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C. H. BLAGBURN

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I. INTRODUCTORY.

There is general agreement that, in present circumstances, it is necessary to produce as much of our food as possible in this country. But, although much has been done on the technical side to increase production, the economic aspects have been somewhat neglected.

We cannot afford to expand our production regardless of expense and a good deal more consideration needs to be given to the possible cost, in valuable national resources, of increasing output by various means. The subject does not lend itself to the kind of experimental investigation that can be applied on the technical side of agriculture. But a good deal of financial and economic data have been collected in recent years from farms operating under commercial conditions at widely different levels of output, and these data can be used to shed considerable light on the subject. This study is based on such data, collected from farms in the South and South Midlands of England by the Agricultural Economics Department of Reading University, under the Farm Management Survey carried out in co-operation with the Ministry of Agriculture.

II. BASIC DATA.

The basic data for this study consist of 287 annual financial and statistical records, obtained from medium-sized farms in the area mentioned above, for the three financial years 1946/7, 1947/8 and 1948/9; of these, 80 refer to 1946/7, 99 to 1947/8 and 108 to 1948/9. The inclusion of three years' figures reduces the effect of any abnormal seasonal conditions. If farms of all sizes had been included, the number of records available would have been considerably greater. But there are such wide differences between the economy of larger and smaller farms that, to avoid misleading conclusions, the study was confined to farms of between 100 and 300 acres.

For some of the farms included, records are available for each of the three years, for others only for one or two years. But in each case the records for a single farm year are reckoned as one unit for the purpose of averaging. Thus, in some cases, a single farm may figure more than once, though, of course,

for different years. This may, for certain purposes, reduce the value of the sample; but it seemed better to accept this disadvantage rather than the greater one of reducing the size of the sample excessively by confining attention to farms for which three years' results were available.

Farms of various types are included in the sample. Of the total number of records available, 166 refer to farms primarily interested in milk-production, 31 to farms mainly producing cash-crops, 18 to farms principally concerned with livestock other than dairy cows, while 72 refer to mixed farms.

III. MEASUREMENT OF OUTPUT AND COSTS.

For an investigation of this kind some reasonably accurate basis of comparing the output of farms of various production types is needed. For this purpose *value of output* has been adopted. No "physical" basis of measurement which will do justice to every kind of farm product seems practicable. Moreover, under the present fixed price regime, it should be justifiable to assume that the prices fixed broadly reflect the relative values of different products to the community.

Even on a value basis, however, there are several possible methods of measuring output. The one adopted—called, in this Report, "net farm output"—is intended to indicate the net value of the produce of the land of the farms themselves, after deducting the value of raw materials produced on the land of other farms—in other words, it is the value of sales off the farm (including Government subsidies) plus or minus any rise or fall in the value of stocks during the year, and minus the value of purchases of livestock, feedingstuffs and seeds.

This deduction is necessary in view of the different proportions of their own produce retained by farmers for feed and seed: farms which sell a large part of their output and rely on purchased feed and seed would otherwise appear to compare over-favourably in output with those which are more self-supporting.

To eliminate the effects of changes in prices and unit costs from year to year, sales and expenses in the first and third years have been adjusted to the average price levels prevailing in the middle year—1947/8.

IV. EXPENDITURE AT DIFFERENT OUTPUT LEVELS.

The sample includes farms ranging in net farm output from a little more than £5 to over £35 per acre. It is interesting first to examine, broadly, the average levels of expenditure associated with different rates of output, ignoring for the moment variations in the methods by which these different rates of output are achieved.

Table I.

Expenditure at different output levels.

Output Level.	No. of Farms.	Net Farm Output per 100 Acres.	Rent & Rates.		Labour.		Manures.		Power Costs.*		Other Expenses.†		Total Expenses.†	
			Per 100 Acres.	Per £100 Net Farm Output.	Per 100 Acres.	Per £100 Net Farm Output.	Per 100 Acres.	Per £100 Net Farm Output.	Per 100 Acres.	Per £100 Net Farm Output.	Per 100 Acres.	Per £100 Net Farm Output.	Per 100 Acres.	Per £100 Net Farm Output.
		£	£	£	£	£	£	£	£	£	£	£	£	£
Under 80% of average ...	91	1,062	137	12·9	548	51·6	47	4·4	260	24·5	94	8·9	1,086	102·3
80% to 100% of average	77	1,445	140	9·7	623	43·1	63	4·4	297	20·5	111	7·7	1,234	85·4
100% to 120% of average	57	1,750	148	8·5	752	43·0	101	5·8	362	20·7	147	8·4	1,510	86·4
Over 120% of average ...	62	2,370	162	6·8	917	38·7	126	5·3	431	18·2	193	8·1	1,829	77·1
Overall Average	287	1,583	145	9·2	686	43·3	79	5·0	328	20·7	130	8·2	1,368	86·4

* In this and later tables includes repairs, depreciation and hire of machinery, electricity, and fuel.

† This does not include purchased livestock, feeding stuffs or seed which have already been deducted in arriving at Net Farm Output.

In the first part of Table I, expenditure*, in total and by various categories, is shown for four broad groups of farms within different ranges of net farm output. The basis of classification used here is not the actual output of the farms but the ratio of each farm's output to the average for the sample in the year in question : this basis is adopted in order to correct for seasonal variations in the general level of farm output from year to year. Expenditure is shown both per 100 acres and per £100 of net farm output.

It will be seen that the rise in net farm output between the lowest and highest groups is accompanied by a substantial but by no means proportionate increase in total expenditure.

An increase in average net farm output of over 120 per cent. between the lowest and the highest groups was accompanied by a rise in expenditure of less than 70 per cent. Increasing output thus resulted in a marked improvement in " productivity," every £100 of net farm output at the lowest level requiring more than £102 of expenditure compared with only £77 at the highest level. This improvement appears to be much more marked in the earlier stages of production increase ; unfortunately, however, because of its limited size, it is not possible to divide the sample into a sufficient number of size groups to shed much light on the trend of costs as production increases.

Looking at the different categories of expenditure, it will be seen that an important factor in the reduction in costs per £100 net farm output is the falling burden of rent and rates. The farms of higher output show only a modest increase in rent and the burden of this charge is thus spread over a far greater volume of output.

The main improvement in " productivity " was, however, in respect of labour and mechanical power.

Expenditure on fertilisers, exceptionally, increased more than proportionately to output and this, no doubt, helped considerably to bring about the overall improvement in productivity shown by the farms of highest output.

These figures may be used to obtain a rough and ready indication of the order of magnitude of the increased expenditure likely to be involved in expanding the production of the agricultural industry.

An increase in total agricultural production is more likely to be attained through higher output on all types of farms than by levelling up the less productive farms more nearly to the standard of the better ones. The following figures, therefore, show the increased output, per 100 acres and per cent., and the increased expenditure, per £100 additional net farm output and per

* In view of the definition of " net farm output," as used here, " expenditure " in Table I and subsequent Tables naturally excludes expenditure on livestock, feedingstuffs and seeds. It also excludes capital expenditure.

cent., which would result if production, on the sample of farms under consideration, were raised by increasing output and expenditure in each of the three lowest groups of Table I to the level of the group immediately above it.

