 40 per cent. of the expenditure. The effective formula might be written:

$$\text{Profit} = \text{Revenue} - (\text{Wages} + \text{Other Expenditure}).$$

Now it has already been shown (Table III) that the same profit per acre can be obtained from very different combinations of revenue, wages and other expenditure; and it is also clear that an increased profit may be obtained not by reducing the wages bill but by economies in the other expenditure, that is, the output per £100 wages remains unchanged; or the profit may be increased by economies in the other expenditure coupled with some increase in the wages, that is, the output per £100 wages is reduced. Further, an increase in the general level of revenue, wages and other expenditure, resulting in an increase in the profit, does not necessarily cause an increase in the output per £100 wages. This is clearly shown in Table VI. In short, revenue, wages and other expenditure can be combined in an almost infinite variety of ways and it would be quite fortuitous if the output per 40 per cent. of the expenditure and the profit occurred in close relationship.

An example may show how unexpected the result can be and how easily an explanation can be found. Case 10 (Table II) shows a fall in the output per £100 wages of 23 per cent., from £422 to £342, despite an increase of 30 per cent. in the profit, from £689 to £894 per 100 acres. The explanation is that whereas wages increased by 156 per cent. the output increased by only 96 per cent. and since the formula for the output per £100 wages is $\frac{\text{Output} \times 100}{\text{Wages}}$, it is clear that the lower the output and the higher the wages the lower will be the answer; it is also clear that there is no necessary connexion between the answer and the profit per 100 acres.

This rather lengthy discussion of the relationship between output, wages and profit has seemed desirable because of the confusion which exists in popular writing and talking on the subject. It is indeed not unreasonable to expect high profits to be associated with, if not indeed caused by, high outputs per unit of labour; but it has been shown, both by abstract reasoning and by actual farming results, that the presumed relationship does not exist. It follows that as a measure of economic and managerial efficiency in farming the output per unit of labour is worse than useless, because instead of being helpful it is extremely misleading.

It must be emphasized, however, that there are other aspects of the output-wages relationship beyond those that have been so far discussed. In a country where labour is the limiting factor in agricultural production, it is important to devise methods which will make the optimum use of the limiting factor and computations about the output per unit of labour can be helpful in arriving at the most effective methods. This approach towards the optimum economic farming unit makes one rather large assumption: it assumes that there is sufficient capital available to equip the man with all the necessary labour-saving machinery. It is in fact a policy for prosperity but there are many farmers, both at home and abroad, who can remember the days when capital, rather than labour, was the principal limiting factor.

In this country, the chief limiting factor to-day is neither labour nor capital but land. Hence, although it can be urged that, so long as there is a shortage of labour in other industries, the most economical ways of using labour in farming must be given full consideration, the farmer will be interested in labour economy only, or at least mainly, in so far as it will enable him to increase his profits. It must not be forgotten that, as already shown, there is on the well-managed individual farm a close relationship between a high output per acre, which is what the nation wants, and a high profit per acre, which is what the farmer wants.

MACHINERY COSTS

Reference has already been made to the greatly increased impact of mechanization on the farming in this country during the war and, especially, post-war years. The cost of depreciation, repairs and renewals is undoubtedly a heavy burden on the mechanized farm. For example, as shown in Table VII,

on farm 3	it increased from 18s. per acre in 1931/8 to 48s. in 1944/50,
" 4	" " 16s. " " 1936/9 to 51s. in 1944/9,
" 8	" " 17s. " " 1937/40 to 48s. in 1945/50,
" 10	" " 28s. " " 1936/43 to 86s. in 1943/50,
" 15	" " 18s. " " 1933/40 to 73s. in 1945/50.

Nevertheless, it is easy to get these machinery costs out of perspective and Table VII shows that the proportion of the total expenditure attributable to the cost of depreciation, repairs and renewals seldom exceeded 10 per cent. Broadly speaking, in pre-war years machinery costs comprised about 8 per cent. of the total expenditure and represented about 7 per cent. of the total revenue, the corresponding figures for the post-war years being about 11 and 9 per cent.

There were, however, some striking departures from these averages. For example, on farms 1 and 6, the cost of depreciation and repairs formed a smaller percentage of both the expenditure and the revenue in the war and post-war than in the pre-war years; on both these farms the amount of new machinery purchased was comparatively small. On farms 10, 13, 14 and 15, on the other hand, a large amount of new machinery was purchased and the percentage of machinery costs was much above the average, reaching 16.6 per cent. in 1945/50 on farm 15.

Table VII also shows that on most farms machinery costs per acre were much higher in the post-war than in the war years. This was partly due to the increased cost of repairs and partly to the heavier depreciation because of the large amount of new machinery bought during the post-war period. For example, on farm 4, new machinery cost 46s. per acre in 1944/9 against only 12s. in 1939/44, on farm 6 26s. per acre in 1944/8 against only 4s. in 1938/44, on farm 13 76s. per acre in 1945/9 against 44s. in 1942/5, and so on. The variations from farm to farm are, however, considerable: it is not surprising that on farms 1 and 6, which were geared to intensive farming in pre-war years, the amount of new machinery purchased was very much less than on farms 12 and 15 which had to be converted to arable farming.

The amount of capital per acre invested in machinery and implements was also highly variable, both in the pre-war and especially in the post-war period. On farm 1 it was only about 50s. an acre in 1923/39 and about 60s. in 1939/49 whereas on farm 6 it was 114s. in 1926/32 and only 54s. in 1944/8. On farm 10, the post-war investment in machinery amounted to nearly £9 per acre or 27 per cent. of the total capital and on farms 13 and 15 it was also about £9 an acre or 32 per cent. of the total capital.

Sufficient has been said to show that, because of the widely different conditions on these farms, generalizations about the capital invested in machinery and implements, the cost per acre of depreciation and repairs and the percentage of the total expenditure and revenue represented by that cost are apt to be rather misleading in relation to particular farms.

Finally, it should be pointed out that in Table VII no reference has been made to either the cost of fuel and lubricating oil or to the cost of contract work. These items are, of course, part of the total cost of mechanization but for the present purpose it seemed better to confine attention to the simple issues of capitalization, depreciation and repairs, since these are the things which farmers worry most about in connexion with mechanization.

TABLE VII
Machinery Costs and Relationships

Case No.	Period	Cost of depreciation and repairs per 100 acs.	Percentage of		Equipment purchased (net) per 100 acres	Capital in Machinery	
			Expenditure	Revenue		Per 100 acres	Per cent. of total
1	1923/4-1938/9 1939/40-1948/9	£ 98	% 6.6	% 6.3	£ 43	£ 253	% 11.9
		187	6.0	4.3	66	292	10.8
2	1935/6-1939/40 1940/1-1945/6	83 169	7.8 11.6	7.5 8.9	103 99	296 453	22.1 26.4
3	1931/2-1937/8 1938/9-1943/4 1944/5-1949/50	90 101 241	8.6 7.6 11.0	9.0 5.8 9.0	27 59 167	222 205 485	21.4 18.0 29.5
4	1936/7-1938/9 1939/40-1943/4 1944/5-1948/9	79 129 256	6.1 6.7 9.1	5.8 4.5 6.9	146 58 229	287 306 613	19.9 15.6 21.4
6	1926/7-1931/2 1932/3-1937/8 1938/9-1943/4 1944/5-1947/8	86 83 105 138	8.3 8.0 7.9 6.6	8.1 5.8 4.7 5.5	76 67 22 127	572 422 360 270	26.2 24.3 19.8 13.1
7	1923/4-1929/30 1930/1-1936/7 1937/8-1942/3 1943/4-1948/9	50 49 74 135	5.9 7.2 8.5 9.6	5.7 6.3 6.8 8.6	35 32 55 107	235 185 240 280	17.2 15.3 19.5 19.2
8	1937/8-1939/40 1940/1-1944/5 1945/6-1949/50	86 126 238	5.7 6.9 8.6	4.0 4.8 7.6	82 96 162	178 212 614	8.7 10.3 20.5
9	1925/6-1931/2 1932/3-1938/9 1939/40-1943/4 1944/5-1948/9	125 125 130 166	9.6 10.3 8.3 7.3	10.9 10.0 6.0 5.8	62 66 91 118	726 584 448 494	30.3 31.7 24.2 23.0
10	1936/7-1942/3 1943/4-1949/50	139 432	8.8 12.1	6.1 9.7	101 306	488 891	22.1 26.9
11	1923/4-1930/1 1931/2-1938/9 1939/40-1943/4 1944/5-1948/9	97 96 133 240	7.9 8.2 7.0 8.2	6.0 7.4 5.6 7.5	33 20 87 223	470 331 369 661	18.3 15.0 14.4 28.7
12	1936/7-1940/1 1941/2-1945/6 1946/7-1949/50	88 148 194	9.0 11.2 8.9	8.1 8.8 6.5	143 124 312	357 453 793	23.3 27.7 34.3
13	1942/3-1944/5 1945/6-1948/9	132 364	7.0 14.6	4.8 10.9	223 383	326 913	18.3 32.2
14	1943/4-1946/7 1947/8-1949/50	168 201	14.6 13.2	10.2 8.0	113 147	384 490	22.3 23.5
15	1933/4-1939/40 1940/1-1944/5 1945/6-1949/50	94 161 364	10.6 12.3 16.6	8.3 10.4 14.2	40 177 279	245 475 897	22.6 29.1 32.7

NEED FOR THE RIGHT PERSPECTIVE

A common mistake, especially amongst farmers, is to seize upon the increase in the cost of a particular item of expenditure and then argue as if the total expenditure

had increased by the same amount. Some percentage increases to illustrate this point are given in Table VIII.

TABLE VIII
Some Percentage Increases

Case No.	Periods	Percentage increase in					
		Revenue	Expenditure	Wages	Machinery costs	All other expenditure	Profit
1	1939/49 over 1923/39	181	109	161	91	59	1,645
2	1940/6 over 1935/40	72	54	80	132	26	170
3	1944/50 over 1938/44	53	65	83	139	37	17
4	1944/9 over 1939/44	39	47	53	98	36	21
9	1944/9 over 1939/44	33	45	71	28	29	0
10	1943/50 over 1936/43	96	126	156	211	95	28
12	1946/50 over 1941/6	77	64	74	31	62	126
13	1945/9 over 1942/5	24	33	42	176	11	4
14	1947/50 over 1943/7	53	34	21	20	46	96
15	1945/50 over 1940/5	65	67	91	100	47	57

Since the periods compared are not the same in all cases, each farm in this table should be considered by itself.

Three things should be noticed. First, except in one case, the percentage increase in the wages was appreciably to substantially higher than that in the total expenditure. This is one reason why farmers have been inclined during recent years to over-emphasize the wages factor in the farm expenditure: there has been in fact a tendency to confuse the part with the whole. Further, in seven of these ten cases, the rate of increase in wages was substantially greater than the rate of increase in the expenditure and in five of these seven cases there was still a substantial increase in the profit.

Secondly, in six of these cases, the percentage increase in the cost of machinery depreciation and repairs was much greater than that in the total expenditure. Here also there is a danger of getting things out of proportion. For example, on farm 10 an increase of 211 per cent. in machinery costs may be rather frightening unless it is related to an increase of only 126 per cent. in the total expenditure, because in 1943/50 machinery costs made up only 12 per cent. of the expenditure, while expenditure other than wages and machinery costs increased only 95 per cent.

Thirdly, in all cases except one, the rate of increase in the expenditure other than wages and machinery costs was appreciably lower than in the total expenditure. This is not surprising since during and after the war the prices of foodstuffs and fertilizers were heavily subsidized and it is known that farm rents have risen only slightly since before the war.

Table VIII makes it abundantly clear that expenditure and revenue should always be considered together rather than separately: an increase in the expenditure (or in the revenue) has no significance unless it is considered along with the increase in the revenue (or in the expenditure). It also shows that calculations of percentage increases (or decreases) must be handled very circumspectly. The student who has increased his mark by 100 per cent. from 20 to 40 per cent. is still on a much lower plane than the one who has increased it by only 10 per cent., from 80 to 88 per cent. Similarly, the increase of 170 per cent. in the profit on farm 2 compared with only 28 per cent. on farm 10 must be linked with the fact that in spite of the much higher rate of increase farm 2 reached a profit of only £4.5 per acre compared with £8.9 on farm 10.

CHAPTER III

RESULTS FROM THE COST ACCOUNTS

A. CASH CROPS VERSUS LIVESTOCK

THE first general question on which the cost accounts throw some light is the relative profitability of cash or saleable crops and livestock. In the case of farms 5, 7 and 8 (Table II) the acreage under cash crops was quite small, since the tillage cropping was done mainly to provide foodstuffs for livestock; on farm 1, the livestock were comparatively unimportant; on farm 10 the tillage cropping was rather specialized; and on farm 3 the principal cash crop was hops. In all the other cases, the farming was based on alternate husbandry, that is, a combination of cash crops and of three-year leys and other crops for the use of livestock.

Now it is fairly easy to decide that it is sound policy to have a combination of cash crops, feed crops and livestock, but the real management problem is to decide what combination to have. What kinds of cash crops and of feed crops and what acreage should be devoted to each kind? What kinds of livestock? On a farm of, say, 400 acres should the livestock consist of 60 cows and their followers, of 40 cows and their followers and a breeding flock of 200 ewes, of a breeding flock of 400 ewes and no dairy stock, or of some other combination of dairy stock and sheep? In other words, by what process of reasoning does the farmer decide what crops shall be grown and what livestock shall be kept on his farm?

So far as these farmers are concerned, there can be no doubt at least about the ultimate objective, which was the largest possible profit from the farm as a whole, that is, the final criterion of the optimum combination of cash crops, feed crops and livestock was the average total farm profit. How can this problem be tackled?

First, a careful estimate should be made of the acreage of land required for a herd of, say, 40 cows and their followers, including not only the land to be grazed but also that devoted to hay, ensilage, roots, kale, oats, mixed corn, and so on: in fact all the land from which the crops are to be consumed by the dairy stock, both cows and young stock. Sometimes, the calculation can be easily made, sometimes it is rather complicated but most farmers who make it are rather surprised at the answer. The total acreage taken up by the dairy stock, computed in terms of the productive unit, the cow, is nearly always surprisingly large—seldom less than three and more often over four acres per cow. The next step is to decide upon the probable profit per cow per annum. Suppose this is put at £20—a moderate figure for the war and post-war years but much too high for pre-war years—equivalent to from £5 to £7 per acre of land used. (But see page 25.)

