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VIII.

RECENT CHANGES IN SYSTEMS OF HUSBANDRY IN ENGLAND

Contributions by

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ERRATUM. Page 49, lines 5 and 6 should read "pastures which would carry a bullock per acre and a half," etc.

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RECENT CHANGES IN SYSTEMS OF HUSBANDRY IN ENGLAND

BEING THE REPORT OF A CONFERENCE HELD AT ROTHAMSTED ON NOVEMBER 27TH 1928 UNDER THE CHAIRMANSHIP OF

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With Contributions by

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FOREWORD

THE twelve papers dealing with recent changes in English systems of husbandry have been grouped in the following order :—

The first two papers, by Sir John Russell and Mr C. S. Orwin, take a general review of the subject from the practical and economic aspects respectively. Mr Rayns deals with the present position in Norfolk, the county of origin of the famous four-course rotation. This paper is followed by a group of six, dealing with the counties of Suffolk, Buckinghamshire, Hertfordshire, Northamptonshire, Nottinghamshire and Sussex. In these counties the four-course rotation, with minor modifications in some areas, formed the essential basis of the farming system until recently. The next paper deals with South Lincolnshire, an area where a six-course shift was drastically changed within living memory. This is followed by Mr Mercer's account of Cheshire husbandry, which was never dominated by the four-course rotation; and in the last paper Mr Taylor discusses the general question of fruit and vegetable growing.

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RECENT CHANGES IN SYSTEMS OF HUSBANDRY IN ENGLAND

By Sir JOHN RUSSELL, D.Sc., F.R.S.

Director Rothamsted Experimental Station

The farming of England as it was known and praised in the nineteenth century was based on the four-course rotation, finally settled at the end of the eighteenth century by the experiments of Lord Townshend and of Coke, both of Norfolk: the rotation was Roots, Barley, Clover, Wheat, and it had the advantage of producing beef, bread, bacon and beer—the necessary and sufficient foods of the Englishman of the time—along with wool and hides to make his clothes and boots. The system enabled each region to be self-supporting for all necessary agricultural products, and in addition it had the technical advantages of producing good yields permanently, of distributing the labour pretty equally over the year, and of facilitating clean and effective cultivation. It required two conditions: cheap labour and an abundant and remunerative demand for wheat and meat. These conditions held through the first seventy years of the nineteenth century, and hence the system remained successful.

As North and South America, Australia and New Zealand developed they put great amounts of wheat on to our markets, and when, later, the refrigerator was developed it became possible to transport beef, mutton and dairy produce without deterioration from any part of the world to this country. Thus the old monopoly possessed by the British farmer was broken, and the two products on which he had relied for the success of his system were being brought to our markets in enormous quantities at prices with which he could not compete. The four-course system thus received its first blow.

The second came after the war. With the establishment of the Wages Boards a scale of wages was made compulsory which, though low enough in all conscience, is still far ahead of anything paid in England in the past, or on the Continent to-day. Labour is no longer either cheap or abundant. The system has therefore received a second blow, and is now staggering apparently to a fall.

In the Eastern and South-Eastern parts of the country the four-course system still dominates agriculture, and in consequence these regions are suffering severely. In the West and North the system plays a part of minor importance; instead agriculture is dominated by grass-land husbandry, which is less depressed. In places also the farms are so small as to be run by the farmer and his family, and as there are no outgoings for wages, and no statutory limit to the hours worked, it has been possible to survive. Mr Mercer

gives an illustration from North Cheshire. Wherever one turns in Great Britain agriculture is most depressed in those regions where the four-course rotation is the chief feature of the farm: it has suffered less where other systems are in vogue. The conclusion seems inevitable that the four-course system is no longer suited to British conditions.

Efforts have been made from time to time to improve the position by intensifying the system, but these have not succeeded in practice.

Improvement is therefore being sought in a change of system: many progressive farmers have already experimented in several directions. As the Eastern part of England was and is most closely associated with the four-course system, it is here that the shocks have been most felt, and here that the most significance attaches to the attempts to get away from it. After the first shock in the nineties many farms were given up in Essex and taken over by Scotsmen, who introduced dairying and potato-growing, and at present, after this second shock, new settlers are again coming in.

The purpose of this Conference is to collect information about the changes so far made and the problems connected therewith and still awaiting solution.

Certain changes in the system have justified themselves so far that they are spreading. They fall into two main classes:

(1) Attempts to reduce expenditure (*a*) by laying land down to grass, sometimes badly and regardless of its suitability; (*b*) by replacing the costly hoed crops (*e.g.* swedes) by broadcasted or closely drilled crops, such as broadcast rape and turnips, silage mixtures, marrow-stem kale, which give as much, or nearly as much, animal food per acre, but at less cost; (*c*) by replacing wheat and barley by a lengthening of the one-year clover ley, using instead a two- or three-year mixture.

(2) Attempts to increase the gross cash output of the farm. Among methods adopted have been (*a*) replacement of the swede crop by the more lucrative potato, brussels sprout, cabbage, or sugar-beet crops; (*b*) specializing in one group of paying products—*e.g.* milk — extending everywhere and largely produced in the North, West and Near South-West of England; potatoes, as in South Lincolnshire; fruit or market-garden produce, as in parts of Norfolk, Kent, Bedford, Worcester, Hereford, etc.; (*c*) developing products that used to be regarded as side-lines of little or no importance to the ordinary farmer—*e.g.* poultry, fruit and vegetables, even mushrooms and flowers.

Certain readjustments of the rotation are being made. Winter-sown oats, having the advantage of escaping frit-fly, are being substituted for spring-sown sorts. Winter-sown barleys also are being tried.

The gross effect of these changes is shown in several directions:

(1) A great decline in the area of arable land, even after allowing for what is taken up for expansions of the towns.

(2) A decline in the proportion of arable to grass-land.

(3) A decline in production of wheat, barley, oats, swedes and mangolds.

(4) An increase in the area under grass and bare fallow.

(5) An increase in potatoes, sugar-beet, brussels sprouts and other market-garden produce, in small fruit and in orchard fruit, in glass-house products.

(6) A great increase in production of milk, of cows in milk and heifers in calf.

(7) An increase in number of smaller-framed sheep, giving the small joints now demanded; generally a shortening of the life of the animals killed for food; replacement of arable Down or Down cross sheep by the grass sheep, often a cross with Scotch black-faced, Kerry, Clun, Grey-faced, Masham, etc.

(8) A great increase in poultry and egg production.