	£	%
Average Increase in Net Farm Output (per 100 acres) ...	436	30·7
Average Increase in Expenditure (per £100 Increase in Net Farm Output) :—		
Rent and Rates	1·9	6
Labour	28·2	19
Manures	6·0	38
Power Costs	13·1	18
Other Expenses	7·6	28
TOTAL	£56·8	19%

In round figures, this process would increase production by about 30%. This is more than the rate of increase provided for in the present agricultural expansion programme, but is not, by any means, outside the scope of practical politics. With this scale of increase, every £100 additional net farm output would require about £57 in additional productive resources of which about £28 would be labour, £13 power and machinery costs, £6 manures and £10 other expenses including rent and rates. The percentage increases in expenditure, except for fertilisers, would be considerably less than the rise in output. In short, higher output per farm on this sort of scale would appear to result not only in a bigger national food production but in greater productivity of resources used.

Three reservations must be made :—

(i) Judged by rent, the farms of higher output tend to be situated—as might be expected—either on somewhat better land than the average or on land carrying more elaborate capital equipment in the form of buildings, etc.* It is true that this has been allowed for, in the above calculations, by showing the increase in average rents. But this is somewhat unrealistic. As the cost of an increase in production on the existing land is being considered, what would actually happen is that rent would remain unchanged but other costs would rise rather more than is shown in the above figures.

(ii) The farmer's personal skill is an important element in the attainment of higher output. One would expect the ability of farmers in the lower output groups to be, on the whole, lower than that of the higher. Increased production

* Farm rents, in practice, include a considerable element of payment for landlord's capital. Strictly, therefore, rent should be excluded, to this extent, from the figures of expenses involved at different output levels and an appropriate addition should be made to the capital investment figures required for different outputs. Insufficient data as to landlord's capital on these farms are available for this purpose.

attained by raising the output of the less productive farms might therefore be expected to cost more than the same output costs at present from the better farms. To this extent the above figures present an over-optimistic picture. But as the rate of increase involved is not excessive, this factor is probably not of great importance.

(iii) The relationship between increases in output and cost shown above is based on the relative values of agricultural produce and productive resources prevailing in the period in question and assumes that the fixed prices for farm produce generally give a correct measure of its value in relation to the cost of resources used. The amount of additional expenditure per £100 additional output would clearly be greater if farm prices were lower in relation to costs. The figure of £57 expenditure per £100 extra output, however, leaves a considerable margin and it would appear that increasing production, within moderate limits, should still be economical even if there were a considerable reduction in values of produce in relation to those of productive resources.

V. CAPITAL AT DIFFERENT OUTPUT LEVELS.

Table II shows the amounts of capital invested, on farms at different levels of net farm output, in live and dead stock and machinery. These figures exclude liquid capital. Being based mainly on the annual valuations carried out for accounting purposes, they are probably rather on the low side especially those for machinery, which is included at depreciated value, not original cost.

It will be seen that capital requirements, like annual expenditure, do not increase proportionately to output. Over 120% greater output was attained by the highest group with only 55% more capital than the lowest group. Capital requirements per £100 of net farm output thus fell from about £143 on the farms with lowest output to just under £100 on the highest. Capital in machinery on the whole increased more, with rising output, than other forms of capital.

The following figures show the increase in capital which would be required per £100 additional net farm output and per cent. if production on the three lowest groups of farms in Table II were raised to the level of the groups immediately above them :—

	£	%
Average Increase in Net Farm Output (per 100 acres)	436	30·7
Average Increase in Capital (per £100 Increase in Net Farm Output) :—		
Capital Invested in Livestock	27·7	14·4
,, ,, ,, Machinery	23·3	21·3
,, ,, ,, Other Items	13·2	13·7
TOTAL CAPITAL	£64·2	16·1%

Table II.

Capital Investment at different output levels.

Output Level.	No. of Farms.	Net Farm Output per 100 acres.	Capital Investment in :—							
			Livestock.		Machinery.		Other Items.*		Total.	
			per 100 acres.	per £100 Net Farm Output.	per 100 acres.	per £100 Net Farm Output.	per 100 acres.	per £100 Net Farm Output.	per 100 acres.	per £100 Net Farm Output.
		£	£	£	£	£	£	£	£	£
Under 80% of average ...	91	1,062	743	70·0	409	38·6	367	34·5	1,519	143·1
80% to 100% ,, ...	77	1,445	836	57·8	498	34·4	408	28·2	1,742	120·4
100% to 120% ,, ...	57	1,750	946	54·1	519	29·6	489	28·0	1,954	111·7
Over 120% ,, ...	62	2,370	1,106	46·7	713	30·1	540	22·8	2,359	99·6
Overall Average	287	1,583	888	56·1	520	32·8	441	27·9	1,849	116·8

* " Other Items " includes growing crops, stocks of farm produce, and farm stores on hand.

In the above statement, the percentage increases are probably of more value than the absolute figures, because of the tendency to under-valuation referred to above. The percentage increase in capital required is rather less in relation to the rise in output, than that in current expenditure. The comparatively heavy increase in machinery requirements, mentioned earlier, is well marked.

These figures, of course, do not mean that substantial increases in agricultural output are not possible without any material addition to capital requirements. Many farms, for example, could increase their production by greater use of fertilisers or more scientific feeding with at most a small increase in capital. All that is implied is that a moderate increase in output achieved by the methods generally in use on farms in the area concerned appears to call for additional capital on the scale indicated.

VI. NET INCOME AT DIFFERENT OUTPUT LEVELS.

Table III shows the margins of surplus of income over expenditure being obtained by farms at different output levels. These surpluses are the amounts remaining to pay farmers for their work of management (farmers' manual labour has already been allowed for) and for the use of their capital. It will be seen that, on average, farms operating at below 80% of normal output made a small loss during these three years, those between 80% and 120% of normal output a surplus of £200 to £250 per 100 acres, while those with over 120% of normal output made surpluses of well over £500 per 100 acres. (There are, of course, very wide variations in individual farm surpluses within each group.)

TABLE III.

Net incomes at different output levels.

Output Level.	*Surplus.*		*Surplus per 100 acres with price reduction of :—*		
	Per £100 Net Farm Output.	*Per 100 acres.*	10%	20%	30%
	£	£	£	£	£
Under 80% of average	— 2·3	— 24	— 130	— 236	— 342
80-100% ,,	14·6	211	66	— 79	— 224
100-120% ,,	13·6	240	65	— 110	— 285
Over 120% ,,	22·9	541	304	67	— 170

It is clear from these figures that prices over the three years in question allowed an appreciable income to medium-sized farms of well below average output. A farmer of 200 acres in the 80-100% output group on average obtained an income of about £640 per annum (allowing £220 per annum for his manual work). A similar farmer in the over 120% output group would

earn £1,300 per annum, on the same basis, so that there was a real incentive to expand production. There is a possibility, however, that this incentive is not as great as it would be if prices were a little lower. Some farmers at the income level of the 80-100% output group might not consider the additional income a sufficient attraction to undertake the very substantial effort and risk involved in increasing output to the upper level.