Now comes the crucial question: how does this profit per acre from the cows compare with that from the cash crops—cereals, potatoes, sugar beet, etc.? The same process can then be applied to the sheep flock or indeed to any other class of livestock which makes substantial demands on the farm acreage.

Whatever the answers to these questions may be in the years to come, there is little doubt about the position during the period 1940 to 1950: *the profit per acre from cash crops has been on a considerably higher level than from either dairy stock or sheep.* Consider these examples.

Farm 2. During 1941/2 to 1945/6, the average yearly profit per cow was £9.1, whereas the average profit per acre from the 1940 to 1946 crops of wheat was £8.5 and from barley £16.3.

Farm 4. During 1939/40 to 1948/9, the average yearly profit per cow was £6·7 compared with:

£8	per acre per annum on	845	acres of	wheat,
£13	"	"	475	" barley,
£5·3	"	"	135	" oats,
£8·1	"	"	115	" potatoes,
£7·3	"	"	290	" sugar beet,
£31·3	"	"	195	" vegetables.

Farm 6. The average profit per acre per annum from the 1933/8 saleable crops was £6·7 whereas the average total farm profit was only £4·9, the corresponding figures for the 1939/44 crops being £13·2 and £8·9 per acre per annum. This is clear evidence that the average profit per acre from the dairy stock and sheep flock was substantially less than from the saleable crops. A detailed calculation for the six years 1938/9 to 1943/4 showed that an average profit of 26s. 2d. per ewe per annum from the half-bred flock was equivalent to a profit of "almost exactly 50s. per acre per annum" on the land used by the sheep.

Farm 9. During 1939/40 to 1948/9, the average profit per cow was £15, compared with an average yearly profit per acre of £7·5 on wheat and £3·3 on oats.

Farm 12. During 1941/2 to 1948/50, the average yearly profit per cow was £15·7 compared with:

£7·6	per acre per annum on	607	acres of	wheat,
£9·3	"	"	398	" barley,
£4·6	"	"	469	" oats,
£15·5	"	"	235	" potatoes.

Farm 15. During 1940/1 to 1949/50, the average yearly profit per cow was £7·8 compared with:

£6·3	per acre per annum on	3,944	acres of	wheat,
£7·5	"	"	3,208	" barley,
£1·7	"	"	4,862	" oats.

At this point it must be emphasized that comparison between the profits from the different ways of using land is valid only for farms on which the conditions of size, climate, soil, topography and so on are favourable to cash cropping. In general, it is only where the farm acreage is large enough to enable the staple cash crops—cereals, potatoes, sugar beet, etc.—to be economically grown that comparisons between cash crops and livestock are really valid.

The temptation to put more land down to grass and keep more sheep and beef cattle is always strong and hardly needs any encouragement from an official "more-meat" policy, because these are much less troublesome ways of farming than milk production and cash cropping; but so long as there are guaranteed prices and assured markets for all the cereals, potatoes and sugar beet which farmers can grow an easier way of farming may be obtained only at the expense of much reduced farming profits. It is indeed widely recognized that in order to ensure a satisfactory total profit from non-dairy cattle and sheep there must be a large turnover and this calls for a much larger acreage than is found on the great majority of lowland farms. The problem can also be set in a different way. To-day, a mixed farm of 400 acres may be earning a net profit or managerial salary of £2,000. Would it be reasonable to pay a man £2,000 a year to manage the same farm entirely under grass and carrying nothing but sheep and beef cattle?

From this comparison between cash crops and livestock several general conclusions can be drawn. In the first place, the farmer whose conditions are suitable for, and who

does in fact put the main emphasis on, cash cropping is not only thereby serving his own interests but also the national requirements. Not only the total farm profit but also the output of human food per acre will be maximized by selling crops rather than livestock and livestock produce. At one time, there were many districts where the whole farming revolved around the folded sheep flock and even to-day there are farms on which the dairy herd is allowed to dictate the cropping programme.

Secondly, in pre-war years the profit on livestock was derived not so much from the farm acreage as from the large quantities of purchased concentrates that were used. Limitations in the farm acreages were not very important because of the virtually unlimited quantities of imported grains, cakes and meals that were available at low prices: the pig feeder could buy barley meal cheaper than he could grow it and the poultry keeper could afford to keep thousands of laying birds on only a few acres of land. Now there is a complete reversal of things. Purchased foodstuffs are not only limited in supply but also very dear and many small-scale farmers now feel very acutely the limitations imposed upon their plans by their small acreages. This being so, the output of livestock and livestock produce depends to a far greater extent upon the output of grass and other crops than it did in pre-war days. Then, it might be said with a large measure of truth that the foundation for the production of milk, eggs, pork and bacon pigs, winter fed fat cattle and sheep was the supply of cheap imported foodstuffs; to-day, the foundation must be good farming for feed crop production. It is in neither the farmer's nor the national interests that land which is capable of growing cash crops economically should be diverted to feed crops to take the place of purchased concentrates and this is a further reason for putting the emphasis on the increased production per acre of grass and other feed crops.

Thirdly, this is a good example of the futility of sweeping generalizations, without regard to the size of the farm, the soil and climatic conditions, the altitude, the topography and so on. About 70 per cent. of the "holdings" in England and Wales are not over 100 acres and only about 4 per cent. are over 400 acres, and it is not very helpful to the 70-acre farmer to be shown what is being done on 400 acres. For example, it may be sound policy on the 400-acre farm to become almost self-supporting as regards foodstuffs but, unless in very special circumstances, it would be disastrous for the 70-acre farmer to attempt to do so. Just as the surest way of depressing our national standards of living would be to stop all imports, so the surest way of reducing the standard of living of small-scale farmers would be for them to stop all "imports" of foodstuffs, fertilizers, and other raw materials.

CHAPTER IV

RESULTS FROM THE COST ACCOUNTS—*continued*

B. MILK PRODUCTION

IN almost any sample of farms, as in the very small sample under discussion, there are three different classes or types: first, those on which there is no dairy herd—farms 1 and 13; secondly, those on which milk production is the only important enterprise—farms 5, 7 and 8; and, thirdly, those on which milk production is only one of several important enterprises.

DAIRY FARMS

In the second class, the issue is fairly clear cut: the total farm profit depends mainly, if not entirely, upon the profit from the dairy stock. The growing of a small acreage of cash crops may still be regarded as complementary to, rather than in competition with, milk production. Thus, 30 acres of tillage crops may be essential to meet the needs of the dairy stock but it may be possible to handle 10 acres of cash crops without increasing the labour unit of men and machinery, that is, the total farm output may be increased without any increase in the general farm overheads—the regular labour staff, rent, machinery costs, etc.

Table IX gives the final results on these three farms.

TABLE IX
Summary of Milk Production Results: Dairy Farms

	Per gallon			Per cow per annum			Average milk yield per cow	Per 100 acres	
	Cost	Price	Profit	Cost	Return	Profit		Profit on milk production	Profit on crops
Farm 5	d.	d.	d.	£	£	£	gals.	£	£
1931/9	23·84	28·67	4·83	61·7	74·2	12·5	621	281	(-) 20
1939/44	28·88	30·39	1·51	64·8	68·2	3·4	538	86	(-) 72
Farm 7									
1937/43	14·02	20·13	6·11	35·1	50·4	15·3	601	217	(-) 35
1943/9	22·63	29·64	7·01	61·1	80·0	18·9	648	265	(-) 117
Farm 8									
1940/5	15·00	23·29	8·29	48·3	75·0	26·7	773	776	11
1945/50	24·71	29·57	4·86	87·9	105·2	17·3	854	423	(-) 74

It will be seen that, despite what has just been said, a distinction has been drawn between milk production and cropping. In this investigation, one of the objects was to measure the comparative efficiency of the milk production unit and it was felt that this could be better done by charging saleable crops to the dairy stock at their selling prices rather than at their production costs: it seemed wrong to make the cows pay for mistakes due to inexperience of, and the difficult conditions for, tillage cropping. All that can be said is that under war conditions tillage cropping enabled these farmers to keep their dairy herds together but only at the expense of reduced farm profits.

In the short period at least, the total profit on the dairy herd depends on the profit per cow rather than on the profit per gallon and the profit per cow depends on three things: the yearly cost per cow, the average milk yield per cow and the price per gallon. Table IX shows how necessary it is to consider these three things together and not separately, as is so often done. In particular, the emphasis that is generally and rightly placed on the average milk yield per cow is apt to lead to under-emphasis on the cost per cow. On farm 5, there is a fall in the milk yield per cow and also in the profit per cow; on farm 7, an increase in the milk yield per cow is accompanied by an increase in the profit per cow; but on farm 8 there is a substantial fall in the profit per cow despite a substantial increase in the average milk yield per cow.

Now there is nothing in the least surprising about these results. It is no doubt true that as the milk yield increases there is a tendency for the cost per gallon of the "production" ration to increase also but this is likely to be more than balanced by the reducing effect of increased yields per cow upon the overhead costs in milk production—the cost of the "maintenance" and dry period rations, most of the cowshed labour and so on. Further, it must always be remembered that with the same profit per gallon the profit per cow increases as the milk yield per cow increases.

For example, on farm 7 the profit per gallon increased by 15 per cent., partly because of the higher yield per cow, but the profit per cow increased by 24 per cent. because of the higher yield per cow. Farm 8, however, shows that the theoretical advantages of a high average milk yield per cow may be nullified by a high average cost per cow. In this case, the cost per cow increased by 82 per cent. against only 40 per cent. for the returns per cow and hence, despite an increase of 81 gallons in the average milk yield per cow, the profit per cow fell by £9.4 or 35 per cent. Lastly, farm 5 shows, in 1931/9, that it is possible to make a reasonable profit per cow from a moderate average milk yield and despite a comparatively high cost per cow, provided the price of milk is high enough—this farm had a Guernsey herd producing "Certified" milk.

It happens, therefore, that these three farms exemplify, almost as well as if they had been selected for the purpose, how important it is to consider the cost per cow, the price per gallon and the milk yield per cow as factors which act and interact upon one another to determine the profit per cow. Given a fixed price for milk and fairly stable conditions of production, as on an individual farm, it may be true to say that a dominant part is played by the average yield per cow but as between one farm and another conditions vary so widely that almost equal importance must be attached to the yearly cost per cow. The highest profit per cow will be obtained where the optimum *relationship* has been established between the cost per cow, the price per gallon and the milk yield per cow.

MIXED FARMS

On the remaining farms in this sample, there are two problems relating to milk production. First, as already mentioned, there is the question of what size of herd should be kept, that is, what combination of milk production and other enterprises will yield the maximum average *farm* profit; secondly, given the size of the herd, how should it be managed so that the profit from milk production will be at its optimum, which is not necessarily the same as maximum. On this type of farm, the final test of the economic efficiency of the milk production unit is not the profit per cow but the profit per acre of land used by the dairy stock, measured against the profit per acre from cash crops over a period of about five years. For example, the profit per cow may be higher when hay is grown on the farm (and charged at cost price) than when it is bought but the profit per acre may be less than it would have been if the land devoted to hay had been used for growing cash crops.

Table X summarizes the final results for milk production on nine of these mixed farms, and the following points are worthy of notice.

1. Perhaps the most striking feature is the comparatively low level of profits per cow, even during the war and post-war periods. Farm 10 made the outstanding average profit of £30.3 per cow per annum over the seven years 1943/4 to 1949/50, the next best performance being an average yearly profit of £20.8 per cow on farm 12 over the four years 1946/7 to 1949/50. On the strength of these results, only an optimist would budget for a profit of as much as £20 per cow under conditions obtaining in 1953/4.
2. To those accustomed to think in terms of milk recording averages, the average milk yields per cow will appear to be comparatively low but, as already pointed out, the method of computation used in this investigation gives an average milk yield per cow appreciably lower than the method used for milk recording purposes. The differences between the two methods are exemplified by the following figures from the Wye College farm herd in 1947/8 to 1950/1.

	<i>Investigation Method</i>		<i>Milk Recording Method</i>	
	<i>Average No. of cows</i>	<i>Average yield per cow</i>	<i>No. of cows</i>	<i>Average yield per cow</i>
		gal.		gal.
1947/8 ..	44	670	31	760
1948/9 ..	54	642	47	771
1949/50 ..	59.7	733	52	773
1950/1 ..	62.5	646	52	741

Farm 10 has the remarkably fine average of 853 gallons per cow per annum over seven years, the next best being 760 gallons on farm 11 over eight years. In the case of farms 2, 3, 9, 10, 12 and 15, the average milk yield per cow has moved substantially upwards during the period under investigation—a tribute to the success with which these farmers have adapted their feeding practices to the changed conditions. On farms 4, 6 and 11, however, the average milk yield per cow has fluctuated very considerably, for a variety of reasons.

3. There is no close relationship between the average milk yield and the profit per cow. Farm 10 shows the dominant effect which the average milk per cow can have upon the profit per cow. In 1943/50, the cost per cow increased by 108 per cent. over 1936/43 but the cost per gallon increased by only 68 per cent.; the price per gallon increased by 60 per cent., the value of the milk per cow by 97 per cent.; hence, although the profit per gallon increased by only 43 per cent. the profit per cow increased by no less than 76 per cent.

On the other hand, farm 2 shows how the effect of an increased milk yield per cow can be completely masked by a disproportionate rise in the cost per cow. Here the cost per cow increased by 110 per cent. against an increase of only 60 per cent. in the value of the milk per cow; hence, the profit per cow fell by 45 per cent. This heavy fall in the profit per cow was not caused by, but happened in spite of, a rise of 84 gallons in the milk yield per cow.