The data are given in the following Table, giving the statistics for England and Wales[1]:

	1908	1927
	Million Acres	
Total land area of England and Wales	37·13	37·13
Total cultivated:		
Above one acre	27·35	25·59
One acre or less, including allotments	[0·30]	0·30[2]
Common, mountain, heath, rough grazing	3·72	5·13[3]
Woods and plantations	1·90[4]	1·88[5]
Area of cities, towns, buildings, roads, railways, villages, country houses and gardens, etc.	3·86	4·23
Permanent pasture	15·94	15·28 (59·7)
Arable	11·41	10·31 (40·3)
Wheat	1·58	1·64
Barley	1·47	1·05
Oats	2·16	1·75
Swedes and turnips	1·11	0·72
Mangolds	0·43	0·30

[1] *Agricultural Statistics*, 1927 (Ministry of Agriculture).

[2] *Agricultural Output*, 1925 (Cmd. 2815).

[3] Of this area about three-quarters form part of individual holdings and one-quarter is mountain or heath grazed in common.

[4] Figures for 1905.

[5] Figures for 1924.

	1908	1927
	Million Acres	
Potatoes	0·42	0·51
Sugar-beet	...	0·22
Orchards	0·25	0·25
Bare fallow	0·30	0·42
Clover and rotation grass:		
Hay	1·81	1·59
Grazed	1·06	0·87
	Millions	
Cows and heifers in milk	1·83	2·09
Cows and heifers in calf	0·50	0·69
Milk (thousand million gallons)	0·97	1·15
Bullocks and other cattle	3·40	3·49
Total cattle	5·73	6·27
Sheep	19·68	17·07
Wool (million lb.)	68·00	56·00
Pigs	2·68	2·69
Meat production (million cwt.)	17·59[1]	15·41
Fowls	28·25	39·49
Eggs (thousand million)	15·01	18·32

The details of the changes as they are being worked out in the various regions are given in the following papers. The problems which arise out of these developments, and which call for investigation, are:

(1) The most effective scheme of manuring and cultivation of the cash crops—potatoes, sugar-beet, brussels sprouts, etc.

(2) The cultivation, manuring and finding of suitable varieties of fodder crops requiring but little labour, such as broadcast rape and turnips, and marrow-stem kale.

(3) The provision of winter keep in place of the old swedes, so as to avoid the necessity for selling of stock in autumn at low price and the purchase of stock in spring at high price.

(4) The lengthening of the one-year ley: (*a*) replacement of ordinary red clover by a mixture; (*b*) if possible, the hastening of development of wild white clover, or some similar plant, so that its benefits may be felt in two years instead of having to wait for three or more; (*c*) the improvement of lucerne culture.

(5) The improvement of grass-land, especially to increase the early and the late growth of grass.

(6) The provision of lime.

(7) The more effective use of home-grown feeding-stuffs;

[1] Average for 1908-1913.

replacement of expensive imported cakes by cheaper home-grown cereals, grass, hay, etc.

(8) An investigation jointly with the proper medical authorities into the question whether freshly produced foods—milk, butter, meat, fruit, vegetables taken fresh from the farm — have any dietetic advantage over goods grown in distant regions, and therefore kept for some considerable time before use.

THE RELATIVE ADVANTAGES OF INTENSIFICATION OR EXTENSIFICATION OF FARMING

By C. S. ORWIN, M.A.

Director Agricultural Economics Research Institute, Oxford

The problem of intensification or extensification of agriculture seems to me to open up a discussion of every economic aspect of agricultural economics. I must be excused, therefore, from dealing with all the questions which it raises, and I propose to concentrate upon making certain distinctions in the various aspects of the problem which seem to me to be important.

The first aspect of the problem with which I should like to deal is the claim, which is much too frequently and too thoughtlessly made, for greater production per acre, for its own sake. I say "too frequently" because its constant reiteration may easily lead to wrong policies, and I say "too thoughtlessly" because it ignores the whole economic basis of production—namely, that output must be related to cost of production, as represented by the labour and capital expended upon each acre of land, and by prices. This advocacy of greater physical production per acre is, of course, based upon the experience of the arable-land decline in the eighties and nineties and, again, since the war. The implication is that the movement is abnormal and unhealthy. Let us ignore for the moment the non-economic considerations of national health and national defence and consider the widest possible economic basis of the use of land for agriculture. Viewing the question from the economic standpoint, I might venture the statement that the degree of productivity of land in agriculture depends ultimately upon the ratio of population to the available land. The classical economists had this aspect clearly in their minds, for the problem in their time was one of immediate importance. The population of Great Britain was increasing with great rapidity. The available agricultural area was, in their view, limited mainly to our national boundaries.

As a result we had the expression of dismal opinion, usually associated with the name of Malthus, of the threatening catastrophe of the pressure of population upon the resources of agriculture. But it was this very same period in which occurred the greatest progress that this country has ever seen in land utilization and in high farming—made possible, of course, by the discoveries of agricultural chemists and the use of artificial manures. In other words, the high proportion of population to available agricultural area led to a natural increase in the output per acre of the available land.

In the last two or three decades of the century there came the sudden reversing of the ratio. Settlement and transport opened up the new countries for agriculture. A free-trade country and a country producing an abundance of manufactured goods for export was in a position, virtually, of adding all of this new land to its available agricultural area. The proportion of population to available agricultural land fell rapidly. Was it abnormal, therefore, that output per acre should also decrease and seek a new level? We had a renewal of these conditions as a result of the war. By reason of the abnormal conditions of the war period our available agricultural area was again restricted, the proportion of population to area increased, and we had to depend again upon the greater productivity of each acre. Upon the return to normal conditions after the war, when the world's agricultural areas were available to us again, was it abnormal or unhealthy that we should return to a lower level of productivity per acre?

I may seem to have spent an unreasonable amount of time upon this somewhat elementary analysis, but the point is so often lost to sight that I think there is some value in pointing out that we may still learn something from the reasoning of the earliest economists. Following out this line, and viewing only the wide economic basis of the use of land to feed the population, it would appear that there is nothing abnormal or unhealthy in the extensification of agriculture following upon the widening of the world's available agricultural area. I ignored at the outset the non-economic considerations of national defence or of national health. If these are to be taken into account, then there is sound basis for the N.F.U. claim:

". . . The Union has consistently adhered to the position that it is not the farmers' business to tell the nation what our national agricultural policy should be; it is the nation's business to state what is expected of home food production. If it be the will of the nation that farming shall be conducted upon ordinary business lines, the industry will continue to adapt its enterprise accordingly. If, on the other hand, the nation demands from the industry results which are in themselves uneconomic and is prepared to foot the bill, farmers will be willing to consider such proposals."—(*N.F.U. Memorandum on Agricultural Policy.*)

In the other aspects of the problem, discussion must be confined to particular commodities. We might look into the question of how we compare with competing countries in this matter of intensification or extensification. There are two ways in which the production of a crop may be intensified—namely, either by the application of more fertilizer per acre or by the application of more labour per acre. As regards intensification by a greater use of fertilizer, the remedy is open to all the world, and, except in so far as the English farmer may be more alert and more ready to avail himself of the low-priced fertilizers which the manufacturing chemists are placing at his disposal, he enjoys no advantage in this respect.