Table III (last three columns) shows the effect on average surpluses, on this sample of farms, of reducing prices by 10%, 20% and 30% respectively with no reduction in costs. The two larger reductions would clearly result in heavy losses at nearly all levels of production. A 10% reduction, however, without having such a disastrous effect, would greatly increase the incentive to expand output. A farmer of 200 acres in the 80-100% output group would have had an income of only about £350—allowing for manual work—compared with £830 in the highest output group. The " utility " of an additional £480 per annum (137%) to a farmer earning only £350 per annum would probably be considerably greater than that of an additional £660 (103%) to one already earning £640.

VII. DIFFERENT METHODS OF INCREASING OUTPUT.

Hitherto, the economy of increasing output has been considered, regardless of the means by which the increase is achieved. There are, of course, many ways of increasing production and the most economical method differs from farm to farm. Broadly, however, output can be increased in one of two ways : (a) by adopting a more intensive farming pattern, e.g. growing more intensive crops such as potatoes or sugar beet, rather than cereals, keeping more highly productive kinds of stock such as dairy cows, pigs or poultry rather than sheep or store cattle, or increasing the numbers of livestock on a given acreage ; (b) by increasing yields from the existing crops and livestock. Neither space nor the material available permit detailed investigation of the many alternative methods of raising output, but it is possible to consider the relative economy of these two broad lines of expansion.

For this purpose it is necessary to devise some simple method of classifying farms (a) according to the intensity of their farming systems and (b) according to the general level of yields attained by them. Because of the variety of systems practised by different farms this can only be done by means of some kind of indices.

In arriving at an index of the intensity of the farming system for a particular farm—referred to hereafter, for convenience, as the " system-index"—the method adopted for the purpose of this enquiry was, first, to assume for each of the main classes of sale crops and productive livestock a

" standard production " (by value) per acre or per unit of stock. The standard figures adopted for the main products were :—

Cereals for sale	...	...	...	£25	per acre
Potatoes	...	...	...	£75	,, ,,
Sugar Beet	...	...	...	£60	,, ,,
Dairy Cows	...	...	...	£75	,, head
Other Cattle and Sheep		...	...	£25	,, livestock unit*
Pigs and Poultry	...	...	...	£60	,, ,, ,,

These are rough-and-ready figures, and no high degree of accuracy is claimed for them. For this purpose all that is needed is a sufficiently close approximation to the *relative* production, by value, of the different kinds of productive units. These factors are applied to the actual acreages of sale crops and numbers of stock on each farm, thus giving, *for the farm as a unit*, a figure of " potential production " per 100 acres. The percentage which this figure represents of the average " potential production " per 100 acres over the whole sample is the " system index " for that farm.

As an example, take a farm on which, for every 100 acres, there are grown for sale 18 acres of cereals, and 4 acres of potatoes, and on which there are kept on average during the year 16·5 cows per 100 acres, pigs and poultry equivalent to one livestock unit, and other livestock equivalent to 7 livestock units. The " potential production " figure per 100 acres for this farm would be arrived at as follows :—

Productive Unit.	*Quantity.*	*Unit Value.*	*Potential Production.*
Cereals for sale	18 acres	£25 per acre	£450
Potatoes ...	4 acres	£75 per acre	300
Dairy Cows ...	16·5 head ...	£75 per head	1,237
Pigs and Poultry	1 Livestock Unit	£60 per Livestock Unit	60
Cattle and Sheep	7 Livestock Units	£25 per Livestock Unit	175
		TOTAL	£2,222

The average " potential production " for the whole sample under consideration during the period in question was £2,000 per 100 acres. This particular farm thus has a " potential production " figure which is 111% of the average—in other words its " system index " is 111.

The actual production of a farm, however, is determined not only by the pattern of farming pursued, but also by the level of yields attained. A dairy farm heavily stocked with cows, or an arable farm concentrating on intensive crops such as potatoes will have a high " system-index " but may yet attain only a comparatively low level of production if yields per cow or per acre are

* For this purpose, numbers of different kinds of stock are reduced to livestock units on an arbitrary basis according to their normal feed requirements per head, one livestock unit being roughly the equivalent of one cow.

subnormal. To arrive at an index of yield for each farm, the actual net production* of the farm is first compared with its " potential production," calculated as described above. This comparison will show the " *actual* production " obtained for every £100 of " *potential* production." This figure, however, is not taken as the " yield index," since it is necessary to allow for seasonal variations from the normal in the average yield obtained over the whole sample—otherwise in a bad year all farmers will tend to have a low " yield index." The yield per £100 potential production for any given farm, arrived at as described above, is therefore related to the average for the sample as a whole and this relationship is adopted as the basis for a " yield-index " for each farm.

Thus, in the example given above, let it be assumed that the farm in question achieved an actual net production of £1,380 per 100 acres compared with the £2,222 theoretically attainable, i.e. £62·1 actual production for every £100 of " potential production." Let it also be assumed that, in the year in question, the average net production over the whole sample was £1,680 compared with an average " potential production," for the whole number of farms, of £2,000, i.e. £84 actual production for every £100 " potential production." The " yield index " of the particular farm would then be $\frac{62 \cdot 1}{84}$ or 74.

In other words, this hypothetical farm is one pursuing a system of comparatively high potential output (as indicated by the " system-index " of 111) but operating at a low level of yield (" yield-index " = 74).

By this means it is possible to obtain, for each farm, as well as for the sample as a whole, a reasonably accurate indication of the influence of these two main classes of factors in determining actual output.

The following Table (Table IV) shows the number of farms in the sample with different indices of system and of yield, on this basis of measurement :—

TABLE IV.

Frequency distribution of farms with different indices of system and yield.

RANGE OF INDEX.	SYSTEM-INDEX.	YIELD-INDEX.
	No. of farms.	*No. of farms.*
Under 65	12	16
65- 74	20	19
75- 84	32	48
85- 94	57	44
95-104	56	53
105-114	48	44
115-124	15	23
125-134	22	16
135 and over	25	24

* " Net production " for this purpose, differs from " net farm output " as defined on page 6, in that purchases of feedingstuffs and seeds are not deducted. Such a deduction would clearly be inappropriate in measuring the actual yield of produce obtained under a given farming system.

It is clear from the above Table that both classes of factors are likely to have had a substantial influence in determining differences in actual output.

The effects on actual net farm output of intensifying the farming system and of increasing yield respectively are shown in Table V :—

TABLE V.

Effect of intensity of system and yield on net farm output.

SYSTEM-INDEX.	*Average Net Farm Output.*	YIELD-INDEX.	*Average Net Farm Output.*
	£		£
Under 75 ...	1,079	Under 75 ...	1,086
75- 84 ...	1,250	75- 84 ...	1,297
85- 94 ...	1,493	85- 94 ...	1,415
95-104 ...	1,627	95-104 ...	1,546
105-114 ...	1,684	105-114 ...	1,708
115-134 ...	1,896	115-134 ...	1,962
135 and over...	2,181	135 and over...	2,455

The following figures (Table VI) show, for groups of farms of high and low output respectively, the number of farms with different indices of system and yield.

TABLE VI.

Frequency distribution of low and high output farms with different indices of system and yield.