TABLE X

Summary of Milk Production Results: Mixed Farms

	Per gallon			Per cow per annum			Average milk yield per cow	S.E. per 100 gal.	Grazing per 100 gal.
	Cost	Price	Profit	Cost	Return	Profit			
Farm No. 2	d.	d.	d.	£	£	£	gals.	lb.	s. d.
1937/8-1940/1	12.76	18.94	6.18	34.3	50.9	16.6	645	458	11 5
1941/2-1945/6	23.76	26.76	3.00	72.1	81.2	9.1	729	497	11 3
Farm No. 3									
1932/3-1937/8	13.71	13.14	(-)0.57	32.8	31.4	(-)1.4	574	504	14 1
1938/9-1943/4	16.83	19.76	2.93	48.1	56.5	8.4	685	437	8 8
1944/5-1949/50	27.79	31.39	3.60	79.9	90.3	10.4	690	453	14 5
Farm No. 4									
1936/7-1938/9	13.78	13.87	0.09	36.1	36.3	0.2	629	574	10 9
1939/40-1943/4	19.16	21.36	2.20	43.0	47.9	4.9	538	576	12 2
1944/5-1948/9	27.94	31.09	3.15	70.5	78.5	8.0	606	472	17 10
Farm No. 6									
1926/7-1928/9	22.21	16.19	(-)6.02	55.9	40.8	(-)15.1	604	471	7 11
1929/30-1931/2	14.78	16.35	1.57	36.5	40.4	3.9	593	449	10 9
1932/3-1934/5	12.70	15.95	3.25	32.6	41.0	8.4	617	546	7 11
1935/6-1937/8	13.97	17.09	3.12	39.0	47.7	8.7	671	501	7 1
1938/9-1940/1	15.10	20.23	5.13	36.8	49.3	12.5	585	496	7 8
1941/2-1943/4	18.62	26.60	7.98	45.3	64.7	19.4	583	516	8 3
1944/5-1946/7	25.02	28.29	3.27	71.1	80.4	9.3	683	470	5 9
Farm No. 9									
1925/6-1931/2	16.27	15.07	(-)1.20	36.4	33.7	(-)2.7	536	509	18 9
1932/3-1938/9	12.04	13.47	1.43	30.0	33.5	3.5	597	400	12 6
1939/40-1943/4	15.76	21.63	5.87	38.1	52.3	14.2	580	367	13 1
1944/5-1948/9	21.69	27.10	5.41	63.4	79.2	15.8	701	381	14 7
Farm No. 10									
1936/7-1942/3	12.20	18.18	5.98	35.1	52.3	17.2	691	393	7 1
1943/4-1949/50	20.52	29.05	8.53	72.9	103.2	30.3	853	396	15 5
Farm No. 11									
1923/4-1930/1	13.26	16.28	3.02	42.0	51.6	9.6	760	469	12 8
1931/2-1938/9	13.27	14.25	0.98	38.8	41.7	2.9	702	494	12 3
1939/40-1943/4	17.59	22.12	4.53	49.6	62.4	12.8	677	471	8 8
1944/5-1948/9	30.44	28.86	(-)1.58	86.0	81.6	(-)4.4	678	549	12 6
Farm No. 12									
1936/7-1940/1	13.70	14.68	0.98	34.0	36.4	2.4	595	490	11 6
1941/2-1945/6	21.15	25.16	4.01	54.8	65.2	10.4	621	482	10 7
1946/7-1949/50	25.32	32.41	7.09	74.3	95.1	20.8	705	477	10 0
Farm No. 15									
1934/5-1939/40	11.34	14.87	3.53	24.8	32.5	7.7	524	500	11 4
1940/1-1944/5	22.73	25.65	2.92	52.6	59.3	6.7	555	492	19 5
1945/6-1949/50	30.34	33.52	3.18	83.8	92.6	8.8	663	502	22 9

Again, in the case of farm 6, the increase in the profit per cow in 1938/41 compared with 1935/8—£12.5 against £8.7—was due to the fall of 6 per cent. in the cost per cow and the rise of 18 per cent. in the price of milk and not to the decrease of 86 gallons in the average milk yield per cow.

- The results on farm 11 are of special interest. Right up until about 1939, this was one of the healthiest herds I have ever known; then gradually the number of "wasters" increased. In 1943, a tuberculin test was made on the whole dairy stock,

with quite disastrous results amongst both the cows and the young stock. During 1944/5 to 1948/9 the average number of cows in the herd was only 27—it was down to 22 in 1946/7—compared with 45 in the preceding period; the average cost of herd maintenance rose to £13.1 per cow per annum against only about £6; and the cost of labour and of general overheads was also much higher than it would have been with the normal size of herd. The net result was a loss of £4.4 per cow per annum compared with a profit of £12.8 in the previous period. It may be added that on this farm the management was first class and the farmer had a lifetime of progressive dairy experience behind him.

EFFICIENCY IN FEEDING

In seeking to measure the comparative efficiency in milk production, it is obviously desirable to concentrate as far as possible on those things over which the management has a large amount of control, and it might be supposed that the *quantity* of foodstuffs, apart from grass, is one thing which is largely controllable. The last two columns of Table X give the consumption of foodstuffs, except grass, in terms of starch equivalents or food units, per 100 gallons of milk produced, and also the cost per 100 gallons milk of the grazing. But it is not easy to decide how these data should be interpreted. Theoretically, the S.E. per 100 gallons should decrease as the milk yield per cow increases, unless there is a marked change in the contribution made by grass to the yearly ration. Not only is there no such tendency shown in Table X but also the amount of S.E. per 100 gallons varies from period to period and from farm to farm in a quite haphazard manner. Nevertheless, some of the individual farm results are highly suggestive.

Farm 10 again stands out with an exceptionally low consumption of S.E. per 100 gallons, the details being as follows:

	1936/43	1943/50
Percentage of S.E. from purchased foods ..	44.3	45.5
" " home-grown foods ..	55.7	54.5
Total S.E. per 100 gallons—lb.	393	396
Cost of grass per 100 gallons	7/1	15/5
Average milk yield per cow—gallons ...	691	853

The general management of this herd is of the very highest order, the feeding is under strict control, and a very progressive policy towards the grassland has been followed for a good many years. It will be seen that, because of the high milk yields, the proportion of S.E. derived from purchased foodstuffs was almost the same during 1943/50 as during 1936/43. Despite the much higher average milk yield per cow and despite a larger contribution made by the grassland to the yearly food requirements of the herd, the consumption of S.E. per 100 gallons was practically the same in 1943/50 as in 1936/43. It is possible that the explanation lies, partly at least, in the higher average "production" ration per gallon required by the higher average yield in 1943/50. Farther than that it is not possible to go.

The data for farm 6 are of interest because they cover such a long period. They are summarized in Table XI.

The variation in the percentage of S.E. derived from purchased cakes and meals is very striking. In 1926/9 it was 63.9, compared with only 19.2 in the next three years; during 1935/41 it was about 50 but in 1944/7 it fell to only 15.3. In 1929/35 corn prices were so low that it was considered better policy to feed the dairy stock on home-grown rather than on purchased concentrates; in 1941/7 purchased foods were, of course, restricted in supply. The cost of the S.E. in purchased foodstuffs ranged from 8s. 10d.

TABLE XI

Comparative Results: 1926/9 to 1944/7—Farm No. 6

	1926/9	1929/32	1932/5	1935/8	1938/41	1941/4	1944/7
Per cent. S.E. from purchased foods	63.9	19.2	26.4	50.1	50.8	31.8	15.3
Per cent. S.E. from home-grown foods	36.1	80.8	73.6	49.9	49.2	68.2	84.7
Total S.E. per 100 gal.—(lb.)	471	449	546	501	496	516	470
Grass etc., per 100 gal. ..	7/11	10/9	7/11	7/1	7/8	8/3	5/9
Average milk yield per cow per annum (gal.) ..	604	593	617	671	585	583	683
Cost per 100 lb. S.E.							
Purchased foods ..	s. d. 14 0	s. d. 11 3	s. d. 8 10	s. d. 9 6	s. d. 11 11	s. d. 17 11	s. d. 20 10
Home-grown foods ..	15 7	10 5	9 6	7 7	8 7	13 9	19 0
Average	14 8	10 8	9 4	8 7	10 4	15 1	19 4

per 100 lb. in 1932/5 to 20s. 10d. in 1944/7 and in home-grown corn, hay, roots, etc., from 7s. 7d. in 1935/8 to 19s. in 1944/7. The overall price per 100 lb. S.E. varied from 8s. 7d. in 1935/8 to 19s. 4d. in 1944/7.* In this case, there is a marked tendency for the consumption of S.E. per 100 gallons milk to fluctuate around 500 lb. without much regard to the average milk yield per cow. This applies also in the case of farm 15.

It should be added that this physical measurement of cowshed efficiency is liable to be misleading unless some attention is given to the cost of the constituent foodstuffs. For example, in pre-war years, it commonly happened that the extensive use of wet grains resulted in a comparatively high consumption of S.E. per 100 gallons and a comparatively low cost per gallon for foodstuffs and the same kind of result is obtained from the extensive use of cheaply grown hay, roots and ensilage. But experience with the pre-war Food Recording Scheme for cows showed conclusively that substantial economies in feeding could be effected once it was known that the consumption of S.E. per 100 gallons was comparatively high.

Generally speaking, it is of course true that during the war and post-war years purchased cakes and meals were used on a much reduced scale, but it may be of interest to show the effect of foodstuffs rationing on individual farms. This is done in Table XII, which gives the average results on seven farms for the three-year periods 1936/7 to 1938/9 and 1946/7 to 1948/9.

It will be seen that in each case there was a substantial increase in the total output of milk, partly due to higher milk yields per cow but chiefly to larger numbers of cows. In most cases, the percentage of S.E. drawn from purchased foodstuffs was very much lower in 1946/9 than in 1936/9, but on farm 10 there was actually a slight increase, while on farm 4 purchased foodstuffs still supplied 46 per cent. of the total S.E. in 1946/9.

It is, therefore, clear that the impact of foodstuffs rationing was very different on different farms.

* The cost per 100 lb. S.E. in a good dairy cake and in oats at different prices per ton is as follows:

<i>Dairy Cake</i>		<i>Oats</i>	
at £12 per ton	16/9	at £10 per ton	14/10
at £24 per ton	33/6	at £15 per ton	22/4
at £36 per ton	50/3	at £30 per ton	44/7

The quantity of concentrates consumed per cow per annum fluctuated very widely, not only from farm to farm, but also from period to period. On farms 4, 6, 7 and 9 the consumption per cow was much lower in 1946/9 than in 1936/9, whereas on farms 10, 12 and 15 it was substantially higher. On farms 10 and 12, however, the quantity of concentrates used per gallon of milk produced was slightly *lower* in 1946/9 than in 1936/9, because of the increased yields per cow. Again, although in five of the seven cases the cost of grazing per 100 gallons milk was considerably higher in 1946/9 than in 1936/9, on farm 9 there was little difference and on farm 12 it was slightly lower.

These results illustrate very clearly that generalizations, no matter how sound they may be, are apt to break down when applied to particular cases.

TABLE XII

Comparative Milk Production Results: 1936/7 to 1938/9 and 1946/7 to 1948/9

A. Concentrates fed per cow per annum—cwt.						
Farm No.	1936/7-1938/9			1946/7-1948/9		
	Purchased	Home Grown	Total	Purchased	Home Grown	Total
4	34.0	—	34.0	17.0	6.6	23.6
6	22.6	0.8	23.4	8.1	9.1	17.2
7	22.3	—	22.3	8.0	9.7	17.7
9	23.7	—	23.7	12.3	4.4	16.7
10	17.0	1.4	18.4	18.8	4.3	23.1
12	20.4	0.2	20.6	7.8	15.8	23.6
15	21.6	—	21.6	13.3	15.5	28.8

B. Lb. of concentrates per gallon						
4	6.07	—	6.07	3.1	1.2	4.3
6	3.69	0.13	3.82	1.37	1.53	2.9
7	4.04	—	4.04	1.43	1.73	3.16
9	4.48	—	4.48	1.97	0.7	2.67
10	2.77	0.2	2.97	2.4	0.55	2.95
12	3.95	0.03	3.98	1.24	2.52	3.76
15	4.63	—	4.63	2.31	2.7	5.01

C. Sundry comparisons								
Farm No.	Per cent. S.E. from purchased foods		Grass etc. per 100 gal. milk		Average milk yield per cow per annum		Total milk produced per annum	
	1936/9	1946/9	1936/9	1946/9	1936/9	1946/9	1936/9	1946/9
4	%	%	s. d.	s. d.	gal.	gal.	gal.	gal.
6	67.1	45.6	10 9	19 4	628	613	14,884	31,264
7	50.6	18.1	7 4	14 4	685	668	19,979	29,850
9	67.7	24.7	14 10	19 2	618	629	18,333	21,479
10	68.9	34.6	14 3	15 2	592	698	22,485	31,525
12	46.7	47.6	7 11	18 6	688	874	27,303	32,043
15	53.3	21.2	10 5	9 9	578	702	16,865	40,458
	71.0	25.4	12 3	21 2	525	644	156,055	424,326

Reference has already been made to the importance, on mixed farms suitable for cash cropping, of keeping down the acreage devoted to dairy stock to the lowest possible level. In some cases, the calculation is rather complicated but in the following cases

there were no serious difficulties. The acreages used by the dairy stock as grass, hay, roots, corn, etc., on these farms for the different periods shown in Table X are given in Table XIII.

TABLE XIII
Acreage used per cow and Milk produced per acre

Farm No.	Acreage per cow per annum				Milk produced per acre per annum			
	Period 1	Period 2	Period 3	Period 4	Period 1	Period 2	Period 3	Period 4
	acres	acres	acres	acres	gal.	gal.	gal.	gal.
4	5.4	2.6	2.6	—	116	207	233	—
9	3.1	3.2	3.3	3.2	173	187	176	219
10	3.4	3.3	—	—	203	258	—	—
11	3.7	3.4	3.4	5.8*	205	206	199	117*
12	5.3	5.3	4.7	—	112	117	150	—
15	3.6	4.2	4.0	—	146	132	166	—

* See explanation of these figures on page 26.

It would appear that the total area of land given up to the feeding of the dairy stock is seldom less than three acres per cow per annum and in some cases exceeds four acres. It is obvious that much depends on the quality of the pastures, the quantity of purchased foodstuffs used and so on. The relevant point is that, at $3\frac{1}{2}$ acres per cow, a profit of £15 per cow is equivalent to only £4.3 per acre of land used.

The computation of the milk produced per acre of land used by the dairy stock is, however, much more complicated. In Table XIII the milk per acre figures have been found in the simplest possible way by dividing the acreage per cow into the average milk yield per cow. In other words, they represent the amount of milk produced from an acre of land and a varying quantity of purchased foodstuffs. The really significant feature of these milk per acre figures is that, except on farm 11, there was a marked upward tendency, despite the much smaller consumption of purchased foodstuffs during the war and post-war periods.