But it is intensification by labour which is most conspicuously in the minds of the advocates of a more intensive agriculture. "More men on the land and greater output per acre" are very common expressions, which have become almost slogans with agricultural publicists. In this respect English agriculture operates under conditions different from all other countries. In no other country have things proceeded so far in the direction of capitalist farming—that is to say, in the separation of the functions of manager and manual worker; in fact some 75 per cent. of the farming area of England is cultivated, in the main, by hired labour employed on farms relatively large, whereas all competing commodities, with the exception of meat, imported into this island are the products of the industry of the family farmer on small holdings. This is true of the dairy products of Ireland, of the Continent and of New Zealand; of the grain of Canada, India, Australia and Russia; of the fruit and vegetable products of the Continent, of California, of South Africa and of Tasmania. In countries where the family farmer predominates, costs of production are necessarily lower than in England, because so much of the labour never appears in the cost sheet. The family farmer pays no wages, he knows no statutory hours of labour; his wife and children share in the work of the farm, and the remuneration per head is generally below that of English wage-labour, having regard to the hours worked. Contrast these conditions with those of capitalist farming in England. Rates of pay depend not upon the value of the product but upon the value of labour in urban industry. Ordinary rates apply only to a restricted working day. Extra pay must be given for overtime and Sunday work; and all these things, reflecting the higher standard of living which has been secured by the English rural worker in contrast with his overseas competitors in all parts of the world, represent a charge upon production which they have not got to meet. Nor is this charge limited to that which is required to meet the worker's standard of life. The Continental peasant and the prairie farmer alike are master and man too, and their standard of life is the subsistence level. In England, where the two functions are no

longer united in the same individual, not only has the worker secured for himself a life something better than this, but so also has his capitalist employer. The English farmer has long been accustomed to a higher standard of living, but it must be recognized that as regards most of his products he is competing with farmers living on the subsistence level the world over.

In this respect we might note, in passing, that our own family farmer is less affected by the risks of fluctuating prices than the capitalist farmer; he is always in receipt of his wage as a worker, even though in times of depression he has to sacrifice his profit as a capitalist.

Nor does this exhaust the handicaps of intensive farming in England in relation to other countries. One-third of the decline in the number of agricultural workers since 1871 is in respect of boys between the ages of ten and fifteen, and is the direct result of the Education Acts. A casual study of the regulations governing compulsory attendance at school in most Continental countries suggests that they resemble our own, in that children must attend until the age of fourteen. But this does not always mean a full-time attendance. In much-advertised Denmark, children of eleven years of age attend for only three days in the week, nor are there facilities in the way of maintenance grants to enable the country child to go on to the secondary school. In Germany, summer school does not begin till midday in the country districts in certain states, and in Belgium and Holland children of ten and of eleven years of age respectively may be released from attendance for a certain period of the year.

As regards intensification of labour, therefore, the farmer is always up against the conditions above recounted — that is to say, he is employing high-paid labour in competition with labour on a subsistence level — and as regards agriculture, at any rate, the saying attributed to the first Lord Brassey that "all labour costs the same" is certainly not true. In the present organization of farming in this country the possibilities, if they exist, of getting a higher output from better paid labour have not been realized, and if and when they are, in what better case will the Eastern Counties corn-grower be, working with men living under Trade Union conditions (with which, of course, I have no quarrel) in competition with the prairie owner-occupier working all the hours of daylight on a combined harvester-and-thresher?

The conclusion seems to be that in the case of what may be termed the primary agricultural products, in the production of which the English farmer has to face the competition of subsistence farmers all over the world, he is at a serious disadvantage. Until the whole world is hungry, or until Geneva has obtained equal conditions of labour all over the world, it seems unlikely that there is

any great future in England for the growth of such commodities except by methods which increase in their extensiveness as the rural standard of living approximates more and more closely to that of the urban industrial worker.

Turning now to the narrower aspect of intensification as illustrated by high farming, the only point which I should like to make is that it is impossible to generalize for farms as a whole, as the individuality of the farm must be taken into consideration. Most people can point to farmers here and there who continue to farm high in the face of prevailing prices, and who tell you that it is no use growing a crop unless you grow a good one. To use these cases as models for general application seems to rest on a complete misunderstanding of one of the most elementary theories of economics. We need not concern ourselves with all the details of the Ricardian theory of rent, but the conception can give us a warning in this matter. The simple basis of the theory, I may remind you, is that land varies in its natural capacity to yield a crop of a particular commodity with a given expenditure of labour and capital. At a given price for the produce there is one grade of land which it will just be profitable to cultivate. That land has been called the "marginal" land at that price. Slightly better land will make a profit, and the best land will make bigger profits. Poorer land could be cultivated only at a loss or with a lower standard of living on the part of the cultivators. I think that many farmers who have never made the acquaintance of Ricardo give their own statement of his theory when they say that "any damned fool can farm good land." The immediate point of importance is that it is the price of the commodity which determines whether a loss or a profit will result on the marginal land, or land which is near the margin of cultivation of the particular commodity. In the case of the best land it is not a question of profit or loss in a time of low prices, it is simply a question of greater or less profits. It is the farmer of the marginal land who must be in a position to adjust his policy to a change in prices, and it is folly to direct him to the example of the farmer on good land.

However, this cannot be regarded as a final answer to the question of the relative advantages of intensification or extensification of farming, for it presupposes only the possibilities regarding the farmer's present system of farming. There is, however, the question of a change of system. Intensification by the corn-grower, for example, is not limited to a consideration of an increased output of grain, or extensification by him to a reduction of his output of the same commodity. Intensification would occur if he were to reduce his corn area and devote some of his plough-land to the production of market-garden crops or sugar-beet, just as extensification might follow by seeding-down the plough-land and ranching it with

sheep. It seems to me, however, that this is not a problem of intensification or extensification, but of readjustment, which may take the form of either of these two policies. One of the most striking examples of readjustment of farming systems is the case of the change to milk-producing which took place in Essex towards the end of last century. Into what category — intensification or extensification—can this change be put? It is true that land was lost to the plough as a result of it, but was there a less expenditure of capital and labour on farms under the new system? Was there a lesser value of produce per acre? Further, looked at from the point of view of the milk-producing industry alone, was it not a case of extensification — taking production from the town dairies with high investment in stock and feeding-stuffs to the more extensive system of production on farms? The example brings out most clearly the difficulties of the terms intensification and extensification when used in connection with a change of system.