RANGE OF INDEX.	Farms with Net Farm Output under 80% of average.		Farms with Net Farm Output over 120% of average.	
	SYSTEM-INDEX.	YIELD-INDEX.	SYSTEM-INDEX.	YIELD-INDEX.
	(*No. of Farms*).	(*No. of Farms*).	(*No. of Farms*).	(*No. of Farms*).
Under 80 ...	36	45	—	—
80- 99 ...	36	32	9	7
100-120 ...	16	13	20	22
Over 120 ...	3	1	33	33

It can be deduced from these figures that, in this sample of farms, while low output was rather more often the result of low yield than of low intensity of farming system, both factors were of about equal influence in the attainment of high output yields. Thus 45 out of 91 low-output farms had yield-indices below 80, while only 36 had system-indices below 80 : on the other hand, out of 63 high-output farms, the numbers having system-indices and yield-indices above 120 were identical.

VIII. EXPENDITURE AT DIFFERENT LEVELS OF INTENSITY AND YIELD.

In Sections IV to VI above the economy of production at different levels of output has been examined without regard to the method by which higher output has been attained. It is important, however, to know whether there are any differences in economy between increasing output by an intensification of the farming system—more intensive crops, or stock, more stock per acre, etc.—or by raising yields—more milk per cow, heavier crops per acre, etc.

In Tables VII and VIII respectively are shown the average expenses per 100 acres and per £100 net farm output incurred by groups of farms differing (a) in the intensity of their farming patterns and (b) in the yields of produce obtained in relation to the system of farming pursued. It will be seen that, on the whole, in neither case did increased output involve anything like a proportionate rise in total expenditure. In Table VII a difference of over 80% in net farm output between the least and most intensive groups of farms was accompanied by less than a 50% difference in expenditure. Table VIII shows that, with about the same difference in net farm output (80%) between the lowest and the highest yielding farms, expenditure also increased by less than 50%. In both cases, therefore, there are big savings in expenditure per £100 net farm output. These savings, however, are more steady and consistent for increasing yields than for increasing intensity of system. In the latter case, all the saving occurs in the early stages of production increase; no saving is shown for farms with indices above 85: above this level costs per £100 net farm output remained more or less unchanged.

If one turns to particular classes of expenditure, it is not surprising to find that both the farms with more intensive patterns and those with higher yields tend to be found on the higher rented land though the rent increase is not entirely consistent for the farms with the higher yields. The average rent difference, however, is small, so that the burden of rent per £100 net farm output falls considerably with higher output in both cases.

The cost of fertilisers rises very steeply as intensity and yield increase—more rapidly in fact than the increase in output. It is a little surprising at first sight to see that the increase is greater on the farms where higher output is the result of a more intensive system than where it is achieved by higher yields. But this is less surprising when it is remembered that the most important yield factor on this group of farms is yield of milk per cow (which obviously is not correlated to the fertiliser consumption) and that increased intensity, as here defined, includes the growing of such crops as potatoes and sugar beet, which normally absorb considerably more fertilisers, as well as denser stocking and therefore greater productivity of grassland and more intensive production of forage crops.

Table VII.

Net farm output and expenditure on farms with increasing intensity of farming system.

System-Index.	*Net Farm Output (per 100 acres).*	Rent & Rates.		Labour.		Manures.		Power Costs.		Other Expenses		Total Expenditure.	
		Per 100 Acres.	*Per £100 Net Farm Output.*	*Per 100 Acres.*	*Per £100 Net Farm Output.*	*Per 100 Acres.*	*Per £100 Net Farm Output.*	*Per 100 Acres.*	*Per £100 Net Farm Output.*	*Per 100 Acres.*	*Per £100 Net Farm Output.*	*Per 100 Acres.*	*Per £100 Net Farm Output.*
	£	£	£	£	£	£	£	£	£	£	£	£	£
Under 85 ...	1,163	143	12·3	574	49·3	51	4·3	263	22·6	107	9·2	1,137	97·7
85- 99 ...	1,546	137	8·9	639	41·3	73	4·7	318	20·6	121	7·8	1,288	83·3
100-115 ...	1,666	144	8·6	725	43·5	81	4·9	341	20·5	140	8·4	1,431	85·9
Over 115 ...	2,011	160	7·9	840	41·8	112	5·6	401	19·9	164	8·2	1,677	83·4

Table VIII.

Net farm output and expenditure on farms with increasing yield.

Yield-Index.	*Net Farm Output (per 100 acres).*	Rent & Rates.		Labour.		Manures.		Power Costs.		Other Expenses.		Total Expenditure.	
		Per 100 Acres.	*Per £100 Net Farm Output.*	*Per 100 Acres.*	*Per £100 Net Farm Output.*	*Per 100 Acres.*	*Per £100 Net Farm Output.*	*Per 100 Acres.*	*Per £100 Net Farm Output.*	*Per 100 Acres.*	*Per £100 Net Farm Output.*	*Per 100 Acres.*	*Per £100 Net Farm Output.*
	£	£	£	£	£	£	£	£	£	£	£	£	£
Under 85 ...	1,208	136	11·3	592	49·0	57	4·7	281	23·3	97	8·0	1,163	96·3
85- 99 ...	1,474	146	9·9	661	44·8	69	4·7	303	20·5	114	7·8	1,293	87·7
100-115 ...	1,632	142	8·7	705	43·2	85	5·2	336	20·6	133	8·1	1,401	85·8
Over 115 ...	2,150	158	7·3	820	38·1	115	5·4	406	18·9	196	9·1	1,695	78·8

Manual labour and mechanical power costs are the two items where increased yield appears to give greater economies than intensification of the system of farming. The reduction in labour cost per £100 net farm output between the highest and the lowest group is only about 15% for farms with increased intensity, but is as much as 22% for those with higher yields; the corresponding figures for the saving in mechanical power are 12% and 19% respectively. Moreover, in the case of the "system-index," practically the whole of the saving in labour costs and power costs occurs in the early stages of increase: there is no saving in labour and practically none in power costs after reaching a system index of 85.

"Other Expenses," which include such items as small tools, veterinary expenses, water charges, binder twine, insurances, sack hire, etc., increase considerably more on farms with higher yields than on those with more intensive farming systems.

It is now possible to calculate by the same method as was used in Section IV above, the extra expenditure of different kinds involved in every £100 of additional net farm output attained by these two general methods of increasing production. The figures are as follows:—

	Intensifying System.		*Increasing Yield.*	
	£	%	£	%
Additional net farm output per 100 acres	283	19·4	314	21·8
Additional expenditure per £100 increase in net farm output:—				
Rent and Rates	2·1	4·3	2·6	5·7
Labour	31·5	13·8	24·2	11·6
Manures	7·4	30·9	6·3	28·6
Power Costs	16·3	15·0	13·0	13·3
Other Expenses	6·3	14·6	10·2	27·8
Total ...	£63·6	14·0	£56·3	13·7

These figures, as would be expected, confirm the conclusion drawn from those in Table I as to the general order of magnitude of the additional expenditure required per £100 increase in net farm output. They also confirm the conclusion drawn from Tables VII and VIII that there is a definite advantage in favour of increasing output by higher yields rather than by intensifying the type of farming. For a moderate production increase, however, and given the ratios between prices and costs prevailing in this period, both processes appear to be economical.