LABOUR RELATIONSHIPS

During recent years, a good many investigations have been made with a view to showing how labour might be economized in the cowshed, and although this investigation was not specially concerned with labour problems some of the labour relationships that have emerged may be of interest. The chief conclusions that can be drawn are as follows:

1. Although in a number of cases, the size of the milking herd was substantially increased during the periods under review while in others it fluctuated considerably, in no single case was the number of cows increased or decreased with a view to forming a more economic labour unit. This does not mean that the size of the herd is not one factor which influences the cost of cowshed labour per gallon and per cow; it does suggest that the desire for labour economy is not the most important factor in determining the size of the herd at any time.
2. In some cases the value of the milk produced per £100 wages was higher since 1939 than before that date while in other cases it was lower, but there does not appear to be any direct relationship between the value of milk per £100 wages and the profit per cow. For example:

<i>Farm No.</i>	<i>Period</i>	<i>Value of milk for £100 wages</i>	<i>Profit per cow</i>	<i>Wages in total milk cost</i>
		£	£	%
4	1939/44	520	4.9	21.4
	1944/9	494	8.0	22.5
6	1937/43	474	11.2	28.1
	1943/7	390	13.9	31.9
7	1937/43	461	15.3	31.1
	1943/9	423	18.9	30.9
10	1936/43	666	17.2	22.4
	1943/50	615	30.3	23.1

The same reasoning applies here as to the relationship between the total farm output per £100 wages and the total profit per acre (pages 13-16).

3. There is no evidence of a consistent increase in the percentage of labour in the total milk costs in the post-war compared with the pre-war years. Once again, a substantial increase in the cost per unit of a particular item does not necessarily mean an increase in the relative importance of that item in the total costs—the cost of labour per cow and per gallon is, of course, much higher in the post-war than it was in the pre-war period.
4. The increased labour costs in the cowshed have been fully offset by the higher milk prices and the higher milk yields per cow.

FOODSTUFFS RELATIONSHIPS

The principal foodstuffs relationships are summarized in Table XIV and attention may be called to the following points:

1. The percentage of the cost of foodstuffs in the total milk production costs generally lies between 50 and 60, the simple average of all the cases being 53, with a minimum of 43 and a maximum of 64. No close connexion exists between the percentage of foodstuffs and the profit per cow.
2. Although there are a good many exceptions, there is a marked tendency for the profit per cow to increase as the output of milk per £100 foodstuffs increases. For example, in seven cases, with an output of less than £210 per £100 foodstuffs the average yearly profit per cow was £5.4, in nine cases with an output between £210 and £240, the average profit was £9.9 per cow and in seven cases with an output between £240 and £260 the profit averaged £14.5 per cow per annum. But this amounts to little more than saying that, provided "other things" remain equal, the higher the output per £100 foodstuffs the higher must be the profit per cow.
3. Although the quantity of milk produced per £100 foodstuffs was, of course, much less after than before 1939, this was more than offset by the increase in the price of milk, by higher milk yields per cow and in other ways, so that there was a substantial increase in the profit per cow after 1939.
4. In this table and also in Table X, the higher profits per cow during the war and post-war years are, of course, largely a reflection of the reduced purchasing power

of the pound. For example, the "real value" of the profit of £30.3 per cow on farm 10 during 1943/50 was probably no higher than, if as high as, the profit of £17.2 per cow in 1936/43.

TABLE XIV
Some Foodstuffs Relationships in Milk Production

	Milk per £100 foods	Value of milk per £100 foods	Milk yield per cow p.a.	Average No. of cows	Foods per cow	Foods per gal.	Foods in total cost	Profit per cow
Farm No. 2	gal.	£	gal.		£	d.	%	£
1937/8-1940/1	2,983	235	645	36	21.6	8.04	63.0	16.6
1941/2-1945/6	1,860	208	729	47	39.1	12.89	54.2	9.1
Farm No. 3								
1932/3-1937/8	3,547	194	574	16	16.1	6.77	49.4	(-)1.4
1938/9-1943/4	2,809	240	685	15	23.6	8.25	49.0	8.4
1944/5-1949/50	1,925	252	690	25	35.8	12.47	44.9	10.4
Farm No. 4								
1936/7-1938/9	3,130	181	629	24	20.1	7.67	55.6	0.2
1939/40-1943/4	2,098	187	538	32	25.7	11.44	59.7	4.9
1944/5-1948/9	1,773	230	606	44	34.1	13.53	48.4	8.0
Farm No. 6								
1926/7-1930/1	3,452	257	611	21.5	17.7	7.00	42.9	0.7
1931/2-1936/7	4,059	271	625	27.6	15.4	5.89	46.8	9.3
1937/8-1942/3	2,878	260	593	32.3	20.6	8.33	48.3	11.2
1943/4-1946/7	2,128	250	664	36.9	31.2	11.28	48.7	13.9
Farm No. 7								
1923/4-1929/30	3,603	206	702	18	19.5	6.66	55.3	4.9
1930/1-1936/7	4,526	255	594	31	13.1	5.30	50.0	7.2
1937/8-1942/3	3,118	261	601	28.4	19.3	7.70	54.9	15.3
1943/4-1948/9	2,074	256	648	29.4	31.2	11.57	51.1	18.9
Farm No. 8								
1937/8-1939/40	4,032	245	681	15.3	16.9	5.95	64.5	15.2
1940/1-1944/5	2,789	271	773	22	27.7	8.61	57.4	26.7
1945/6-1949/50	1,717	211	854	19	49.7	13.98	56.6	17.3
Farm No. 9								
1925/6-1931/2	2,684	169	536	45	20.0	8.94	54.9	(-)2.7
1932/3-1938/9	4,226	237	597	38	14.2	5.68	47.2	3.5
1939/40-1943/4	2,543	229	580	40	22.8	9.44	59.9	14.2
1944/5-1948/9	2,332	263	701	43	30.1	10.29	47.5	15.8
Farm No. 10								
1936/7-1943/4	3,744	284	691	38	18.4	6.41	52.5	17.2
1943/4-1949/50	2,146	260	853	37	39.7	11.19	54.5	30.3
Farm No. 11								
1923/4-1930/1	3,090	210	760	43	24.6	7.77	58.6	9.6
1931/2-1938/9	3,429	204	702	52	20.5	7.00	52.7	2.9
1939/40-1943/4	2,504	231	677	45	27.0	9.58	54.5	12.8
1944/5-1948/9	1,782	214	678	27	38.1	13.47	44.3	(-)4.4
Farm No. 12								
1936/7-1940/1	3,436	210	595	30	17.3	6.98	50.9	2.4
1941/2-1945/6	2,194	230	621	45	28.3	10.94	51.7	10.4
1946/7-1949/50	1,638	221	705	58	43.0	14.65	57.8	20.8
Farm No. 15								
1934/5-1939/40	3,526	218	524	312	14.9	6.81	60.1	7.7
1940/1-1944/5	1,909	204	555	624	29.1	12.57	55.3	6.7
1945/6-1949/50	1,408	197	663	649	47.1	17.05	56.2	8.8

Taken together, Tables X, XII and XIV illustrate one of the outstanding features of farming during these 25 years. On many farms, the pattern of farming has changed considerably. In some cases the change has been caused by, or at least associated with, an increase in the size of farm (Table I); in others, it has been due entirely to the changing economic conditions under which farming has been carried on. In milk production there has been not only a marked swing towards tuberculin-tested milk but also an almost revolutionary change in the method of feeding cows. Hence, a large part of the variations in the milk production results shown here must be attributed to the changed conditions of milk production, to a change in the "climate" of milk production.

OTHER LIVESTOCK

Of these 15 farms, five have never kept *sheep*, five have had sheep during the whole period of investigation and five gave up sheep during the war and have not so far returned to them. In these circumstances, it is not proposed to make any detailed reference to the sheep results, especially since they have been discussed at some length in two recent reports.*

None of the 15 farms has kept *pigs* except on a small scale during the period of the investigation and only two have kept *poultry* on more than the usual "barnyard" scale. Hence, nothing more need be said about these livestock.

* Report No. XLII, Department of Economics, Wye College, Financial Results in Sheep Husbandry—1936/7 to 1946/7 (1948).

Report No. XLIII, Department of Economics, Wye College, Financial Results on the College Farm. The Sheep Flock: 1926/7 to 1947/8, with special reference to 1944/5 to 1947/8 (1949).

CHAPTER V

RESULTS FROM COST ACCOUNTS—*continued*

C. CROP PRODUCTION

THE management problems that arise in connexion with the cropping programme on any farm may be listed under three heads.

1. What proportion of the land should be devoted to cash crops and to feed crops?
2. What kinds of cash crops and feed crops should be grown and what acreage should be devoted to each kind?
3. How can the crops, of whatever kind, be grown most economically?

One of the outstanding lessons of this investigation is that in seeking to answer such questions the farmer's assessment of the comparative economic strength of livestock and cash crops, of different kinds of livestock and cash crops, is apt to be more or less inaccurate. For example, back in the twenties and early thirties, farmers were shocked to be shown that the annual loss on the sheep flock kept largely on the fold was appreciably greater than the charge that had been made for the folded crops, so that, in effect, the sheep would still have lost money even if the whole cost of growing the folded crops had been charged against the succeeding crops in the rotation. This conclusion was indeed hotly challenged but it no longer causes much discussion: folded flocks of sheep have virtually disappeared from the farming scene of these parts. The ancient fertility rites represented by the folded crops have been abandoned and their modern counterpart is the three-year ley.

As a second example, the case of a pedigreed herd of Sussex cattle may be quoted. The farmer was immensely proud of this herd and he got an unpleasant surprise when the first detailed account was placed before him. It took three years' accounting to convince him that the financial problem of the Sussex herd was insoluble, and so it had to go.

Another aspect of this problem of farm reorganization can be illustrated by reference to farm 6. In 1926/7, this farm showed a loss of £212, ten years later, in 1936/7, there was a profit of £2,002. The first year's detailed accounts exposed several weaknesses and a number of radical changes were gradually made, not only in matters of detail but also with reference to the general system of farming. The cropping in 1926/7 and 1936/7 was as follows:

	1926/7	%	1936/7	%
Cereals	89 $\frac{3}{4}$		122 $\frac{1}{2}$	
Canning peas	—		21	
Potatoes	36		10 $\frac{1}{4}$	
Sugar beet	5 $\frac{1}{2}$		—	
Black currants	3 $\frac{1}{4}$		—	
	<hr/>		<hr/>	
Total cash or sale crops	135	36.2	153 $\frac{3}{4}$	43.1

Roots, kale and cabbage	14 $\frac{3}{4}$		4 $\frac{1}{2}$	
Folding crops	10		—	
Clover hay	37 $\frac{1}{2}$		—	
Seeds hay	25 $\frac{1}{4}$		—	
Rotation grass	—		63 $\frac{1}{4}$	
Wild white clover and grass seed ..	—		[28 $\frac{1}{4}$]	
<hr/>				
Total arable feed crops	87 $\frac{1}{2}$	23.5	67 $\frac{3}{4}$	19.0
<hr/>				
Bare fallow	8 $\frac{1}{2}$	2.2	—	—
Permanent grass	142	38.1	135	37.9
<hr/>				
	373	100.0	356 $\frac{1}{2}$	100.0
<hr/>				
The financial results were:				
	£		£	
Expenditure per 100 acres	1,284		1,224	
Revenue per 100 acres	1,227		1,787	
<hr/>				
Profit per 100 acres	(-)57		563	
<hr/>				

In this case, it is fair to say that the changes in the cropping were prompted by the *known* financial results from the different crops. It was, for example, quickly established that canning peas fitted extremely well into the general farm economy: a profitable cash crop, providing a useful by-product in the shape of pea-haulm ensilage and enabling some very effective half-fallowing to be done.

One important lesson to be learned from this investigation, therefore, is the need for a new approach to the possible reorganization of the farming system—an approach which does not ignore all traditional ideas and methods but which considers them strictly on their merits. In particular, there must be no confusion between the means and the end and we must be on guard against getting rid of one fetish only to put another in its place. For example, the idea of self-sufficiency in livestock foodstuffs is perfectly sound in some circumstances but not in others; it may often be sound for cattle and sheep but seldom for pigs and poultry; and whether the end point is maximum profit to the farmer or maximum production of human food over-emphasis on "self-sufficiency" can do much harm.

As already indicated, one general conclusion from the investigation is that, particularly during the war and post-war years but also between the wars, the profitability of cash crops has been on a higher level per acre than that of livestock and feed crops, including grass. It also shows that the level of profitability from cash crops depends on a wise choice of the crops that are grown.

One thing is quite clear. On the general, mixed farm the foundation of the tillage cropping is cereal growing and the results of this investigation show that, financially, this has been a sound foundation. It is true that in the late twenties and early thirties, the very low corn prices threatened the stability of tillage farming but the Wheat Act of 1932, establishing "deficiency payments" on the wheat crop, revived the confidence of corn growers. It is perhaps not always fully realized that the maintenance of alternate husbandry depends essentially upon satisfactory financial results from corn growing. The acreage under potatoes, sugar beet, canning peas, green vegetables and so on is definitely restricted, and it is only cereals that can cover the broad acres required in alternate husbandry farming. In commenting on his detailed profit and loss account to a farmer, almost any time during the last twenty years, I have nearly always had occasion to point out the comparatively strong financial position of cereal growing.

Nevertheless, the results on farm 12 are a stern warning that there are conditions under which cereal growing is a rather hopeless financial venture.

Having decided upon the cropping programme, for the short period at least, the farmer's next problem is how to maximize the profit per acre from each cash crop and from the cash crops as a whole, how to produce the feed crops at the lowest possible cost per ton. Here it is relevant to say a few words about the accounting problem that arises in striving to obtain separate results from each crop on the farm.

First, we might prepare a profit or loss statement for each "productive" account taken by itself—each cash crop and each class of livestock—add up the profits and losses and call the answer the total farm profit. This is the method inherent in what is called "enterprise costing", although it seldom happens that it is followed to its logical conclusion—the computation of the total farm profit.

The second way is to determine the total farm profit on the usual lines and then proceed to break down that profit into its component parts by means of a system of complete cost accounting. Hence, the results of the detailed profit and loss account can always be checked against the total profit according to the financial accounts. This, of course, is the method that has been used in this investigation.