I have had to limit myself to the discussion of a few only of the points raised under the title of this paper. There can be no absolute decision on the subject suggested by it, and to sum up, three questions seem to be indicated, the answers to which I must leave you to supply:

(1) Are we to attempt a gradual redistribution of the land so as to promote its occupation in smaller units, thus bringing our farmers and farm-workers down to a subsistence level, as represented by the family farmer, in order to put them on equal terms with their overseas competitors?

(2) Are we, on the other hand, to meet this competition by taking a lesson from urban industry—a lesson which has been applied already, here and there, by agriculturists in regard to particular products—and to seek to maintain the standard of living by application of the large-scale factory system, with a low-production cost and a lower output per acre?

(3) Or are we, as another alternative, to direct production in this island in such a way as to exploit the virtual monopoly in certain commodities which we enjoy by reason of transport costs, perishability and so forth, leaving all land which would be described as "marginal" under such a system to go in or out of cultivation, of one kind or another, as the state of the market or the courage of agricultural adventurers might determine?

CHANGES IN THE HOME OF THE FOUR-COURSE ROTATION

By F. RAYNS, M.A.
Director Norfolk Agricultural Station

Well over a hundred years have elapsed since the four-course or Norfolk rotation was developed. Two Norfolk landowners—Coke of Holkham and Townshend of Raynham—evolved the ideas and put them into practice on poor land with such extraordinary results that Arthur Young, in *Agriculture in Norfolk, 1804*, is prompted to observe: "A county of rabbits and sheep-walk has been covered by some of the finest corn in the world; and, by dint of management, what was thus gained has been preserved and improved even to the present moment."

Since that time the Norfolk four-course shift has been the backbone of Norfolk farming and of that of many other counties. It is still the most generally adopted rotaion in the county from which it is named. Yet changes are taking place, and pioneers are breaking traditions, just as Coke and Townshend broke them many years ago. If, however, these changes are to be understood, it will be best to outline the farming of a typical four-course farm and to say something of the soils upon which it is practised. These are having a distinct influence upon the character of the breaks which have so far occurred.

The four-course shift of wheat (or rye), roots, barley and hay has always been associated with light land. The sheep and barley type of farming is merely a synonym of four-course rotation farming. The system was developed upon the light gravels which overlie the chalks of Norfolk, and for over a generation has kept them under the plough, clean and in good heart. Mutton, beef and barley are the chief objects of the four-course farmer. In Norfolk he frequently, although not invariably, has no more permanent grass-land than will carry his horses successfully through the summer. His stores for winter-feeding are bought from October onwards, and are chiefly large, polled, Irish shorthorns—polled because more can be fitted into the yards in winter, and large because they are expected to consume at least 120 to 150 lb. of roots per day. Enough of these 2½-3-year-old stores are kept to turn all the straw into manure—an operation which not infrequently employs the bullock-tender in his yards and boxes from October to June, while root-feeding and straw-trampling go on continuously. The beef upon which the county has made its reputation is made in this way, cotton and linseed-cakes and hay being the usual adjuncts.

Condition of the land is maintained by dressings of yard manure to the mangolds and the wheat, and by the use of sheep. The four-course shift is not typical without its ewe flock. Flocks of pure-bred Suffolks are as common in Norfolk four-course husbandry as the swedes or the barley, and interfere but little with the smoothness of the cropping. Some catch-cropping is inevitable. Oats (or rye) and tares are drilled on some of the wheat stubbles and are followed by late-sown white turnips. Rye is often grown for early sheep-feed, and part of the hay shift used for the same purpose. Naturally there are other schemes for providing sheep-feed, but the purpose of this paper is not to give an exhaustive description of four-course farming, but sufficient of the essentials to enable the breaks from it to be recognized. It must be added, however, that fat lamb is sometimes the object, but more often the lambs are sold as stores at the July lamb sales to farmers possessing no ewe flock, or are fattened on swede turnips on the farm of their birth.

This is the rough outline of a system of farming which is being severely criticized by many farmers in Norfolk, some of whom are not afraid to make public the losses they have sustained by rigidly adhering to it. Their opinions and experiences are supported by a series of excellent economic and financial investigations made during the past five years by the Farm Economics Branch of the Cambridge Department of Agriculture. These reports, while not necessarily coinciding exactly with the kind of four-course farming which has been outlined, are to be issued finally over a period of four years. A rough four-course cropping may therefore be assumed, but since milk-production, potatoes and sugar-beet are grown on some of the farms for which the results are given below, some slight modification of the typical four-course form has taken place. In spite of this, losses have still resulted, and the state of East Anglian agriculture is disclosed as a very bad one indeed. Nothing but bold change in policy would appear to meet the case:

Lady Day Entry Farms		*Net Return as a Percentage on Assets, after deducting value of unpaid work and interest on capital*
1924-1925	Six farms	− 0·3 per cent.
1925-1926	Six farms	− 5·0 ,,
1926-1927	Seven farms	− 8·6 ,,
1927-1928	Five farms	− 9·8 ,,
Michaelmas Entry Farms		
1923-1924	Fourteen farms	− 6·6 ,,
1924-1925	Fifteen farms	+ 3·3 ,,
1925-1926	Thirteen farms	− 1·3 ,,
1926-1927	Fifteen farms	− 8·4 ,,

There are, of course, many factors entering into the success of any business, but in this case it is difficult, after inspecting the results, to resist the conclusion that this system of farming has failed. The various departments of the farms, however, would be expected to show varying results and to indicate the places where four-course farming is or is not profitable.

Figures taken from the same Cambridge analyses show that cattle and sheep have lost money:

	Percentage of Return on Mean Capital invested	
	Cattle	*Sheep*
1923-1924	− 2·4 per cent.	... per cent.
1924-1925	+ 7·0 ,,	+ 11·5 ,,
1925-1926	− 13·0 ,,	− 41·6 ,,
1926-1927	− 5·8 ,,	− 23·7 ,,

These cattle and sheep eat the roots grown on Norfolk four-course farms and so control the financial success of at least one-quarter of the arable land. Neither is this the whole story, for a large part of the hay is used for the same purpose, and therefore, with the exception of some of the hay fed to the horses, the profit or loss on nearly half the farm depends upon the profit or loss on cattle and sheep, and the cash return upon the outlay is delayed until the sales of these have been effected. It must be remembered, too, that dealing plays as great a part in the production of beef as does the feeding, and that the farmer is usually in a disadvantageous position when meeting either the dealer in store cattle or the butcher. If, in spite of this handicap, the stock make money, the farm may be profitable; if they lose money, then the manure from the bullocks and the residues from the sheep are expensive, and the consequent charges which have to be made to the wheat and the barley are a severe handicap. Chances of profit then are slight. Hence it is in view of the important position which roots and stock hold in the economy of a four-course-shift farm that progressive local agriculturists have argued that this was one place to break away from tradition; that the root shift must therefore be made profitable and must bring in more direct cash. They have also argued that no more hay than is consistent with safety should be grown; that, while it is essential to maintain a full head of stock, an attempt must be made to make stock-feeding a less risky undertaking and to improve the condition of the land as the result of *profitable stock* management. No longer must the stock be excused for losing money because it leaves manure behind.