IX. CAPITAL AT DIFFERENT LEVELS OF INTENSITY AND YIELD.

When one comes to consider the relative merits, from the point of view of capital requirements, of increasing output by intensification of the farming system or by higher yields, the results obtained from this sample of farms leave no doubt that the advantage lies with increasing yields. The relevant figures are in Tables IX and X. In every respect the increase in capital with rising output is considerably less where the increase is the result of higher yields, and the saving in capital required per £100 output is correspondingly greater. Thus, whereas the reduction in capital required per £100 net farm output is only about 8% between the farms of highest and lowest intensity of system it is nearly 30% between those of highest and lowest yield. The farms with system-indices above 115 in fact show an actual reduction in economy of capital of all kinds compared with some lower groups.

It follows that the amount of additional capital needed to increase output by a given amount is very much less where the extra production is obtained by higher yields. This is shown by the following figures, which have been arrived at by the same method as was used in calculating additional expenditure per £100 higher output.

	Intensifying System.		*Increasing Yield.*	
	£	%	£	%
Additional net farm output per 100 acres	283	19·4	314	21·8
Additional capital per £100 increase in net farm output :—				
Capital invested in Livestock	38·5	13·1	25·7	9·5
,, ,, ,, Machinery	37·0	22·5	16·5	10·3
,, ,, ,, Other Items	29·2	20·9	4·2	3·0
Total ...	£104·7	17·5	£46·4	8·2

X. EFFECT OF VARYING INTENSITY OF SYSTEM AND YIELD ON NET INCOME.

Table XI shows the surplus of income over expenditure per £100 net farm output, per 100 acres and per £100 capital on groups of farms with increasing intensity of farming system and with increasing yield. It will be seen that, in general, variations in yields affect net incomes to a greater extent than variations in the intensity of the farming system.

Table IX.

Capital investment with increasing intensity of farming system.

System-Index.	*Net Farm Output per 100 acres.*	Capital Investment in :—							
		Livestock.		Machinery.		Other Items.		Total.	
		Per 100 acres.	*Per £100 Net Farm Output.*	*Per 100 acres.*	*Per £100 Net Farm Output.*	*Per 100 acres.*	*Per £100 Net Farm Output.*	*Per 100 acres.*	*Per £100 Net Farm Output.*
	£	£	£	£	£	£	£	£	£
Under 85	1,163	743	63·9	394	33·9	363	31·2	1,500	129·0
85- 99	1,546	881	57·0	466	30·1	395	25·3	1,742	112·4
100-115	1,666	880	52·8	532	31·9	426	25·5	1,838	110·2
Over 115	2,011	1,071	53·3	708	35·2	611	30·4	2,390	118·9

Table X.

Capital investment with increasing yield.

Yield-Index.	*Net Farm Output per 100 acres.*	Capital Investment in :—							
		Livestock.		Machinery.		Other Items.		Total.	
		Per 100 acres.	*Per £100 Net Farm Output.*	*Per 100 acres.*	*Per £100 Net Farm Output.*	*Per 100 acres.*	*Per £100 Net Farm Output.*	*Per 100 acres.*	*Per £100 Net Farm Output.*
	£	£	£	£	£	£	£	£	£
Under 85	1,208	803	66·4	448	37·1	444	36·8	1,695	140·3
85- 99	1,474	852	57·8	529	35·9	437	29·6	1,818	123·3
100-115	1,632	899	55·1	523	32·0	408	25·0	1,830	112·1
Over 115	2,150	1,045	48·6	603	28·0	484	22·5	2,132	99·1

Table XI.

Net income at different levels of intensity of system and yield.

System-Index.	Surplus.			Yield-Index.	Surplus.		
	Per £100 *Net Farm Output.*	*Per* 100 *acres.*	*Per* £100 *Capital.*		*Per* £100 *Net Farm Output.*	*Per* 100 *acres.*	*Per* £100 *Capital.*
	£	£	£		£	£	£
Under 85	2·3	26	1·7	Under 85	3·7	45	2·6
85- 99	16·7	258	14·8	85- 99	12·3	181	10·0
100-115	14·1	235	12·8	100-115	14·2	231	12·6
Over 115	16·6	334	14·0	Over 115	21·2	455	21·3

Except in the early stages of expansion, an increase in the intensity of the system did not raise the surplus per £100 net farm output or per £100 capital and gave a relatively moderate increase in the surplus per 100 acres. On the other hand, surplus per £100 net farm output, per 100 acres and per £100 capital all rose steadily as yields increased.

XI. COMBINED EFFECTS OF VARIATIONS IN INTENSITY OF SYSTEM AND IN YIELD ON ECONOMY OF PRODUCTION.

In practice the output of a particular farm is determined by the joint influence of the intensity of the system of farming carried on and the level of yields attained and it is therefore of interest to examine the relative economy of farms with different combinations of these two factors. The relevant figures are in Tables XII, XIII and XIV. In these Tables farms have first been divided into three groups on the basis of the intensity of the system pursued and each of these groups has been sub-divided into three yield groups. The object of these Tables is to endeavour to isolate the effects on output, expenditure and capital of variations in intensity of system and in yield respectively. Previous Tables have shown the effects of variations in each of these two factors singly, ignoring any concurrent changes which may occur in the other factor. In Tables XII and XIII, however, the effects of increases in yield are shown for groups of farms within the same range of intensity of system and vice versa.

This basis of classification indicates more clearly than Tables VII and VIII above, the considerably greater influence on the economy of production exercised by variations in yield than by changes in intensity of farming pattern. Briefly, the first two sections of Table XII (net farm output and expenditure) reading downwards for changes in system-index and across for variations in yield-index, show that in each group, net farm output varied considerably more widely for differences in yield than for differences in the intensity of the farming system, while variations in expenditure were approximately equal for both factors. As a result, as will be seen from the third section of the Table, increasing yields in each case led to substantial and fairly consistent reduction in expenditure per £100 of net farm output ; but by no means the same can be said as to the effects of an increase in intensity of farming system at similar yield-levels. In the latter case, the savings in expenditure per £100 net farm output are, at most, relatively small, and are not at all consistent ; on the low-yield farms economy of production actually declines as the system-index increases.

The three most economical groups are throughout those with high yields, and the three least economical are with one exception those with low yields, irrespective of the intensity of the farming system in operation.

Table XII.

Output and expenditure with different combinations of intensity and yield.

System-Index.	Net Farm Output. (per 100 acres).			Expenditure (per 100 acres).			Expenditure (per £100 Net Farm Output).		
	Yield-Index Under 90	*Yield-Index* 90-110	*Yield-Index Over* 110	*Yield-Index Under* 90	*Yield-Index* 90-110	*Yield-Index Over* 110	*Yield-Index Under* 90	*Yield-Index* 90-110	*Yield-Index Over* 110
	£	£	£	£	£	£	£	£	£
Under 90	1,005	1,221	1,609	971	1,151	1,307	96·6	94·3	81·2
90-110	1,185	1,586	2,117	1,107	1,310	1,717	93·4	82·4	81·0
Over 110	1,380	2,012	2,524	1,367	1,735	1,932	99·1	86·3	76·7

Table XIII.

Capital investment with different combinations of intensity and yield.