Cost accounts resemble a series of carefully controlled, continuous experiments, each of which is shaped upon the results of all the preceding experiments. In the first year or two, only the most tentative conclusions can be drawn from the experiments and from the cost accounts but as the results accumulate the evidence becomes clearer and clearer and ultimately it is possible to formulate definite conclusions on which action can be safely taken.

Now the idea that a farm must be regarded as a one and indivisible whole is widely held. For the short period, this idea is undoubtedly sound but it does not follow that the cropping schedule can, or should, never be revised on the strength of the financial results from individual crops. Again and again in the course of this investigation individual farmers have found it advisable, and possible, to amend their cropping programme according to the cost accounting results; but—and this is the crucial point—they have been able to do this in the light of the results from all the cash crops, all the livestock and the farm as a whole. One example must suffice out of many examples that might be given.

In 1929, a certain East Kent farmer made a tentative venture in sugar beet growing on a farm where potatoes and broccoli had been the principal "fallow" crops. The result was encouraging and next year the acreage was increased. The net results for the eight years 1931 to 1938 were as follows:

					<i>Acreage</i>	<i>Yearly profit per acre</i>		
						<i>£</i>	<i>s.</i>	<i>d.</i>
Potatoes	..	..	..	..	138½	5	0	6
Sugar Beet	..	..	..	..	192½	3	19	11
Broccoli	..	..	..	..	84½	(—) 5	1	1

These results were conclusive enough to establish sugar beet as a worth-while crop in the rotation and in the following seven years, 1939 to 1945, 165 acres left an average yearly profit of £18 17s. 2d. per acre. The broccoli crop, on the other hand, disappeared—temporarily at least—from the rotation. On the same farm, canning peas came to be regarded as one of the most profitable cash crops, not only for the direct profit but also because it was an excellent preparation for a second crop in the same year—collards. It is not suggested that only farmers who keep cost accounts can make such cropping changes but without cost accounts the changes are largely plunges into the unknown.

It must be emphasized here that it would be foolish in the extreme to keep chopping

and changing on the basis of the results for a single year or even for two years; it would be equally foolish to revise the cropping on the strength of the results for only one crop, even over several years. And no matter how comparatively profitable a particular crop may be, it is seldom possible to increase the acreage beyond a certain point; the problem is how to plan the cropping so that the average yearly profit from the tillage land as a whole can be maximized.

PRICING HOME-GROWN FOODSTUFFS

There is one accounting problem about which something must be said at this point because it affects the relative accounting results from crops and livestock, namely, the basis on which home-grown foodstuffs are charged against the livestock.

In the case of grass, ensilage, kale, rape and similar crops, there is general agreement that the only rational basis is cost of production. There is indeed no market for these crops: the fact that a minute proportion of grassland is "sold" every year as agistment grazing does not mean that there is a market for grassland as a whole.

The case of hay, dried grass, mangels, fodder beet, swedes, cabbage and similar crops is slightly different in so far as market quotations for possible sales can often be obtained. Indeed, in many districts there are farms where one or other of these crops may be grown specifically for sale. Broadly speaking, however, they are grown for home consumption and the sale of a few tons of hay or mangels is not a good reason for assuming that all the hay and mangels could have been sold at satisfactory prices. Normally, therefore, the basis should again be cost of production.

In principle, the production costs should be based on average results over four or five years, but in practice it is perhaps safer to keep to the yearly costs. So long as milk production costs, say, are averaged over four or five years before firm conclusions are drawn, it is immaterial whether the home-grown foodstuffs are priced on a yearly or on an average basis; but it is always necessary to guard against drawing the wrong conclusions about a sudden increase in milk production costs because of an unfavourable season for the feed crops, including grass.

The third group of crops includes cereals, beans, peas, potatoes, sugar beet, broccoli, linseed, and so on, for which there is always a market, in the true sense of the term; and it is here that opinions differ sharply. The "academic" view generally is that the cost must always be followed right through to the final product, that on no account must either profit or loss be shown on a crop which is actually consumed on the farm, that all home-grown foodstuffs, without exception, must be charged against the livestock at cost price. The point of view of the "practical" man, however, is generally very different.

A simple example will illustrate the points at issue. A farmer decides to establish a pig breeding and fattening unit with the help of home-grown barley. The academic view is that the cost of producing bacon pigs can be reduced by feeding home-grown barley at a cost price of 16s. to 18s. per cwt. rather than purchased barley at 25s. to 30s. per cwt., whereas the farmer contends that unless the pigs can afford to pay him market price for the barley and still leave something over to cover the additional capital, management and risk involved in keeping pigs there is no point in keeping them. The real question is not: will the profit on pigs be increased by feeding them partly on home-grown barley? but: will a combination of barley and pigs earn a larger profit than barley alone? To the farmer, this is not an intricate economic or accounting problem but simply a matter of business-sense. Why, indeed, should he go to all the extra expense, all the extra worry, of keeping pigs unless he can earn a higher profit from feeding his barley than by selling it to the local merchant?

In this investigation, therefore, home-grown cereals, pulses and other saleable

crops have always been charged on the basis of current market prices and it may be added that this basis has had the support of all the co-operating farmers, both in the pre-war and in the war and post-war periods.

There is one further group of foodstuffs to be considered, such as straw, threshed hay, chat or brock potatoes, sugar beet tops, pea haulm silage and other by-products. In these cases, neither the cost nor the market price basis is applicable and it is necessary to use somewhat arbitrary prices, based upon the feeding value of each by-product. Each case must be considered on its merits. Sometimes the crop is a willing "seller" (of the by-product) but the livestock not a very willing "buyer"; sometimes, the livestock economy may be dependent on the by-products. For example, on a farm with a large head of livestock, including pigs, and a small acreage of potatoes and sugar beet, there will be a ready "market" for both the chat potatoes and the sugar beet tops; but where there is a large acreage of these crops and only limited numbers of livestock the disposal of the by-products is more difficult. Again, the credit which should be given to a corn crop for the straw varies a great deal according to whether it is burned on the ground after a combined-harvester or used as fodder for dairy cows after a self-binder and thresher. It is sufficient to say that in this investigation the prices charged against the livestock for by-products were determined after considering the special circumstances of each case. It may be added that, broadly speaking, the conclusions drawn from the crop accounts are seldom appreciably affected by the pricing of the by-products.

FACTORS IN CROP PROFITS

The profit per acre on any crop depends primarily on three factors: the cost per acre, the yield per acre and the price per unit of the product; while the cost per unit of product is equal to the cost per acre, *minus* any credit there may be for a by-product, divided by the yield per acre of the main product. Consider the following results for the barley crop on farm 6.

TABLE XV

Relationship between Cost per acre, Yield per acre, Price per cwt., and Profit per acre—Barley crop, 1927-1948

Period	1927/9	1930/2	1933/8	1939/41	1942/4	1945/8
Average yearly acreage	75	74	45	28	31	56
Net cost per acre	£ 11.3	£ 9.6	£ 9.1	£ 10.7	£ 14.0	£ 17.4
Credit for straw	1.0	1.1	1.3	1.3	1.1	1.0
Returns per acre	18.6	9.9	14.0	27.7	34.9	28.1
Profit per acre	7.3	0.3	4.9	17.0	20.9	10.7
Average yield per acre—grain—cwt. ..	29.4	20.8	24.1	26.1	25.2	22.2
Average cost per cwt.—grain ..	7/-	8/3	6/6	7/3	10/3	14/9
Average price per cwt.—grain sold ..	12/2	9/-	10/7	20/1	27/4	25/2

It will be seen that during this period of 22 years each of the factors summarized shows very great variations: the cost per acre from £9.6 to £17.4, the yield per acre from 20.8 to 29.4 cwt., the price per cwt. from 9s. to 27s. 4d., the cost per cwt. from 6s. 6d. to 14s. 9d. and the profit per acre from £0.3 to £20.9—variations which were quite normal to corn-growing during these years and which were, of course, partly due to the reduction in the purchasing power of the pound. Comparison between, say, 1927/9

and 1930/2 or 1942/4 and 1945/8 shows that the difference in the profit per acre is due to the interactions amongst the three variables: cost per acre, yield per acre and price per cwt., rather than to any one of them. Sometimes, as between 1927/9 and 1930/2, the yield per acre plays a dominant part; sometimes, as between 1942/4 and 1945/8, the cost per acre is mainly responsible; while as between 1933/8 and 1939/41 the price per cwt. is the principal cause of the difference in profit.

PRICE PER UNIT

Of these three factors, it is broadly true to say that the price per unit of the product is beyond the farmer's control. In the twenties and early thirties the price of wheat was determined by world conditions, but in 1932 the Wheat Act introduced "deficiency payments" which represented the difference between the average seasonal price and 10s. per cwt., subject to certain supply conditions. In the case of barley and oats it was not until the 1937 Agriculture Act that an attempt was made to stabilize prices by means of annual subsidies. During the war and post-war years, of course, markets have been assured and prices guaranteed for all the staple farm crops and farmers have been free to concentrate on maximum production without the fear of market slumps.

Nevertheless, the actual prices received for cereals, potatoes and sugar beet still depend to an appreciable extent upon their quality, as well as upon the months in which the crops are marketed. Up to a point, quality is a matter of good management, especially as regards the selection of the varieties best suited to the conditions and the most suitable manuring; but it is also largely influenced by seasonal conditions over which the farmer has no control: the difference between feeding and malting quality barley may be a matter of a few showers at the critical time during harvest. Further, there is always a limited market for seed samples at a premium over feeding or milling prices.

YIELD PER ACRE

But it is the yield per acre and the cost per acre which offer most opportunity for the exercise of the farmer's managerial functions. The two are, of course, interdependent, in so far as high yields may be associated with high costs and low yields with low costs; but no matter how efficiently the cultivations, seeding, manuring and harvesting may be done, no matter how high the natural fertility of the land, the yield per acre is still largely influenced by the weather conditions during seed-time, growing season and harvest. Indeed, impressions of the variations in the annual crop yields which are based upon the official national average yields are likely to be misleading in respect of the variations on individual farms.

Table XVI gives the annual yields per acre of wheat, barley, oats and potatoes on farm 1—a 400-acre corn growing farm—for the 25 crop years 1924 to 1948. It will be seen that the wheat yield per acre ranged from 17.8 cwt. in 1946 to 27.3 cwt. in 1924 (omitting 1947 when only two acres were harvested out of 24 acres sown), the barley yield from 13.4 cwt. in 1940 to 26.5 cwt. in 1926, the oat yield from 10.4 cwt. in 1945 to 34 cwt. in 1946, and the potato yield from 3.7 tons in 1945 to 12.1 tons in 1946. It will also be noticed that there are considerable variations in the five-yearly averages. Table XVII shows the annual variations in the wheat yields per acre on 17 farms for the six years 1940 to 1945 and also the six-yearly average yields. In both respects, the variations are very substantial.

There is, of course, nothing surprising in the large variations in crop yields as between one farm and another. The suitability of the conditions—soil, climate, topography and so on—under which the different crops are grown varies considerably from farm to farm and so does the managerial capacity of the growers. Table XVII illustrates

TABLE XVI

Summary of Annual Yields per acre—Farm No. 1

	Wheat		Barley		Oats		Potatoes	
	Acreage	Yield per acre	Acreage	Yield per acre	Acreage	Yield per acre	Acreage	Yield per acre
		cwt.		cwt.		cwt.		tons
1924	30	27.3	99	26.1	15	16.6	6	8.0
1925	54	22.7	92½	24.5	14	24.7	6	6.5
1926	43	17.8	108½	26.5	16½	22.8	13	7.8
1927	34	21.3	103½	22.7	14½	22.3	13	4.5
1928	27½	25.5	120½	23.9	34½	22.5	0	—
1929	36	23.1	120½	17.7	37½	25.6	0	—
1930	31½	18.0	96	20.4	36	27.8	0	—
1931	26	25.5	120½	20.7	26½	26.9	3	5.0
1932	24	18.2	81½	21.1	41½	23.2	6½	5.5
1933	45	21.4	76½	20.0	43	16.9	10	8.0
1934	60	24.7	82½	24.0	18	17.5	9½	8.5
1935	59½	25.1	104½	24.0	16	23.7	10	5.2
1936	47	20.9	107½	22.0	24½	15.2	9½	8.4
1937	46½	17.9	102	19.2	23½	17.1	8½	7.8
1938	45½	23.5	109½	21.9	17½	25.9	7½	8.4
1939	63½	23.4	90½	24.6	15	24.0	10	8.2
1940	49½	20.8	101	13.4	34½	12.1	19	4.6
1941	91½	23.3	93	17.4	19½	18.5	26½	8.8
1942	66½	23.7	99½	17.1	20½	18.0	23	11.9
1943	103	19.2	72	17.0	20½	18.8	31	7.4
1944	57	25.8	68	17.5	26½	19.4	33½	5.7
1945	65½	18.9	80	25.0	26½	10.4	37	3.7
1946	52	21.3	109	19.0	23½	34.0	37	12.1
1947	2	12.5	144½	20.0	46	14.1	38½	8.4
1948	50	26.8	122	18.4	12	16.9	38	10.9
25 years	1,210½	22.3	2,506	21.0	623½	20.4	396½	7.8
1924/8	188½	22.5	524½	24.7	94½	21.9	38	6.5
1929/33	162½	21.3	495½	19.8	184½	23.7	19½	6.6
1934/8	258½	22.7	506½	22.2	99½	19.4	45½	6.9
1939/43	374	21.9	456½	17.8	110½	17.2	109½	8.4
1944/8	226½	23.2	523½	19.8	134½	18.2	184½	8.2

one of the fundamental difficulties in fixing "fair" prices for crops. A price for wheat that is fair to farm 16—farm 17 may be ruled out as sub-marginal—growing an average of 20.3 cwt. per acre, that is, somewhere about the national average yield, must be more than generous to farm 1 with an average yield per acre of 32.4 cwt.

But what about the yearly variations on the same farm? In part, the annual yield per acre for any crop depends on the particular field or fields on which it happens to be grown. On most farms, the different fields vary in their productivity and suitability for particular crops; hence, a reduction in the acreage of potatoes may be followed by an increase in the yield per acre because the reduced acreage can be grown on more suitable land. Apart from this, it may and does happen that in a particular year a certain crop gets more than its fair share of the less suitable land. On farm 1, for example, the potatoes were planted in 1945 on rather thin downland. It was a dry season and the result was a crop of only 3.7 tons per acre. In the following year, they were planted on the valley land and a crop of 12.1 tons per acre was harvested.