It is generally agreed that corn-growing is inevitable on the Norfolk light arable farms, for without straw and, consequently, manure they cannot be kept in good heart. This, however, does

not supply a satisfactory reason for continuing to grow corn at a loss, and the question at once arises, "Is there any need to lose money in corn-growing or to grow corn for the sake of the straw?" Surely there must be some means by which corn-growing can be justified? Surely it is better, for instance, to grow more barley than wheat at places where the cultivation of barley is favoured, as it is in many districts in Norfolk? Surely higher yields of the cereal which is smiled upon by soil and climatic conditions should be possible? Men who spend their lives amongst farmers can conclude that only those who farm higher than their neighbours are the successful ones. Their yields are higher, their costs of production per unit of corn are lower, and they have fewer crop failures, for their land is in a state of continual improvement.

Following these very general arguments, breaks from the four-course shift have taken place in Norfolk during the last few years. Three examples are given. The first two have been found on all soils between the clays and the lightest of the sands, and the cropping given below of five farms reduced to a common unit—*i.e.* per hundred acres of arable—will facilitate comparison:

Crop	*As Per Cent. of Total Arable Acreage*				
	Farm 1	*Farm* 2	*Farm* 3	*Farm* 4	*Farm* 5
Winter wheat . .	4	2	9	...	4
Sugar-beet . .	40	39	40	42	48
Potatoes . . .	...	5	3	...	...
Hay	15	9	12	4	14
Peas . . .	...	4	4	...	2
Spring barley . .	32	32	28	44	25
Spring oats . .	9	5	4	8	7
Black-currants . .	...	4	...	...	...
Total acres . .	572	300	569	136	269

These are essentially sugar-beet-growing farms, and the basis of the rotation is a three-course one of barley, sugar-beet or hay, sugar-beet. In practice, complications in the cropping arise: the peas, potatoes, wheat and oats have to be fitted in. Such complications, however, are the fate of all farmers and need cause no further concern here, for so long as the principles of rotations are observed, a mathematically accurate distribution and regular sequence in the cropping are of no great practical interest. One-third of these farms is mucked each year and one-third is hoed. The cropping

of four other farms given below illustrates the same principles: less hay, less wheat, more barley, more saleable roots than on the Norfolk rotation. Some stock-feeding roots, however, are retained. A five- or six-course rotation is adopted: barley, hay, wheat or oats, barley, sugar-beet or potatoes or mangolds or swedes. Occasionally a third straw crop is taken after the hay:

Crop	*As Per Cent. of Total Arable Acreage*			
	Farm 6	*Farm 7*	*Farm 8*	*Farm 9*
Winter wheat	22	18	12	13
Sugar-beet	10	13	9	26
Potatoes	3	...	...	...
Other roots	6	9	12	3
Hay	17	20	12	14
Barley	36	40	48	32
Oats	6	...	7	12
Total arable acres	439	173	170	160

The cropping of nine farms has now been given. Each farmer has attempted to modify or discard the four-course shift because each felt that it did not meet the changed conditions. Each has adopted parallel lines. The cereal crop which suits the county has been extended as far as is practicable: sugar-beet has been used to replace stock-feeding roots, with the result that the work immediately after harvest has been intensified. Compensations, which fortunately have aided rather than hindered the changes, have been necessary. Wheat-sowing and mangold harvest interfere with sugar-beet lifting; mangolds are therefore reduced and wheat is kept as low as thatching requirements will allow. There has been less time for muck-carting and ploughings for wheat in the autumn. More spring corn has followed logically, and the policy has been cemented by the fact that in most seasons good yields of malting barley can be grown after sugar-beet with the aid of 3 to 4 cwt. of a complete manure.

The ewe flock and even the fattening hogget have disappeared from these farms. The beet tops are carted off and fed in the yards to stock less mature than formerly. On farms with 20 per cent. or so of permanent grass the tops are fed to dairy cattle. As a rule, however, the feeding of bullocks in yards has continued, and for stock food great reliance has, perforce, been placed upon sugar-beet tops and dried pulp. Omitting the dairying interests,

the stock policy on these farms has changed in that no great attempt is being made to produce beef. Cattle weighing from 6 to 8 cwt. live weight are usually bought and run cheaply in the yards during the winter, but kept sufficiently forward to be very desirable material for the grass feeder, to whom they are sold in the spring. The tops usually last until Christmas, when sugar-beet-top silage, a few roots or pulp replace them. Hay and an allowance of a mixture of concentrated foods balanced from the cheapest ingredients contributes the remainder of the feeding. On this treatment some of the cattle usually become fat enough to go through the fat-stock ring, and are saleable because they are neither too fat nor too big. This method may only be local in its application, for there are not in every county fattening pastures like the ones adjoining the sea in Norfolk, and consequently there may not be the same demand for this type of store. The fact remains, however, that these farmers have found their solution and escape from the winter feeding for beef in the production of forward stores for the grass feeders in their own county. They are meeting a local demand and marketing a desirable commodity. They have recognized that their brother farmers are usually better purchasers than the dealers or the butchers, and that there is always a demand for stores in good condition to eat the early grass. They get on to the market before the Irishman can produce animals with sufficient meat on them. It can be said for this method that there is less risk and a very reasonable chance that the bullock will leave a little more than his muck and his memory. The root shift is then likely to be profitable and the stranglehold on the corn removed. It will be as well, perhaps, to emphasize that cattle under two years old require care when feeding on sugar-beet tops. These, although theoretically superior to roots, have not proved quite equal to them in practice. But they are satisfactory, and the care required in their feeding will be readily bestowed by a man who is keen on his job. If he is not, he can hardly expect success.

Our economists are continually emphasizing the importance of the men at the helm as the dominating factor in farming enterprise. It would appear that the days of the smooth-running four-course shift, with its seasonal precision, its simple feeding, its shirking of all breeding responsibilities, except in the case of sheep, have gone. At least this is the opinion of the men who are prepared to supplement it with that commercial enterprise and business opportunism which present conditions demand. On each of the farms quoted the change from a four-course shift has increased the labour. This is eminently desirable provided the value of the output is increased a little more than proportionately. It may, therefore, be appropriate to show how the stock-carrying capacity and the labour requirement have been influenced on one of the farms. This is given on page 23.