System-Index.	Capital (per 100 acres).			Capital (per £100 Net Farm Output).		
	Yield-Index Under 90	*Yield-Index* 90-110	*Yield-Index Over* 110	*Yield-Index Under* 90	*Yield-Index* 90-110	*Yield-Index Over* 110
	£	£	£	£	£	£
Under 90	1,435	1,438	1,736	142·8	117·8	107·9
90-110	1,583	1,795	2,117	133·6	113·2	100·0
Over 110	1,970	2,499	2,511	142·7	124·2	99·5

This Table also illustrates clearly the much greater productivity and economy of the farms on which high intensity of system is combined with high yield than those where both yield and intensity are low. The highest group of farms, with both intensity and yield well above average, reached an output of over £25 per acre at a cost of less than £77 per £100 of net farm output, the lowest produced only £10 net farm output per acre at a cost of nearly £97 per £100 output.

A similar analysis of capital requirements is given in Table XIII and here again the isolation of the respective effects of increasing intensity and yield emphasizes the conclusion drawn in Section IX above that expanding output by increasing the intensity of the farming system leads to greater capital requirements than by increasing yield.

In only one yield-group was there any consistent reduction in capital per £100 net farm output as intensity of system increased, whereas increasing yield led to a very considerable reduction in capital in relation to net farm output in every case.

Again the contrast between the highest and the lowest groups is striking. The farms with maximum intensity and yield produced their net output of £25 per acre with approximately the same amount of capital (£25) per acre, i.e. about £1 of capital for every £1 produced, the lowest group required more than £14 of capital per acre to produce its meagre output of £10 per acre—£1 8s. 0d. of capital for every £1 produced.

The figures of net farm income, per 100 acres, per £100 net farm output, and per £100 capital, given in Table XIV, for different combinations of intensity and yield, naturally follow from what has been said with regard to output, expenditure and capital. Increasing intensity leads to comparatively moderate increases (or at the lowest yield levels to actual reductions) in surplus, while increasing yields in all cases shows very substantial rises in surplus particularly in surplus per 100 acres.

The difference in average surplus between the highest and the lowest groups is outstanding. The group of minimum intensity and yield obtained on average a practically negligible surplus both per acre and per £100 capital, while the highest group on average earned a surplus of nearly £6 per acre and nearly £24 per £100 of capital.

There is, of course, a wide range of economy between individual farms at all levels of output and the value of average surplus figures is therefore less than it would otherwise be. Table XV shows the numbers of farms at each level of intensity of system and yield which earned different rates of surplus or deficit. This gives some indication of the range of variation and at the same time confirms the general tendency towards greater economy on the farms

Table XIV.

Net farm income with different combinations of intensity and yield.

System-Index.	Surplus (per 100 acres).			Surplus (per £100 Net Farm Output).			Surplus (per £100 Capital).		
	Yield-Index Under 90	*Yield-Index 90-110*	*Yield-Index Over 110*	*Yield-Index Under 90*	*Yield-Index 90-110*	*Yield-Index Over 110*	*Yield-Index Under 90*	*Yield-Index 90-110*	*Yield-Index Over 110*
	£	£	£	£	£	£	£	£	£
Under 90	34	70	302	3·4	5·7	18·8	2·4	4·9	17·4
90-110	78	276	400	6·6	17·6	19·0	4·9	15·4	18·9
Over 110	13	277	592	0·9	13·7	23·3	0·9	11·1	23·6

Table XV.

Frequency distribution of surpluses with different combinations of intensity and yield.

System-Index.	Farms with Deficits.			Farms with £0-£4 Surplus per Acre.			Farms with over £4 Surplus per Acre.		
	Yield-Index Under 90	*Yield-Index 90-110*	*Yield-Index Over 110*	*Yield-Index Under 90*	*Yield-Index 90-110*	*Yield-Index Over 110*	*Yield-Index Under 90*	*Yield-Index 90-110*	*Yield-Index Over 110*
Under 90	6	15	8	20	19	8	1	4	10
90-110	14	4	5	24	21	9	4	16	22
Over 110	11	9	2	11	14	2	6	8	14

with high yields compared with those of high intensity of system. Out of 85 farms which obtained a surplus of over £4 an acre, 46 were farms of high yield, 28 farms of average yield and only 11 farms of low yield. But only 28 were farms of high intensity of system, 42 were farms of average intensity and 15 were farms of low intensity. Again, out of 74 farms which showed a deficit, only 15 were in high yield groups, 28 had average yields and 31 had low yields ; on the other hand, as many as 22 farms of high intensity showed deficits, 28 were of average intensity and 29 farms of low intensity.

XII. APPLICATION OF GENERAL PRINCIPLE TO A SPECIFIC PROBLEM.

In Sections VIII to XI above, the general question of the relative economy of increasing output by more intensive systems or by higher yields has been examined and the conclusion that seems to emerge is that on the whole the latter method is the more economical. In practice, of course, the problem will arise, for the individual farmer, in a more specific form. Milk producers, for example, will ask themselves whether it is more profitable to try to increase their production by keeping more cows or by keeping higher yielding cows. Taking this as a typical example of the practical form in which this general problem will arise, the relative merits of these two alternatives are examined in Table XVI. These figures are based on returns from medium-sized dairy farms, i.e. farms where milk is the main source of income. The farms are divided into two groups—those where the number of cows per 100 acres is above and the milk yield per cow below the general average and those where the reverse is the case. It will be seen that the average net farm output per acre of the two groups is approximately equal. There is no doubt, however, that the farms with smaller numbers of high-yielding cows were more economical than those which obtained their production from comparatively large numbers of low-yielding cows. The expenditure of the former group for every £100 of net farm output was only £84·2 compared with £93·3 for the low-yield farms, and their surplus, per 100 acres, was £259 compared with only £115 on the low-yield farms.

TABLE XVI.

Relative economy of alternative methods of obtaining milk.

Type of Farm.	*No. of Farms.*	*Average No. of Cows per 100 acres.*	*Average Yield per Cow.*	*Net Farm Output per 100 acres.*	*Total Expenses per 100 acres.*	*Expenses per £100 Net Farm Output.*
			Galls.	£	£	£
Cow numbers high, Milk yield low	43	19·7	543	1,712	1,597	93·3
Cow numbers low, Milk yield high	42	12·4	771	1,643	1,384	84·2

Table XVII.

Land use and livestock kept on farms at different levels of intensity of system.

System-Index.	No. of Farms.	Land Utilisation.			Sale Crops (per 100 Acres).		Livestock Units (per 100 Acres).			
		Tillage %	*Temporary Grass.* %	*Permanent Grass.* %	*Cereals.**	*Potatoes, Sugar-Beet, etc.*	*Dairy Cows.*	*Pigs and Poultry.*	*Other Livestock.*	*Total.*
					acres.	acres.				
Under 75 ...	32	36·9	20·0	43·1	18·9	0·8	4·8	0·6	17·9	23·3
75- 84 ...	32	44·8	16·5	38·7	24·2	1·4	7·2	1·4	16·8	25·4
85 -94 ...	57	38·4	20·1	41·5	18·9	1·1	10·4	1·0	17·6	29·0
95-104 ...	56	43·1	20·9	36·0	23·7	1·9	12·6	1·2	17·2	31·0
105-114 ...	48	44·0	20·8	35·2	25·6	3·4	12·4	1·6	17·2	31·2
115-134 ...	37	43·3	22·2	34·5	20·1	4·6	16·0	3·0	17·2	36·2
135 and over ...	25	44·2	18·2	37·6	21·6	4·5	20·6	1·9	20·2	42·7

* 1947-8 and 1948-9 only.