But the major cause of the fluctuations in the annual yields is, of course, *the weather*, particularly rainfall and sunshine. Seasonal conditions affect yields in many different

TABLE XVII

*Average Yields per acre of Wheat on 17 farms—1940/5**

Farm No.	1940	1941	1942	1943	1944	1945	Six years
	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
1 ..	30.4	32.6	35.2	38.4	32.3	27.8	32.4
2 ..	33.5	32.3	30.1	29.2	24.6	26.5	29.5
3 ..	22.4	26.3	23.9	24.9	24.8	33.6	26.3
4 ..	25.2	25.7	27.7	26.5	32.1	19.7	26.2
5 ..	28.8	21.7	27.3	26.5	24.9	27.5	25.9
6 ..	22.5	30.9	22.9	26.3	28.6	27.5	25.6
7 ..	19.3	22.0	24.2	22.0	30.2	26.0	25.2
8 ..	20.6	27.3	19.5	24.5	29.9	23.8	24.6
9 ..	16.5	23.4	21.9	30.9	35.9	26.9	24.4
10 ..	9.7	21.4	24.4	25.4	27.2	25.2	24.3
11 ..	20.0	18.5	27.8	30.8	23.0	21.0	24.0
12 ..	16.8	22.1	23.4	25.9	29.3	21.2	22.9
13 ..	18.8	18.1	22.6	26.1	26.4	24.1	22.9
14 ..	21.2	17.2	21.7	29.4	22.3	26.1	22.7
15 ..	20.8	23.3	23.7	19.2	25.8	18.9	21.8
16 ..	15.0	18.0	22.0	21.3	23.0	16.0	20.3
17 ..	4.2	11.7	16.4	17.7	15.3	14.5	14.7
17 farms	20.7	22.3	24.1	25.5	26.0	22.8	23.9
England	17.8	17.6	20.3	19.9	19.5	19.0	—

* Department of Economics, Wye College, Report No. XXXIX (1949).

ways and their impact on different crops is not always in the same direction—unfavourable weather during the corn harvest may cause bumper crops of potatoes, roots and grass. It is also well known that some plant diseases and insect pests, such as potato blight, take-all and eyespot, frit fly and aphides, are much more damaging in some seasons than in others. There is no need to labour this point, beyond saying that unless the conditions are exceptionally bad, as they were during the 1950 corn harvest in many districts, some farmers have the knack of coping with difficult weather much more successfully than others.

There is, however, another reason for variations in crop yields on individual farms which is of great importance, namely, *the efficiency of the management*. Consider these data from farm 15.

			Wheat	Barley	Oats
			cwt.	cwt.	cwt.
Average yield per acre:	1941/5	..	13.4	14.1	14.8
" " "	1946/50	..	23.8	19.6	18.3
Average yield per acre	1949	..	29.2	26.2	20.1
" " "	1950	..	21.1	17.0	22.1

This is a large downland farm on which much of the land would be called second-rate and a good deal of it third-rate. In 1943, it was agreed that barley was the best cereal to grow and that 18 cwt. per acre was about the highest yield that could be expected. Two things completely changed these ideas. It was found, first, that the conditions were eminently suitable for growing spring wheat of the Atle variety and, second, that liberal dressings of potash and other fertilizers made a great difference to the productive capacity of the land—in 1946/50 manures for wheat cost an average of 68s. 4d. per acre per annum. It will be seen that the average yields per acre were much higher in 1946/50

than in 1941/5 and, what is even more important, the increases were due mainly to action taken by the farmer.

Nevertheless, the yields for 1949 and 1950 also show very emphatically that not even the most efficient management, backed by the most modern machinery, can prevent weather conditions from causing substantial variations in the yields per acre. In 1949, yields of 29.2 cwt. per acre of wheat on over 600 acres and of 26.2 cwt. of barley on over 300 acres were quite phenomenally good for this type of land; in 1950 these crops promised equally good, if not better, yields but instead, because of the exceptionally difficult weather at harvest, the yield of wheat fell by 8.1 cwt. and of barley by 9.2 cwt. per acre.

One of the outstanding lessons of this investigation is that over a large proportion of the land, the productive capacity has been quite wrongly assessed. Again and again, a farm gets a bad reputation; it passes into the hands of a more efficient farmer and in a few years' time it is regarded as one of the most productive farms in the district. During the food production campaign of the last war, a very common remark was that the crop yields on a certain area of land were "surprisingly" good—a confession that the productive capacity of that land, under good farming, had been under-estimated. Soil and seasonal conditions offer a ready excuse for the incompetent farmer and the excuse has been far too readily accepted as a reason for his low average crop yields.

It is not suggested that, in all cases, the power to push up the yields per acre lies in the hands of the farmer. Broadly speaking, low yields are due to one or more "limiting factors". If the limiting factor is just "poverty", as indeed it often is, the application of the most suitable quantities of the required kinds of manure often works wonders; if the limiting factor is slovenly cultivations, again something can be done about it; it may be that a change in variety is what is wanted; and so on. But if, on the other hand, the limiting factor is moisture, the provision of an artificial supply in general cropping is seldom practicable; while it may be beyond the scope of a tenant farmer to overcome the limitations imposed by inefficient drainage. The important point here is that the successful farmer is always searching for the limiting factors and for ways of overcoming them, whereas the less successful accepts them as things completely beyond his control.

One striking example of the influence of the yield on the profit per acre may be given from the 1944 barley crop, as follows:

	<i>Farm A</i>	<i>Farm B</i>
Acreage grown	343	16
Average cost per acre	£11 18 6	£19 18 2
Average returns per acre	£21 17 8	£43 16 6
Average profit per acre	£9 19 2	£23 18 4
Average yield per acre—cwt.	17.9	36.1
Average cost per cwt. of grain	12/7	10/9
Average profit per cwt. of grain	11/2	13/3

COST PER ACRE

The cost per acre is, of course, largely determined by decisions taken by the farmer. It is he who decides what cultivations shall be given and what forms of equipment shall be used, what variety and quantity of seed shall be sown or planted, what kinds and quantities of fertilizer shall be applied, how the crop shall be harvested, and so on. And all the decisions must have reference to the size of the farm, the acreage of each crop and the soil, climatic and topographical conditions. Further, although the cost per acre

may not be much affected, the yield and quality of the crop will depend partly and sometimes considerably upon the proper timing of the various operations: it may cost just the same to sow sugar beet to-day as ten days ago but the yield per acre may be several tons lower; the cost of harvesting barley may be the same to-day as ten days hence but the quality of the grain may be very different. It is true that the cost of cultivations and of harvesting are in no small measure affected by seasonal conditions, but the differences in the production costs per acre of crops from farm to farm are mainly due to managerial and environmental factors. All these things are common knowledge and no one who is familiar with the extremely diverse conditions under which crop production is carried on is the least surprised at the wide variations in the production costs per acre of all crops.

There are, however, certain general principles in crop production which the successful farmer instinctively realizes and acts upon and which are ignored by the less successful. Even at the risk of over-simplification, the position may be put briefly in this way.

In any given case, for any crop on any farm, there are certain basic, fixed or overhead charges which must be incurred, no matter what the size and quality of the crop may be. The rent must be paid, certain minimum cultivations—at least one ploughing, some harrowing and cultivating and rolling, drilling or planting the seed—must be done, a certain minimum quantity of seed of a certain quality must be sown or planted, and certain operations during growth, at harvesting and threshing must be performed.

Fifty years ago, a very large proportion of crops was grown with no more than these minimum operations and the size and quality of the crops depended mainly upon the productivity of the land and the seasonal conditions, while the variations in the costs per acre were on a much smaller scale than they are to-day. But now there is much wider choice of the way in which the cultivations and harvesting can be done, of the varieties to be sown or planted, of the fertilizers to be applied, of the spraying to be done against weeds, insect and fungoid pests, and so on. By proper cultivations and by the choice of the most suitable varieties and fertilizers, yields per acre can be raised to a level which was quite impossible fifty years ago, with the result that, under similar conditions, both costs and yields per acre tend to be much higher on well managed than on badly managed farms.

It might be said that the good farmer prefers to focus his attention on the fixed or overhead costs and realizes that the higher the yield the lower will be the unit cost of the overheads but he also realizes that he can minimize the unit cost of the overheads by up-to-date methods of cultivation and harvesting. The incompetent and slack farmer, on the other hand, is much too fond of invoking the law of diminishing returns to support his contention that high yields do not pay. He has probably heard or read that, according to Sir John Lawes, of Rothamsted fame, "high farming is no remedy for low prices", whereas what Lawes did say was that "*higher* farming is no remedy for low prices".

It is quite true that as the "variable" costs of manuring, spraying, cultivations, etc., increase, there is a tendency towards diminishing returns, but only after a certain point. For example, the expenditure of £3 per acre on fertilizers may result in an increase of x units per acre in the crop yield but an expenditure of £6 per acre will give an increase of less than $2x$ units. The two points that arise here are: first, there are still large areas which do not get even the £3 worth an acre of fertilizers and, second, the expenditure of a "second" £3 an acre on fertilizers may still pay very well in spite of the "diminishing return". Many farmers contend that it cannot possibly pay to apply 6 or 8 cwt. per acre of sulphate of ammonia and nitro chalk on the grassland, but this is not a good reason for not applying even 2 cwt. an acre.

In any case, there are certain practices in modern crop production to which this

law of diminishing returns does not apply at all. For example, the cost of spraying a corn crop badly infested with charlock or runch may be £2 per acre and the increased yield over unsprayed corn 6, 8 or 10 cwt. an acre, but there should never be any question of a second spraying. On the other hand, a single spraying against potato blight may be completely useless while three sprayings may increase the yield by several tons an acre. In short, the law of diminishing returns becomes a sort of boggy to the incompetent farmer, chiefly because he does not properly understand it, whereas the successful farmer seldom gives it much thought: he is convinced that although *high* farming may not be a *complete* remedy for low prices *low* farming is the sure road to bankruptcy, especially with low prices.

During the course of this investigation, a vast quantity of data on production costs, returns and profits for the staple farm crops has been accumulated. Table XVIII, giving the results for the wheat crop for the five years 1945 to 1949, may serve to illustrate certain general conclusions which can be drawn.

1. It is hardly ever safe to base conclusions about the profitability of any crop on the strength of either the cost per acre or the yield per acre or the price per unit of product taken by itself. For example, the cost per acre on farm 15 is £4.2 higher than on farm 12, but the profit per acre is only £1.4 lower, while the profit per acre is £2.6 lower on farm 6 than on farm 15 although the cost per acre is £2.8 lower.
2. It follows that it is not possible to lay down a "standard" cost per acre (or yield per acre) which might be used as a measure of the productive efficiency of the management.
3. It may be wrong to criticize a particular cost-item taken by itself and without reference to the final result. For example, it might be suggested that on farm 15 a cost of £6.2 per acre for mechanical equipment is higher than it should be, in the light of the £4.0 on farm 12 and £4.4 on farm 4, but the farmer would probably maintain that so long as he can average a profit of fully £8 per acre per annum over nearly 500 acres a year of wheat there can be nothing seriously wrong with his general organization. Again, it might be suggested that on farm 15 an average cost of £3 per acre for fertilizers is on a lavish scale compared with £1 an acre on farm 6 and £1.8 on farm 12, but the answer would certainly be that it was only by liberal manuring that an average yield of nearly 24 cwt. an acre was achieved and that less generous manuring would have resulted in a smaller yield, with scarcely any reduction in the other costs.

On the other hand, a cost of £6.1 per acre for manual labour on farm 6 does suggest a weakness in the labour organization, especially since there was nothing in the conditions on the farm or in the yield per acre to explain the comparatively high cost.

4. The average cost per cwt. of grain on farm 12 was only 11/7, against 13/6 on farm 4 and 14/10 on farm 15. It follows that in the event of a fall in corn prices farm 12 would be in a stronger position to meet it than either farm 4 or farm 15.
5. On farms 4, 12 and 15, man labour and mechanical equipment costs accounted for about 55 per cent. of the total costs (the corresponding figure for potatoes being about 56 per cent.). The point to be noticed here is that there is a tendency to over-estimate the economies which may be made by mechanized methods: to assume that a 10 per cent. reduction in the cost of man labour and mechanical equipment means a 10 per cent. reduction in the total costs.
6. The results on farm 15 suggest very strongly that the costs per acre on a large, fully mechanized and extremely well managed farm are not necessarily lower than on other smaller farms not so fully mechanized.

TABLE XVIII

Comparison of Wheat Costs per acre per annum—1945/9 crops

	Farm No. 4	Farm No. 12	Farm No. 15	Farm No. 6
Average yearly acreage	92	56	484	65
Costs:	£	£	£	£
Man labour	5.0	4.4	4.2	6.1
Mechanical equipment (and horse labour)	4.4	4.0	6.2	4.3
Seed	9.4	8.4	10.4	10.4
Manure	1.9	2.0	2.8	2.2
Rent	3.1	1.8	3.0	1.0
Sundries	1.1	1.2	1.0	1.3
Rotation costs	1.3	0.9	1.7	1.2
	0.5	0.6	0.2	0.2
Total costs	17.3	14.9	19.1	16.3
Apportionment: grain	16.8	14.3	17.7	15.4
straw	0.5	0.6	1.4	0.9
RETURNS				
Grain: sold*	23.2	21.7	23.3	20.4
seed	0.9	0.5	0.3	0.4
fed	0.8	0.8	1.3	—
	24.9	23.0	24.9	20.8
Straw: sold and used on farm	1.0	0.6	1.4	1.0
Ploughing subsidy	0.2	0.8	0.9	—
Total returns	26.1	24.4	27.2	21.8
PROFIT	8.8	9.5	8.1	5.5
Average yield per acre—grain—cwt.	24.9	24.7	23.8	20.6
Average cost per cwt.—grain	13/6	11/7	14/10	14/11
Average price per cwt.—grain sold†	18/9	17/3	20/3	18/7
Average profit per cwt.—grain	7/1	7/8	6/9	5/4
Percentage grain sold	91.6	93.4	92.8	98.1
* Including acreage payment.	1.7	1.8	1.0	1.7
† Excluding acreage payment.				