It may be as well to observe, before these figures are studied, that stock-feeding without roots is easier and absorbs less labour than the swede and mangold, notorious for the amount of carting and manual labour required in their preparation. Dried pulp, fed soaked, has been shown to be just as satisfactory as roots.

CROPPING OF ROOT SHIFT—FARM 156 ACRES ARABLE

Year	*Swedes and Mangolds*	*Sugar-Beet*	*Head of Stock*		*No. of Men*	
			Cattle	*Pigs*	*Regular*	*Casual*
1923	31 acres	0 acres	45	...	8	...
1924	31 ,,	4 ,,	41	...	8	...
1925	24 ,,	4 ,,	36	30	8	...
1926	17 ,,	17 ,,	40	...	7	...
1927	9 ,,	30 ,,	34	56	7	2
1928[1]	8 ,,	27 ,,	49	116	7	2
1929[2]	4 ,,	39 ,,	...	...	7	3

The change from eight to seven regular hands in 1926 was due to one man being placed permanently in charge of poultry established on land previously arable. Black-currants, developed at the same time, reduced the arable land to be cropped with roots, corn and hay. The black-currant labour is not included in the Table. The point of importance is the one at which the proportion of sugar-beet to the remaining roots caused the employment of extra labour. This did not take place until over half the root shift became sugar-beet. In respect of the additional labour required for beet, much depends upon the way it is handled, the proximity of means of transport and the weather. It is likely to vary from year to year, but there seems no reason to assume that the variation would be great. On another farm of 174 acres of arable land, 14 acres of sugar-beet in a root shift of 31 acres were handled entirely by the normal staff of nine men employed, two of whom were stock-tenders and did not help with the beet.

Perhaps a more interesting break in Norfolk has taken place on the gravelly soils over chalk, which are so light in places that blowing sand is by no means an uncommon sight. These soils are the natural home of the Norfolk sheep and barley farms, and it is not too much to say that many of them have been kept in cultivation by the use of arable sheep alone. Rents of five shillings an acre and less are not uncommon on this land. Yields, however, are controlled by the weather: drought in May or June usually heralds a year of loss, for, in spite of constant sheeping and manure-carting, equally continuous ploughing and cultivation keep the humus contents of these soils low. There is little retention of water or manures in the land and no power of drought-resistance. A successful break on such lands started by the introduction of a five-years' ley—

[1] 20 tons pulp purchased and tops fed for the first time. [2] Anticipated.

hayed in the first year and grazed afterwards. In this way the number of times the land is ploughed over a number of years is lessened and the land is given a period of natural recuperation. After that it is usually possible to grow fair crops of corn. There is nothing new in a five-years' ley. It is interesting in this case, however, because the land is light and the rainfall much lower than in the Northern Counties, where the long ley is common. Light land and low rainfall are supposed to render pasture-making impossible. They have not done so in the last five years provided the work has been done well and the grass properly grazed, although it would be idle to pretend that the grazing is of the Midland or Western pasture order of excellence, or that at the end of three years the leys are as good as on the North-Western or Aberdeenshire farms. They are, however, good enough to carry a fair head of sheep and cattle. Similar methods made Coke of Holkham famous, and he insisted upon a ley of longer duration than one year, and studied the grasses and clover very carefully. It is extraordinary how little the present-day Norfolk farmer knows of the methods of this master, and interesting to find a return to his longer ley as a part solution of present difficulties on the same class of land.

The stock policy is essentially a combination of breeding, rearing and feeding. The sheep—Mashams—range the temporary leys and are crossed with a Suffolk ram. A proportion of the lambs are fattened on the grass and marketed in the late summer. The remainder of the lambs bred are finished on sugar-beet tops. The aim in the cattle policy is to produce beef at or about eighteen to twenty months old. Lincoln Red heifers are crossed with an Aberdeen-Angus bull; they calve with the grass and rear their own and one or two other Lincoln calves. The best of these heifers' calves replenish the breeding herd.

The whole of the root shift is sugar-beet, except a few mangolds grown for the Mashams at lambing. For the winter-feeding of cattle great reliance is placed upon sugar-beet pulp.

Every crop except the hay is a cash crop, for the rotation is in principle the same as on the better land mentioned above. It is barley, sugar-beet, barley, five-years' ley, barley: a little rye is grown for thatching. Only the merest outline of these farms has been given. The methods are important in Norfolk, for they have so far proved a financial success on land which was becoming derelict under the Norfolk four-course rotation.

Recent breaks from the four-course rotation in Norfolk have embodied the following principles:

(1) Rotations of longer duration than four years. The better lands have been cropped on a three- five- or six-course shift.

(2) More saleable roots, at least half the root shift being sugar-beet or potatoes.

(3) Weight has been placed upon the acreage of barley—the corn crop for which the soils and the climate of the county are best suited. Wheat has disappeared from some of the farms.

(4) The area of hay has been kept as low as stock-feeding requirements permit.

(5) Less and less stock-feeding roots are being grown. Sugar-beet tops, sugar-beet-top silage and pulp are being substituted in stock-feeding.

(6) Sheep are being discarded or arable flocks replaced by the much cheaper grass-land sheep.

(7) On the lighter lands the temporary ley is being used. In spite of adverse circumstances it is proving successful.

(8) Smaller joints of beef and mutton, cattle fat at a more tender age, and breeding, rearing and feeding on the same farm are striking changes.

(9) Greater interest is being taken in poultry-keeping.

(10) On the better land black-currants and other fruit is extending.

THE ENTRY OF SUGAR-BEET INTO THE ECONOMY OF THE FARM

By Colonel G. H. LONG
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The extension of the sugar-beet industry of recent years, particularly in the root-growing areas of the Eastern Counties, has perhaps opened up more revolutionary ideas in the four-course shift of farming since its introduction by Coke of Holkham in the early part of the last century.

That sugar-beet can be grown in this country equally as well—both as regards weight per acre and sugar content—as in the best sugar-beet areas on the Continent has now been proved without doubt, and, under present conditions, profitably.

The problem now confronting the industry is the future prospect when the period of subsidy ends. The industry can be then carried on successfully only if the farmer makes full economic use of the crop. It is not proposed in this paper to deal with the costs of growing and harvesting the sugar-beet crop, as this has been fully done in a recent publication,[1] from which the following typical figures are taken:

AVERAGE PROFITS PER ACRE AND PER TON OF WASHED BEET (1927)

Number of fields costed	172
Average washed yield	7·71 tons
Sugar per cent.	16·1

[1] Carslaw, Burgess and Rogers, *Sugar-Beet in the Eastern Counties*, 1927.