XIII. FACTORS RESPONSIBLE FOR INCREASING OUTPUT.

In previous pages consideration has been given merely to the two broad alternatives of increasing output by more intensive farming systems or by higher yields. There are, however, various ways of increasing the intensity of the farming system and various directions in which yields can be increased and it is worth while examining the part played by these different factors in increasing output on this sample of farms.

(i) Factors Determining Intensity of Farming System.

Table XVII shows the average utilization of the land and the average constitution of the livestock population on farms at different levels of intensity of system.

Generally, the number of livestock and particularly of cows kept was the main factor determining the relative level of intensity, though increased acreages of intensive crops such as potatoes and sugar beet also played some part. There were nearly twice as many livestock, four times as many cows and nearly six times the area of potatoes and sugar beet per 100 acres on the most intensive farms as on the least intensive.

The distribution of the land between tillage and grass and as between temporary and permanent grass was apparently not of great significance.

Average figures, however, may be misleading when dealing with a wide range of farming types. The importance of specific factors in individual cases is of more significance.

(a) *Tillage Area.*

Table XVIII.

Frequency distribution of low and high output farms at different tillage levels.

Percentage of Tillage.	*No. of Farms.*	*Proportion of Farms with Output-Index of :—*			
		Under 80	80-99	100-120	*Over* 120
		%	%	%	%
Under 30%	56	39	27	14	20
30-40%	91	23	28	22	27
40-50%	65	37	28	18	17
Over 50%	75	34	21	25	20
Total	287	32	26	20	22

Table XVIII shows that variations in tillage area have apparently not affected output to a very marked extent and that an increase in tillage is not consistently associated with higher output. The group of farms with least tillage (under 30%) has a slightly higher than average proportion of farms of low output and a slightly lower proportion of farms of high output, but this

is true also of the group with 40-50% of tillage. The distribution of low and high output farms in the group with maximum tillage (over 50%) is about average and the largest proportion of high output farms is found in the group with only 30-40% of tillage.

(b) *Intensive Crops.*

Intensive crops such as potatoes and sugar beet are not grown on a large scale in this area. Of the 287 farms in this sample only 17 devoted more than 7% and only 8 more than 10% of their area to these crops. The considerable influence of a comparatively small increase in these crops on total output is shown, however, by Table XIX. While only 14% of farms with less than 1 acre of such crops per 100 acres reached the highest output level, 43% of those with more than 5 acres (about two-thirds of which had between 5 and 7 acres) were in that category. It is clearly the use which is made of tillage which influences output rather than the actual area of tillage.

TABLE XIX.

Frequency distribution of high and low output farms with different acreages of intensive crops.

Area of Intensive Crops per 100 acres.*	*No. of Farms.*	*Proportion of Farms with Output-Index of :—*			
		Under 80	80-99	100-120	*Over* 120
		%	%	%	%
Under 1 acre	121	40	30	16	14
1 to 3 acres	75	42	17	28	13
3 to 5 ,,	46	11	41	13	34
Over 5 ,,	45	13	22	22	43
Total	287	32	26	20	22

* Potatoes, sugar beet and vegetables for sale.

(c) *Density of Stocking.*

The importance of density of stocking with livestock as a factor influencing output on these farms is shown by Table XX. Only 10% of the farms with less than 20 livestock units† per 100 acres reached an output more than 20% above average while 56% produced less than 80% of normal output. By contrast, 40% of those having more than 40 livestock units per 100 acres exceeded the average output by more than 20% and only 14% of them fell below 80% of average output.

† One livestock unit represents the number of livestock of a particular kind having food requirements approximately equivalent to those of a dairy cow.

TABLE XX.

Frequency distribution of high and low output farms with different densities of stocking.

Livestock Units per 100 acres.	*No. of Farms.*	*Proportion of Farms with Output-Index of :—*			
		Under 80	80-99	99-120	*Over* 120
		%	%	%	%
Under 20	42	56	17	17	10
20-30	90	37	31	20	12
30-40	106	25	30	19	26
Over 40	49	14	22	24	40
Total	287	32	26	20	22

The number of cows kept is probably the most important single factor contributing to high intensity of farming system and therefore to high output. Table XXI shows that only 9% of the farms with more than 16 cows per 100 acres had less than 80% of average output, while 51% had outputs exceeding the average by over 20%. These proportions were almost reversed for farms with less than 8 cows per 100 acres.

TABLE XXI.

Frequency distribution of farms of high and low output with different numbers of cows per 100 *acres.*

Number of Cows per 100 acres.	*No. of Farms.*	*Proportion of Farms with Output-Index of :—*			
		Under 80	80-99	99-120	*Over* 120
		%	%	%	%
Under 8	60	48	30	12	10
8-12	57	44	32	14	10
12-16	37	24	24	30	22
Over 16	55	9	16	24	51
Total	209	32	26	19	23

In view of this close connection between cow numbers and high output, Table XXII, which indicates the relationship between tillage area and cow numbers, sheds considerable light on the comparatively poor results, so far as value of output is concerned, obtained by increasing the amount of tillage (see Table XVIII, p. 29). Of the farms with maximum tillage, practically half had less than 8 cows per 100 acres and only 12% had more than 16. The group with the highest proportion of farms carrying over 16 cows per 100 acres is that with 30 to 40% of tillage. These figures show that, although there

is no essential reason why increased tillage area should reduce the number of cows kept, in practice that is what has actually happened on this sample of farms. Sale crops tend to replace forage for livestock and the net results on the farms with more tillage is a somewhat lower output by value.*

TABLE XXII.

Relationship between cow numbers and tillage area.

Tillage Percentage.	*Proportion of Farms with Cow Numbers per 100 acres :—*			
	Under 8	8-12	12-16	*Over* 16
	%	%	%	%
Under 30 ...	20	20	25	35
30-40 ...	22	22	16	40
40-50 ...	24	48	11	17
Over 50 ...	49	21	18	12
Total ...	30	27	17	26

Where the larger tillage area is used to produce more food for livestock and the number of cows are maintained this reduction in output does not occur.

Table XXIII shows that high net farm output by value was achieved equally on farms with much or little tillage provided cow numbers were kept up.

TABLE XXIII.

Effect of tillage area and cow numbers on output.

Tillage Area and Cow Numbers.	*Proportion of Farms with Output-Index of :—*			
	Under 80	80-99	100-120	*Over* 120
Tillage over 40% :—	%	%	%	%
Cow numbers over 12 per 100 acres	17	17	26	40
Cow numbers under 12 per 100 acres	46	27	16	11
Tillage under 40% :—				
Cow numbers over 12 per 100 acres	13	32	25	40
Cow numbers under 12 per 100 acres	52	32	9	7

(ii) FACTORS DETERMINING OVERALL FARM YIELD.

Table XXIV shows the average yields per acre of certain crops, the average milk yield per cow and the average value of total livestock production

* It is, of course appreciated that higher tillage area may lead to the production of more of the kinds of commodities most needed for dollar-saving.

per livestock unit on farms grouped according to overall yield-index. It is clear that on this sample of farms the productivity of the livestock kept was a much more important factor than that of crops in determining the level of "yield" of the farm as a whole. Crop yields on the highest yielding farms were only 20 or 30% above those on the lowest yielding farms whereas milk yields were over 60% and livestock yields generally about 40% higher.