FEED CROPS

In the case of feed crops, profit per acre does not arise and conclusions about the efficiency of production must be based on the cost per acre, the yield per acre and the cost per unit of the product. As already pointed out, one important consideration is the most effective utilization of the land under feed crops. On large and medium sized farms, wherever conditions are favourable to cash cropping, one object must be to reduce the acreage under feed crops to a minimum and this can only be done by maintaining the production per acre at a high level. On small farms, where the emphasis will generally be on livestock rather than on cash crops and where maximum output must be a principal objective, high production of feed crops is even more important.

Under some conditions, however, the general policy on the large farm may be to put the emphasis on minimizing the cost per acre. For example, kale may be grown by broadcasting the seed or sowing it in narrow rows and then folding off the crop. In this way, a comparatively small crop per acre may be grown and utilized at a very low cost per ton. But on the small farm, with its limited acreage, the emphasis will be on the yield of kale per acre and large crops are less suitable for folding than small to moderate ones. Much extra labour will be required cutting the kale and carting it off but although

the cost per acre may be high the cost per ton may still be quite reasonable. What is even more important, a 25-ton crop of kale provides about 45 cwt. of starch equivalent and 8 cwt. of digestible crude protein, compared with only 20½ cwt. and 2¼ cwt. respectively from a 26 cwt. an acre crop of oats (and straw).

Now in the case of feed crops such as mangels, kale, hay and ensilage it is possible, by taking a little extra trouble, to ascertain the yields per acre with reasonable accuracy, but this is not true of the most important feed crop—grass. When this investigation commenced in 1923, most of the grassland was permanent and the costing of it was child's play, chiefly because so little was done to it. Gradually, the depression of the twenties and early thirties compelled many farmers to reconsider the way in which their farms were organized. The experience on farm 6 may be taken as fairly typical of what happened on a good many other progressively managed farms in the area.

As far back as 1929, a field was sown down to a three years' ley with a simple perennial ryegrass and wild white clover mixture and during the next ten years the whole of the arable land was gradually brought under alternate husbandry. Further, in 1937, the first field of old permanent pasture was ploughed up and gradually the bulk of the permanent grass was brought into the rotation. There was a good reason for laying down grass at one point and ploughing it up at another, for it had become abundantly clear that not even good permanent pasture was pulling its weight in the farm economy compared with rotation grass and cash crops. It should be noticed that in 1937 it was not so much a question of producing more human food as of organizing the cropping on a more profitable footing.

Right up until about 1944, it was considered that one of the strong points of the three-year leys was that they did not need, and did not get, any artificial manuring at all, except for an occasional top dressing to provide an "early bite" for cows. The seeds sown were mostly home-grown "seconds", harrowing or rolling was not necessary and there were few thistles to cut. The leys were entirely grazed, mostly by sheep, and their carrying capacity was found to be equivalent to from three to three and a half Half-bred ewes per acre all the year round, the average cost being equivalent to between 9s. and 10s. per ewe per annum. It should be added that the leys provided as a by-product a very profitable cash crop in the form of wild white clover and ryegrass seed and that when they were ploughed up they made a notable contribution to the productive capacity of the land.

The keynote of this method of managing the leys was its simplicity and a large amount of high quality grazing was obtained at a very low cost per unit. During the six years 1933 to 1938, the average yearly cost per acre was only 34s. 1d. and during the next six years, 1939 to 1944, it was only 37s. 1d. Further, during the three years under the ley the land got a complete "rest", under Nature's restorative influences and entirely free from Man's continual promptings and proddings.

After 1944 and particularly after 1947, the position on this farm gradually changed and the emphasis is now placed on the highest possible output per acre of animal foodstuffs in the form of grass, hay, ensilage and dried grass. Artificial manures are liberally used, most of the seed is purchased, the cost of labour involved in making hay, ensilage and dried grass is comparatively heavy and a considerable amount of machinery is required. During the three years 1949 to 1951, the overall expenditure on the leys amounted to an average of £15 15s. per acre per annum, compared with less than £2 during 1933 to 1944. Further, the production of grass, hay, ensilage and dried grass was so intermingled, the one with the others, that it was no longer possible to compute the costs of the separate foodstuffs derived from the leys.

Now it is clear that the final test of the economy of this intensive system of grassland management lies in the efficiency with which the various products are utilized by the livestock, in this case principally dairy stock. A crop of wheat can be grown, combine-

harvested and the proceeds paid into the bank, but grassland products must undergo elaborate "processing" into milk and meat before their cash value can be realized. It happened that on farm 6, since the new grassland policy was introduced, the net financial results from milk production have been progressively worse, culminating in a loss of about £4 per cow in 1950/1. It would, however, be wrong to conclude that the grassland policy was mainly or even largely responsible for the unsatisfactory milk production results—the dairy herd was itself undergoing reorganization which was considerably upset by a severe outbreak of infertility amongst the cows. This case provides clear and convincing evidence that efficient production and efficient utilization of grassland products must go hand in hand.

But it is on the small to medium sized farms that there is perhaps most scope for increased grassland production. On these farms, one of the factors limiting the total output is the acreage and one of the surest ways of raising the total output is to increase the production of feed crops, especially grass. The primary objective therefore should be, not to substitute grass and grassland products for purchased concentrates in order to minimize the cost per gallon but to supplement the concentrates with increased quantities of grass, hay, ensilage and dried grass in order to increase the total output of milk and thereby increase the *total* profit from milk production. It happens that farm 10 provides an excellent example of this policy. The relevant data are given in Table XIX.

TABLE XIX

Milk Production Results on Farm 10: 1936/43 and 1943/50

	1936/7 to 1942/3	1943/4 to 1949/50
Acreage	152	156
Average number of cows	38	37
Per gallon: Average cost (pence)	12.20	20.52
Average price (pence)	18.18	29.05
Average profit (pence)	5.98	8.53
Per cow: Average cost (£)	35.1	72.9
Average return (£)	52.3	103.2
Average profit (£)	17.2	30.3
Average milk yield per cow per annum—gallons ..	691	853
Average yearly output of milk—gallons	26,013	31,727
Total S.E. per 100 gallons—lbs.	393	396
Per cent. S.E. from purchased foods	44.3	45.5
S.E. per cow per annum. Purchased foods ..	1,200	1,537
Home-grown foods	1,518	1,841
Total	2,718	3,378
Cost of grazing per cow per annum (£)	2.3	6.1
Cost of grazing per gallon (pence)	0.82	1.73

In pre-war years, this farm had about 50 acres of not very good permanent pasture. During the war, this was ploughed up, limed and manured and either directly reseeded or brought under alternate husbandry with very satisfactory results. The leys were liberally manured and, latterly, the cows were intensively grazed with the aid of an electric fence. But no attempt was made to reduce the consumption of purchased concentrates.

The milking capacity of the cows was being gradually raised, and this was met by increasing the rations of both purchased and home-grown foodstuffs, of which grass, hay and ensilage formed an important part. The improvement in the grazing was not obtained without cost, since the cost of grazing per cow per annum increased from £2.3 in 1936/43 to £6.1 in 1943/50. The yearly output of milk increased from 26,013 gallons in 1936/43 to 31,727 gallons in 1943/50, that is, by 22 per cent.—it was as low as 22,764 gallons in 1942/3 and reached 34,230 gallons in 1949/50.

Here there was an exceptionally good combination of all the essentials for economic milk production: high class management, good cowmanship, heavy milking cows, a good cowshed, control over the quantities of foodstuffs consumed and well balanced rations, including high quality grass, hay and ensilage. The management, the cows and the method of feeding were so first-rate that good results would have been obtained in 1943/50 even with the pre-war type of pasture; it was the improvement of the grassland and the method of using it which raised the whole business of milk production to an unusually high level of efficiency.

Farm 10 exemplifies what is apt to be overlooked by enthusiasts in grassland improvement: that such improvement is only a means to an end and not an end in itself. The real problem in management is the integration of the increased output of grassland products and the other equally important factors in economic milk production. Farm 10 has succeeded in doing so, whereas up to 1951 at least, farm 6 has not succeeded. As the mechanism of production becomes more and more complicated, as it is undoubtedly doing, the net financial results become more and more dependent on managerial efficiency, and here the small to medium sized farm has the advantage that the management can be concentrated not only on a smaller area but also, as a rule, upon a smaller number of conflicting enterprises.

Farms 6 and 10 illustrate another important aspect of the relationship between more intensive grassland management and milk production. On farm 6, the objective is to step up the production of both milk and meat, from dairy stock and sheep, with only very restricted use of purchased foodstuffs and without seriously encroaching on the land available for cash cropping. In this way, the bulk of the imported concentrates can be freed for the feeding of pigs and poultry and perhaps also yarded beef cattle. It should be emphasized, however, that this policy of self-sufficiency for dairy foodstuffs is not likely to succeed unless the quality of the grassland products can be maintained at a high level and this imposes an additional strain on the managerial capacity. It is comparatively easy to increase the gross output from the grassland, but it is far more difficult so to organize the cropping programme that the nutritive value of the products will be uniformly high. It cannot be said that this problem has yet been solved on farm 6.

Farm 6, however, has about 450 acres of land, and the problem is very different on farm 10 with only about 150 acres. During and after the war the cash crops grown (on farm 10), on about 20-30 acres, were highly profitable and the annual output of milk could not have been maintained, let alone substantially increased, without the fullest possible use of purchased concentrates. Until 1950, at least, there can be no doubt that the feeding policy pursued on this farm was not only in the farmer's interests but also, because of the highly efficient use that was made of the purchased foodstuffs and the large amount of milk produced per acre, it was in the national interests as well.

The point is that farm 10 is much more representative of the great majority of milk producers than farm 6—at least as regards its size and layout. Any substantial reduction in the use of purchased foodstuffs in milk production would almost certainly be followed by a decline in the total output of milk, especially on those farms—and there are many—where grassland improvement has not yet made much progress. It is clear, therefore, that a generalization based upon what has been done on farm 6 might have very undesirable consequences if applied throughout the milk production enterprise.

COMPOSITION OF PRODUCTION COSTS

Another aspect of crop production costs about which there is much discussion is the percentage of the total costs taken up by the various items: man labour, mechanical equipment, seed, manure, and so on. Table XX summarizes the results in this respect for the wheat crop on four farms for different periods—similar results would be shown on other farms and for other crops. Attention may be called to the following points:

1. The composition of the costs per acre varies considerably from period to period. For example, on farm 1, the percentage of man labour varied from 30.4 in 1924/8 to 46.9 in 1944/8; the cost of manure made up 20 per cent. of the total on farm 1 in 1924/8 and 7.9 per cent. in 1944/8; and so on.
2. The percentage composition varies considerably from farm to farm: the percentage of man labour was 22.6 on farm 15 in 1946/50 against 46.9 on farm 1 for 1944/8; on farm 15 the cost of manures made up 19.8 per cent. of the total in 1941/5 compared with only 3.1 per cent. on farm 6 in 1942/4; and so on.

TABLE XX
Distribution of Costs—Wheat

Farm No.	1			4		
	1924/8	1934/8	1944/8	1937/9	1940/4	1945/9
Period						
Yearly acreage	38	52	45	57	77	92
Man labour	% 30.4	% 31.7	% 46.9	% 29.5	% 28.4	% 28.9
Horse labour, tractors and equipment	18.7	22.4	19.6	22.1	22.3	25.4
Seed	49.1	54.1	66.5	51.6	50.7	54.3
Manure	8.1	6.5	7.8	11.6	14.6	11.0
Rent	20.0	13.7	7.9	15.8	20.0	17.9
Sundries	16.9	12.6	8.0	8.4	6.2	6.4
Rotation costs	2.0	2.6	5.1	3.2	4.6	7.5
	3.9	10.5	4.7	9.4	3.9	2.9
	100.0	100.0	100.0	100.0	100.0	100.0
Total cost per acre £	12.8	10.6	21.6	9.5	13.0	17.3

Farm No.	6				15	
	1927/9	1933/8	1942/4	1945/8	1941/5	1946/50
Period						
Yearly acreage	29	57	76	65	211	578
Man labour	% 34.7	% 41.8	% 52.0	% 37.2	% 16.4	% 22.6
Horse labour, tractors and equipment	19.0	21.8	19.2	26.2	31.9	32.6
Seed	53.7	63.6	71.2	63.4	48.3	55.2
Manure	9.9	8.0	11.0	13.4	15.5	15.1
Rent	7.4	7.1	3.1	5.5	19.8	16.0
Sundries	10.0	11.8	8.2	7.3	6.9	4.7
Rotation costs	2.5	2.7	3.8	4.9	6.0	8.5
	16.5	6.8	2.7	5.5	3.5	0.5
	100.0	100.0	100.0	100.0	100.0	100.0
Total cost per acre £	12.1	8.5	12.6	16.4	11.6	21.2

3. On farm 6, in 1927/9, 16.5 per cent. of the cost was on account of manurial residues and beneficial cultivations from previous root crops whereas, because of the change in the cropping programme, the corresponding figure in 1942/4 was only 2.7 per cent.
4. Rent formed on the average less than 10 per cent. of the total costs and in each case the percentage declined steadily during the periods of the investigation: from 16.9 to 8 per cent. on farm 1, 6.9 to 4.7 per cent. on farm 15, and so on.
5. On the average, the cost of "sundries" formed less than 5 per cent. of the total. Hence, an error of even 10 per cent. in this figure would affect the total costs by only about one-half per cent.
6. A fall in the percentage figures between two periods does not necessarily mean a fall in the cost per acre. For example, on farm 15 the percentage cost of manures fell from 19.8 in 1941/5 to 16 per cent. in 1946/50, but the cost per acre rose from £2.3 (19.8 per cent. of £11.6) to £3.4 (16 per cent. of £21.2).
7. It is clear that conclusions based upon average results must be applied very cautiously to individual farms. For example, the impact of a rise in the price of fertilizers is much greater on farm 15 than on farm 6 and an increase in the wage rates has a greater effect on farm 1 than on farm 15.

It should be pointed out here that in this investigation no attempt was made to compute the number of hours' work represented by a certain cost per acre. In the first place, the additional clerical help that would have been necessary was not available; and, secondly, the computation of the cost of man labour in growing a crop is a much more straight-forward operation than that of the number of hours. In any case, conditions vary so much from farm to farm that comparisons based on the number of hours of work are liable to be even more misleading than those based on the labour costs.