	Per Acre	*Per Washed Ton*
Total cash costs	£21 1 $4\frac{1}{4}$	£2 14 $7\frac{3}{4}$
Gross cash receipts	21 6 $10\frac{3}{4}$	2 15 $4\frac{1}{2}$
Cash profit	0 5 $5\frac{1}{2}$	0 0 $8\frac{1}{2}$
Credit for tops and net residual values of manures and cultivations	3 18 $7\frac{1}{2}$	0 10 $2\frac{1}{2}$
Net profit	4 4 1	0 10 $10\frac{3}{4}$

The purpose of this paper is to relate my personal experience in substituting sugar-beet on two-thirds of the root area on a mixed farm of 700 acres (600 acres arable) in Suffolk carrying a dairy and flock of breeding ewes.

Labour

The first and all-important question is labour. Although certain casual labour is employed during hoeing and lifting, from early in May to the end of November the resources of the farm are heavily taxed by the busy periods of the hay and corn harvests, and autumn threshings and seeding. It is only by the most careful organization that the farm routine can be carried on without neglect, and it has been found necessary that more permanent hands must be kept on during the winter to catch up the arrears of work of less importance on the farm.

Sheep

The problem of providing enough winter keep for the ewe flock with so large an area under beet was at first a difficult one, particularly until experience proved that beet tops can be quite safely folded by breeding ewes, provided they are allowed to wilt and have not become rotted through frost; and it can most certainly be stated that an average crop of tops will substitute an average crop of white turnips or kale of an equal acreage.

The method now adopted on this farm is to break up the early seed leys[1] (Italian rye-grass and trefoil) after folding with ewes and lambs in the spring, and drill with rape. The ewes fold on this during August and September, and from early October to the New Year on beet tops. Four to five acres of mangolds are grown for the lambs in the spring, and this is the only root crop (other than beet) grown on the farm for pulling off. No experience has been had with the use of beet pulp for ewes, but one of the best-known sheep-breeders in the district, who was very short of keep last winter, fed his ewes on dried pulp and hay for some weeks with no ill effect; in fact he had a remarkable fall of lambs. Beet tops therefore that had previously been ploughed in now take the place of about one-third the crop of turnips and kale previously grown for the ewe flock alone, at a saving of the whole cost of the latter crops.

[1] Called "layers" in East Anglia.

Cattle

This farm carries a dairy of twenty cows and about forty to fifty head of young growing stock, and for some years past the root crop has been almost entirely substituted by ensilage made in a tower silo from vetches, beans and oats. This has not been entirely dispensed with (during the past two winters about 150 tons have been used against 300 tons previously) by making fuller use of the residue of beet.

At the present time cows are having beet tops thrown out on the pastures in lieu of cabbages, which formerly were grown for this purpose but are now entirely dispensed with. For yard feeding, both for cows and young stock, roughage consists entirely of dried beet pulp (previously soaked) and either beet tops or ensilage, together with long oat straw. It is now intended, as soon as the beet crop is lifted, to make 100 tons of ensilage from the tops in the manner adopted on the Continent, and referred to below.

By adopting the methods described above, not only is the very expensive root crop almost entirely dispensed with, but an abundant supply of roughage is available on the farm at all seasons, and the head of stock on the farm has not been diminished by the introduction of sugar-beet.

Continental Experience

In the summer of this year (1928) the writer paid an extensive visit to the beet-growing areas of Germany, and was most impressed with the manner in which the German farmer has introduced sugar-beet into the economy of his farm, and has indeed made it the very basis of his farming operations both in crops and stock. No other crop at all appears to be grown for fodder, and on all the farms visited a large head of stock, both sheep and cattle, are kept.

All stock are kept in sheds or yards all the year round, and are fed entirely on beet residues and straw, with the necessary concentrates. For winter feeding the methods are similar to those now in use on this farm—*i.e.* beet tops fed fresh, and pulp, either wet or dry, with straw. For summer feeding the universal custom seems to be the use of ensilage made of beet tops, again with straw.

The method of making tops into silage is that sometimes used in this country: carting into a shallow pit and compressing by carting the loads on to the mass. On those farms close to the factories wet slices were mixed with the tops, and the resultant silage appeared to be eaten with relish, and all stock looked remarkably well on it. In Germany the beet-grower apparently gets his pulp back from the factory without charge for wet slices and only the bare cost of drying and bagging for the dry, and it appears that the factories in this country might well copy this example in future years.

Summary

From the experiences quoted it does appear that although the labour bill on the beet crop is heavy it is at least repaid on a cash basis, and the residue of the crop relieves the farm labour account of the very heavy item of root crops grown entirely for stock.

Present-day costs of pulp returned from the factory are 7s. 6d. per ton for wet, and £4, 15s. *ex* factory for dry.

As the usual recognized proportion between beet pulp and mangolds is about 1 lb. of pulp = 8 lb. mangolds, this would represent mangolds at about 12s. per ton. It will be realized that as beet pulp is received in a form ready for feeding, the very heavy cost of carting roots from clamp to farm and pulping and cleaning is entirely dispensed with, and as beet pulp can be usefully supplemented by the tops fed either green or as silage, the residue of the crop is most assuredly an economic substitute for the usual root crop.

As to the effect on other crops in the rotation, we in East Anglia have always maintained that close-folding roots by sheep was absolutely essential for the following barley crop, not only for the value of the fold manure but for the mechanical action of treading the land by sheep. The experience of the past nine years on this farm proves beyond doubt that barley can be as successfully grown following beet as following roots folded; indeed in most seasons it is of far better quality, and little or no difference has been noticed in the barley whether the tops have been folded or ploughed in.

The deep cultivation for beet has also, without doubt, given our thin-skinned lands of West Suffolk far greater drought-resistance, which in this dry district is of considerable importance.

In conclusion, the last and all-important factor of the entry of sugar-beet into the economy of the farm is the fact that during the past lean years the beet crop alone has made the farm an economic proposition, and in fact has saved many of us in East Anglia from the Bankruptcy Court.

RECENT CHANGES IN SYSTEMS OF FARMING IN BUCKS

By JOHN PORTER, B.Sc., N.D.A.
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The fall in prices of farm produce generally since 1920 has not been accompanied by a corresponding fall in the cost of production. The continued production of much of the farm produce on pre-war systems has, therefore, become an uneconomic proposition.

The average price of English wheat fell from 18s. 10d. per cwt. in 1920 to 11s. 6d. in 1927; oats fell in the same years from 20s. 5d. to 9s. 1d. per cwt.; beef fell from 21s. 9d. per stone in 1920 to 11s. 1d. in 1927.