TABLE XXIV

Average yields of crops and livestock at different levels of yield-index.

YIELD-INDEX.	CROP YIELDS (per acre).			*Milk-Yield per Cow.*	*Value of Livestock Production per Livestock Unit.*
	Wheat.	*Barley.*	*Oats.*		
	cwt.	cwt.	cwt.	gall.	£
Under 75 ...	15	14⅓	13½	481	38·0
75- 84	16½	14½	15	510	39·4
85- 94	16¼	16	14½	580	37·3
95-104	16½	17¾	17	642	39·0
105-114	18	17	17	692	44·2
115-134	19½	20	20	721	46·0
135 and over ...	18	19	16½	777	53·5

Milk yield is such an important factor on this group of farms that it is worth while examining more directly its influence on both output and general economy. In Table XXV are shown the average net farm output and expenditure per 100 acres of three groups of farms with increasing milk yield per cow. Within the general sample of medium-sized farms the figures are confined to farms which are primarily dairy farms, i.e. those deriving 45% or more of their income from milk.

TABLE XXV.

Milk yield per cow, net farm output and expenditure on medium-sized dairy farms.

Range of Milk Yield per Cow.	*No. of Farms.*	*Average Yield per Cow.*	*Net Farm Output per 100 Acres.*	*Expenditure.*	
				Per 100 Acres.	*Per £100 Net Farm Output.*
		gall.	£	£	£
Under 600 galls....	66	524	1,417	1,316	92·8
600-725 galls. ...	55	665	1,820	1,536	84·4
Over 725 galls. ...	42	830	1,903	1,534	80·6

While net farm output increased with rising milk yield, the increase became considerably less marked at the highest level of yield. Expenditure rose considerably more slowly than output and was, in fact, no greater for the highest yielding group than for the group with moderate yields. Production thus became a good deal more economical as yield per cow increased.

XIV. SUMMARY.

1. The expansion of agricultural output in the United Kingdom, necessary though it may be, ought not to be carried out without regard to the economical use of valuable resources such as labour and capital. This report embodies the results of an enquiry into the relative economy of farms achieving different levels of output by alternative methods. It is based on data collected from medium-sized farms in certain Southern and South-Midland counties by the Agricultural Economics Department of Reading University in the harvest years 1946 to 1948.

2. In general, with the price-cost ratios prevailing in the period in question, expenditure on the farms surveyed tended to increase considerably less rapidly than output. Farms with the highest outputs thus, on average, incurred the lowest expenditure per £100 of net farm output.

3. This is true not only of total expenditure but also of most of the components of cost, i.e. rent, labour, power costs and miscellaneous expenditure. Expenditure on fertilisers, however, tended to increase more rapidly than output.

4. Results from this sample of farms indicate that a moderate all-round increase in output (of the order of 30%) is likely to involve additional expenditure of at least £55 to £60 for every £100 additional output at current prices. The additional expenditure of fertilisers might be expected to be relatively heavy, compared with other items of cost.

5. Capital requirements also tended to increase considerably less rapidly than output and at approximately the same rate as expenditure. Thus the farms with highest output on average showed the biggest return per £100 of capital. Capital invested in machinery increased more rapidly, with higher output, than other forms of capital.

6. A moderate all-round increase in output would appear to involve additional capital at the rate of nearly £65 for every £100 additional net farm output.

7. On average, during the three years in question, farms whose output was more than 20% below " normal " made a small deficit, while those whose output was more than 20% above normal made surpluses of well over £5 per acre, which was more than double the surplus *per acre* of farms of around normal output and more than 50% above their surplus *per unit of output.*

8. Farm output can be increased by two broad methods—by adopting a more intensive pattern of farming, e.g. more intensive crops such as potatoes, more intensive livestock such as dairy cows or poultry, or greater density of stocking ; or by attaining higher yields, e.g. of crops per acre, milk per cow,

eggs per hen, etc. It is important to know what, if any, differences in economy of production may be expected from these two broad methods of increasing output.

9. This report suggests a convenient rough-and-ready system of indices for classifying farms according to their relative intensity of farming system and their relative yields.

10. At the lower output levels the attainment of higher production by means of a more intensive farming system resulted in a considerably less than proportional increase in expenditure and therefore in a substantial saving in expenses per £100 of net farm output. Higher up the scale of output, however, the rate of increase of expenditure resulting from this general method of raising output almost equalled that of output. In other words, where increased output was the result of intensification of the system of farming, diminishing returns soon came into operation.

11. Higher output resulting from higher yields, on the other hand, was accompanied by a fairly steady reduction in expenditure per £100 net farm output. Thus, on the whole, increasing output by raising yields seems likely to be a more economical process than by intensifying the pattern of farming.

12. A practical example of this is seen by comparing the economy of about 40 dairy farms, where the density of stocking is high but the milk yield relatively low, with a similar number where a high milk yield per cow is obtained from a smaller number of cows. The expenditure per £100 net farm output was only £84·2 for the latter compared with £93·3 for the former group.

13. Moderately increasing output by intensifying the farming system seemed likely to result, on this sample of farm, in additional expenditure of about £63 per £100 additional net farm output compared with about £56 where the increase is obtained by raising yields. But, in view of paragraph 10 above, where the increase results from greater intensity, the cost will clearly vary greatly according to whether the farms concerned are at present operating at low or relatively high intensity.

14. The attainment of higher output through a more intensive farming system appears to require a considerably greater increase in capital than where the higher output results from better yields.

15. In the sample surveyed, there is little increase in output per £100 capital as the farming system becomes more intensive : indeed, on the most intensive farms there is an actual reduction in output per £100 capital. On the other hand, there is a substantial saving in capital in relation to output as yield increases.

16. It seems likely that increasing agricultural output by means of a general intensification of farming patterns would require additional capital at least equal in value to the additional annual output, whereas the same kind of increase obtained by a general increase in yields from present farming systems would appear to require less than half the additional capital.

17. In practice the output attained by any farm depends on a combination of both factors, i.e. the intensity of the farming system and the general level of yields. The report examines the economic position of groups of farms with different combinations. For farms of poor, average and high yield the improvement in economy resulting from intensifying the system of farming is comparatively small. The improvement from increasing yields, at all levels of intensity of system, is considerably more pronounced.

18. The highest surpluses per acre (£3 per acre or more over the three years) and per £100 net farm output were obtained by groups of farms with higher than average yields, whether of low or high intensity of system. The lowest surpluses per acre (less than £1 per acre over the three years) and per £100 net farm output were, with one exception, obtained by groups with yields well below the general average, whether their farming system was of high or low intensity.

19. A similar position prevails with regard to return on capital invested. Whatever may be the relative intensity of the farming system the biggest outputs per £100 capital were obtained by the highest yield groups and the smallest by the lowest yield groups.

20. It seems justifiable to conclude that, in advisory work directed towards increasing farm output with the greatest economy, priority should generally be given to correcting deficiencies in yields. For example, a dairy farm where low output and profits can be traced both to poor milk yield and under-stocking should get its milk yield up as a first priority ; increasing the number of cows without raising yields may even make production less economical.

21. Differences in output level and in the factors responsible for the level of output appear to be considerably more important than differences in production-type in determining the relative economy of farms. This suggests that a classification of farms by output-level is an essential first step in analysing the factors responsible for the economic position of particular farms.