SCOPE OF THE RESULTS

Although the financial results discussed in this report have been obtained entirely from the south-eastern counties, there is no reason to believe that the conclusions which have been drawn from them are not of quite general application. The need for pushing up the output per acre on small farms to the highest possible level is just as great in Cumberland as it is in Kent, and it is unlikely that the annual crop yields per acre fluctuate less widely in Yorkshire than they do in West Sussex. The intensification of grassland production may be somewhat easier in western districts where the rainfall is heavier than it is in the south-east, but the problem of the economic utilization of grassland products is just as difficult. Indeed, if there are any general principles in good farming they must be as applicable to conditions in Aberdeenshire as to those in Surrey, and it has been a principal object of this report to show that there are such principles. For example, the effect of "overheads" on the unit costs of production of milk, crops and other products is quite universal in farming, no matter where it is carried on, and the problem of finding the optimum combination of cash crops, feed crops and livestock is one which concerns farmers wherever they are. Lastly, these case studies demonstrate beyond any question the need for basing conclusions upon long-term results.

CHAPTER VI

MANAGERIAL EFFICIENCY

IN this report frequent references have been made to what has been called managerial efficiency, but it is a term which is not easily defined in precise terms. The real problem is to distinguish between the part played by management and by environmental conditions—soil and climate, altitude and topography and so on—in bringing about certain results, but there is a good deal of confusion about the nature of these results. It is suggested, on the one hand, that the efficiency of the management on any farm must be judged by the amount of human food that is produced, in relation to the environmental conditions, and, on the other, that the final test must be the average yearly farm profit. Now it may be quite true to say that from a national point of view the production of the maximum quantity of human food is a matter of the highest importance. Nevertheless, it is only half a truth.

If the quantity of human food were the only criterion of efficiency in the national sense, it would be hard to justify the feeding of large quantities of wheat to poultry and thereby losing from 85 to 90 per cent. of the energy value of the wheat, or the feeding of large quantities of barley to bacon pigs by which about 75 per cent. of the energy value of the barley will be wasted. Hence, production must be judged in terms of quality as well as quantity, and the farmer who feeds a large quantity of his barley to bacon pigs because he believes that the pigs will pay him a better price for the barley than the local merchant could afford to do, must not be condemned because he is actuated by the profit motive, although his total output of human food, in terms of calories, will thereby be substantially reduced. He is, in fact, helping to satisfy the *quality* requirements of the food supplies. It can be said that the surest way of raising the "quality" and reducing the quantity of our home food supplies would be to make it much more profitable to feed cereals to livestock than to sell them. The reverse policy was, of course, in operation during the war and post-war years.

Further, even from a national point of view, efficiency in production must have some relation to profit. It is, for example, in the national interests that a given quantity of milk should be produced with the smallest possible consumption of labour, food-stuffs, etc., and the only practicable measure of the relationship between the "input" and "output" in milk production is the profit. Again, under similar soil and climatic conditions, one farmer may grow an average crop of 25 cwt., another only 20 cwt. per acre of wheat. It is fairly certain that the profit per acre will be substantially higher on the 25 cwt. than on the 20 cwt. crop, so that again the farmer's interests are not opposed to, but coincide with, the national interests. In short, efficient production, even from a national point of view, cannot be accurately measured according to the quantity and quality of the human foods produced, but must have some relation to the quantities of land, labour and capital expended in that production: broadly speaking, from a national point of view, what is called profitable production is more efficient than unprofitable. It would be unnecessary even to mention this truism were it not for the fact that in some quarters it is assumed that efficiency in farming is entirely a matter of human food production.

The second aspect of this efficiency problem about which there is a good deal of confused thinking is this. In all investigations into the financial results in farming—and the present investigation is no exception—one of the most striking features is the very large differences in both the costs and the profits in milk production, sheep breeding, wheat growing and so on. It is, of course, generally agreed that these differences are due

partly to differences in managerial efficiency and partly to environmental conditions. Amongst those with only a superficial knowledge of how farming is carried on, there is a marked tendency to assume that the differences in the results are mainly, though not entirely, due to differences in managerial efficiency; on the other hand, amongst the less successful farmers there is an equally strong tendency to attribute the differences mainly to environmental conditions of size of farm, soil, topography, altitude, layout, buildings, and so on.

In the course of this investigation, a mass of indisputable evidence has been obtained to show not only the important part played by management in the successful operation of any farm but also the way in which skilful management can overcome many of the inherent difficulties of soil, layout, topography, and so on. There is also strong evidence to show that at times climatic conditions may defeat the efforts of even the most efficient management.

Farm 6. Consider first these results for farm 6.

			<i>Per 100 acres</i>		
			<i>Expenditure</i>	<i>Revenue</i>	<i>Profit</i>
			£	£	£
1926/7 to 1931/2	..		1,031	1,062	31
1932/3 to 1937/8	..		1,040	1,427	387
1938/9 to 1943/4	..		1,320	2,213	893
1944/5 to 1947/8	..		2,060	2,500	440
<hr/>					
1926/7	..	..	1,284	1,227	(—) 57
1936/7	..	..	1,224	1,787	563
1943/4	..	..	1,493	2,510	1,017
1946/7	..	..	2,200	2,168	(—) 32

During the 18 years 1926/7 to 1943/4 the farm was under the same management and its acreage remained almost unchanged. Early in the period, it became clear that a radical change in the organization was called for, and this was gradually effected. At the moment, the nature of the change is not important; what is important is the fact that it was made and the results of making it. Despite the difficult economic conditions, the average yearly profit per acre increased from 6s. 2d. in 1926/7-1931/2 to 77s. 5d. in 1932/3-1937/8, the improvement being due almost entirely to an increase in the output per acre. In 1936/7, there was a total profit of £2,002 compared with a loss of £212 ten years earlier. Under war conditions the profit shot up to over £10 per acre in 1943/4. There can be no doubt that the very marked improvement in the financial results during this period was due essentially to the efficiency of the management. It is right to add that progress was carefully and accurately charted year by year by means of the cost accounts.

Towards the end of 1944, a change occurred in the management and there was another change about two years later. During the four years 1944/5 to 1947/8 the average yearly profit per acre was only £4.4 compared with £8.9 in the previous six years—in 1946/7 there was a total loss of £139 compared with a profit of £3,873 in 1943/4. Now it would be wrong to attribute the remarkable change in the financial results on this farm entirely to the change in the management, because there were also other disturbing factors which need not be detailed here, but there is no doubt that management must be held primarily responsible. It will be noticed that whereas the expenditure increased by 56 per cent. in 1944/8 over 1938/44, the revenue increased by only 13 per cent., but there was nothing in the seasonal conditions to explain this disproportionate increase in the expenditure.

Farm 9. Another example of a similar kind is provided by farm 9 and the relevant results can be summarized as follows

	<i>Per 100 acres</i>		
	<i>Expenditure</i>	<i>Revenue</i>	<i>Profit</i>
	£	£	£
1925/6 to 1931/2 ..	1,299	1,151	(-)148
1932/3 to 1938/9 ..	1,212	1,247	35
1939/40 to 1943/4 ..	1,568	2,157	589

In this case a change in the management occurred early in 1932 and a loss of 29s. 7d. per acre per annum in the seven years 1925/6 to 1931/2 was converted into a profit of 7s. in the seven years 1932/3 to 1938/9 and a profit of 117s. 10d. in the five years 1939/40 to 1943/4. During the first period, each year showed a loss, in the second 1932/3 and 1933/4 still showed a loss, but the remaining five years showed a profit.

On farm 6, the new management took over a thoroughly prosperous business; on farm 9, it was faced with a business in a bankrupt condition, and it was a year or two before it could be pulled round. The results for the third period are, of course, affected by war conditions but they were partly due to the thorough reorganization which was gradually effected.

Farm 10. An example of a rather different kind is provided by farm 10, to which special reference has already been made (page 47). When this farm was taken over in 1936, it was in a semi-derelict condition and yet during the seven years 1936/7 to 1942/3, it left an average yearly profit per acre of £7 and during the seven years 1943/4 to 1949/50 nearly £9. In the first of these periods, the yearly output averaged nearly £23 per acre; in the second, it was no less than £45.

In this case, the evidence on the importance of managerial efficiency is what might be called circumstantial, but it is none the less valid. Instead of submitting to the inherent weaknesses of the farm, this farmer organized the cropping in such a way as to exploit the weaknesses; for example, the soil is light and hungry but it responds generously to liberal manuring and was found to be very suitable for certain special crops of a high value per acre.

Nevertheless, the principal inherent weakness was drastically revealed in the very dry summer of 1949 when the tillage crops were almost failures and the grassland badly "burned". A profit of nearly £16 per acre and an output of nearly £59 per acre in 1947/8 were followed by a small loss and an output of only about £39 in 1948/9, while the delayed effects of the drought were reflected in a profit of only about £6 per acre in 1949/50. Had it not been for this minor catastrophe, the average yearly profit per acre in 1943/4 to 1949/50 would, of course, have been considerably higher than £9.

Farm 15. As a second example of the importance of climatic conditions, the experience on farm 15 may be quoted. In 1948/9 the average profit per acre was £6.2 whereas in the following year, largely because of the disastrous harvest weather, it was only £3.8. The average profit per cow was substantially higher in 1949/50 than in 1948/9—£16.2 against £10.9—and this illustrates one of the advantages of mixed farming.

Farm 14. Farm 14 illustrates how high-class management can overcome extremely difficult conditions of layout and topography. This is a large upland farm made up of several scattered holdings; there are many steep slopes and the arable land cannot be rated higher than second-class; there is a considerable acreage of rough grazings. By skilful adaptation of the system of farming to the conditions, there was an overall yearly profit of £5 per acre on an output of only £16½ in 1943/4 to 1946/7 and of nearly £10 per acre on an output of £25 per acre in 1947/8 to 1949/50. These profits compare very favourably with those on other farms with much superior conditions of soil, layout, and so on. It must be added that all the necessary capital for full-scale mechanization

and ample livestocking was available: in the case of a farm of this kind and size it is the combination of sufficient capital and first-rate management which is the essential requirement for financial success. It is perhaps fair to say that the mechanization of corn growing, including particularly combine-harvesting, has greatly reduced the gap which used to exist between a scattered, hilly farm of this kind and a more compact farm on level ground.

These examples must suffice to illustrate the important point that good management, backed by sufficient capital, is seldom daunted by the most discouraging conditions of soil, layout, topography, and so on, provided there is a reasonably sure market at economic prices for the products. They also show that the great unpredictable and uncontrollable factor in farming is the weather: on farm 10 lack of rain in 1949 prevented crops from developing, on farm 15 growing conditions in 1950 were excellent, but too much rain during harvest caused very heavy losses. There is no need to labour this point. Even so, there is a tendency amongst slack and incompetent farmers to use the weather as an excuse for their unsatisfactory results, forgetting that their neighbours have secured much better results under the same weather conditions.

It follows from what has been said that a farmer is a good manager not so much because he has worked out certain ways of doing things, but because he is always ready to adapt, and capable of adapting, his methods to his conditions, and one of the great advantages of mechanization is that it gives him far greater control over his particular conditions—on farms 14 and 15 extensive corn growing would have been virtually impossible without tractors and combined-harvesters and all the rest. The success of migrant farmers, whether from Ayrshire to East Lothian or Essex or from Cornwall to Kent, depends essentially upon their adaptability. They cannot help taking with them the customs and practices with which they are familiar, but they are quick to discard them as soon as it is clear that they do not fit their new conditions. At the same time, they have the knack of grafting the system of farming with which they are most experienced on to their new farms; hence the gradual development of milk production in many of the eastern and south-eastern counties of England where milk production was almost unknown sixty or seventy years ago.

As already pointed out, what may be called the technique of farming is now far more varied and complex than it used to be; at almost every point the farmer has a much wider choice about how the farm should be organized and operated. And there is therefore greater scope for the exercise of the managerial talent. One of the severest tests of the managerial talent is in the discriminating use of the capital resources, generally rather restricted. The temptation to spend money on machines and buildings is much stronger than it was even thirty years ago and the farmer who invests several hundred pounds in a hay and straw baler or combined-harvester, which may be in use only about ten to fourteen days in the year, does not always give sufficient thought to alternative ways of investment, such as livestock or fertilizers, which could reasonably be expected to yield a much quicker, as well as a larger, total return.

There is no question of underrating the tremendous importance of modern machinery and buildings in efficient farm production but do not let us overrate their importance. Modern equipment is no substitute for good management and, indeed, if it is to be effectively and economically employed, the management must be of higher rather than lower calibre; or at least it must be of a different calibre. A large mechanized farm needs greater powers of organization than its counterpart of fifty years ago. Then, the power unit was the horse team and the choice of implements was very limited; now, all sorts of questions face the manager: how many tractors and what kind or kinds, how many combined-harvesters and what kind or kinds, how many motor vehicles and what kinds, and so on?

Again, on the smaller farm, a very common question is: will it be more economical

to buy a machine or to hire it, or, should a machine be bought partly for one's own use and partly for hiring out to one's neighbours? All these and many other similar questions did not arise fifty years ago and the corresponding questions that did arise were much less difficult: in many cases the cropping was organized around so many teams of horses, as on the three-pair-of-horses farms of north-east Scotland.

In short, whether it be the small, medium-sized or large farm, there is far greater scope for highly efficient management to-day than there was fifty years ago, and it is for this reason that the differences between good and bad management are much greater than they used to be.

It would, however, be wrong to leave the impression that environmental conditions in farming are no longer important and that efficient management can overcome all manner of inherent weaknesses in the make-up of a farm. Broadly speaking, successful farming under unfavourable conditions of soil, layout, topography, altitude, etc., requires a *combination* of good management and sufficient capital. This is clearly shown on farms 14 and 15 whereas on farm 7 it has not been possible to accumulate enough capital out of profits to make the necessary improvements to rather difficult soil and topographical conditions, despite highly capable management. Under poor management, farms 14 and 15 would certainly have achieved much smaller profits or even losses; given more capital, farm 7 would have shown much better financial results.

This report is hardly the place for a full discussion of what is one of the big unsolved problems in agriculture: the provision of capital to farmers who could employ it efficiently. It is sufficient to emphasize, first, that maximum production in agriculture depends not alone upon managerial efficiency—however important that may be—but upon a combination of good management and sufficient capital to enable each farm to be organized and operated in the most effective way and, secondly, that there are many small-scale farmers, working under difficult environmental conditions, who find it quite impossible to save all the capital they would like to have for development purposes, who never get the opportunity of showing the capacity for management which is latent in them.

Wye College,
December, 1953.



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