As to production costs, the prices of new implements, feeding-stuffs, and, to a smaller degree, fertilizers, have remained comparatively high since 1920. The weekly wages of agricultural labourers have increased from 14s. 8d., not considering perquisites, in 1910, to a minimum of 32s. at the present time. In fact, farmers living in close proximity to industrial towns, such as High Wycombe, Slough, etc., have to pay wages considerably above this weekly minimum, and even then it is possible to induce new agricultural labourers to come only so long as suitable cottages are available. Apart from the actual amount of wages, the stipulations as to hours in the Agricultural Wages Act, as well as daylight saving, have tended to increase the cost of production in many cases.

Directions in which Changes must be effected

There are at least two ways in which farming may become a better paying proposition—viz.

(1) The income from the farm must be increased in some way or other to meet the present comparatively high cost of production. This may be brought about by Government protection or subsidies—which is unlikely—or by introducing new crops or new branches of live stock into the system of farming, which will bring in an increased revenue.

(2) The system of farming may be modified in such a way as to reduce the cost of production.

Either or both of these methods might bring about the desired result.

Changes which are taking place to Reduce or Eliminate Unprofitable Branches

Reference to the Agricultural Returns supplies the following valuable information as to reductions which are taking place in various branches on Bucks farms—viz.

(1) *Horses.*—The number of agricultural horses has gone down by approximately 2000 between 1915 and 1925, and another 2000 between 1925 and 1927, which reflects adversely on the number of heavy horses bred. This depression may be due to the partial substitution of horses by tractors.

(2) *Beef Cattle.*—In spite of graziers having had a very bad time, there is no indication that the cattle of two years and over are declining. The cause of the trouble is to be found in the steady fall in the average price of beef since 1920.

(3) *Arable Land Sheep.*—Although the sheep population has

remained fairly steady, arable land sheep have decreased in numbers considerably, owing to the labour costs connected with hurdling sheep on arable land.

(4) *Rough grazings* have increased by about 7000 acres between 1915 and 1924, and have remained at substantially the same figure since.

(5) *Arable Land.*—The acreage of arable land has declined steadily in recent years, and on the 1927 figures is 26,000 acres less than it was in 1915, and 17,000 acres less than in 1924.

(6) *Arable Land Crops.*—The *wheat* acreage fell by fully 17,000 acres between 1915 and 1927. Between 1924 and 1927 the *oat* and *barley* acreage declined by 5000 acres, and *rotation hay* by 4000 acres. Since 1915, *beans*, *mangolds* and *turnips* (including *swedes*) have each declined by 2000 acres, and *vetches* and *lucerne* by, roughly, 50 per cent., while *bare fallow* has increased by 4000 acres.

Branches of Farming which are being Retained or have Increased

(1) *Cows-in-milk* have increased by fully 3000 since 1915, while cows-in-calf are 1000 up, and heifers-in-calf 2600 above the 1915 figure. This makes a total increase of dairy cows and heifers-in-calf of about 6600 since 1915.

(2) *Sheep.*—The total sheep population has remained fairly steady; but grass-land sheep have replaced arable-land sheep in many cases.

(3) *Poultry.*—These have increased since 1921 by no less than 150,000 fowls, 5000 ducks and 2000 turkeys.

(4) *Permanent Grass-land.*—Since 1924, permanent grass-land has increased by 19,000 acres.

(5) *Arable-Land Crops.*—*Sugar-beet* has increased since 1924 by fully 200 acres; *cruciferous green crops* for cattle- and sheep-feed have increased over 200 acres since 1925. *Other crops*, which are chiefly market-garden crops, have increased by 1170 acres since 1915. *Orchards* have shown a steady increase in acreage since 1925.

General Changes in Systems to meet Present Conditions

These may be outlined shortly as follows:—

(1) Permanent grass-land is being increased at the expense of arable land.

(2) There is a great stimulus in milk production for the raw-milk trade, which has a far-reaching effect on the systems of farming —*e.g.*

(*a*) An increased number of dairy cows is being bred.

(*b*) Better bulls and, in several cases, premium bulls are being used to improve the dairy stock.

(*c*) There is an increased interest in milk recording, clean-milk production, etc.

(*d*) The root-break in arable land is being modified to include kales (chiefly marrow-stem), forage crops and silage, with corresponding reduction of mangolds and swedes.

(*e*) Much more attention is being paid to rationing of the dairy cows, and there is a distinct tendency to use home-grown grains, etc., as far as possible, rather than to sell the home-grown grain and buy cake.

(*f*) Wet pastures are being mole-drained, and poor pastures dressed with basic slag, or basic slag and kainit, to increase the stock-carrying capacity of the pasture-land, as well as to reduce the necessity for supplementary concentrated foods to a minimum.

Further, there is some interest being taken in the use of nitrogenous manuring to secure an early spring bite, as well as a late bite in the autumn, so as to reduce the cost of milk production.

(*g*) Increased interest is being taken in milking machines.

(*h*) In North Bucks, farmers supplying milk to the Buckingham Factory are being paid bonuses on cleanliness as well as on quality of milk supplied.

(3) Grass-land sheep are in many cases replacing arable-land sheep in order to reduce labour costs of hurdling, etc. However, on some arable farms, arable-land sheep are being retained, and appropriate forage crops grown for them, as the folding of green crops on the land is one of the chief ways of manuring the land.

Bucks is one of the most important counties for the breeding of Western Horn sheep, which are much favoured for crossing for "early lamb" production.

(4) *Pig-keeping.*—There is a distinct tendency to concentrate more on porkers than on bacon pigs. In North Bucks at least one farmer keeps pigs on the open-air system. During the summer months the pigs receive nothing but the grass they pick up, except at farrowing time and a short time while nursing the piglings. On the Chiltern Hills several farmers keep the pigs in the beech woods, where they pick up the beech-mast, acorns, etc.

(5) Poultry for egg production is becoming a more important branch on many farms, as it is a means of bringing in ready money.

(6) *Arable-Land Crops.*—The changes in cropping are largely confined to the root-break, where the comparatively expensive mangolds and swedes are being replaced by (*a*) crops which can be more cheaply grown—*e.g.* kales, forage and silage crops, etc.; (*b*) sugar-beet or market-garden crops (brussels sprouts, cauliflower, broccoli, cabbages, peas and beans picked green, etc.), the idea being to substitute crops which would bring in considerably more money.

Possible Future Developments

(1) There would appear to be scope on the lighter classes of arable land for the introduction of a system of three or four years leys containing wild white clover, because there is probably no better way of increasing the fertility of the soil for the economical and successful growing of grain crops, as well as for providing a maximum supply of rich, succulent grass for the stock, and in this way reducing the cost of producing milk, beef, mutton, etc.

(2) *Fruit and Vegetable Culture.*—In South Bucks vegetables are widely grown on a field scale as a substitute for mangolds and swedes in the root-break. The crops grown most extensively are early potatoes, brussels sprouts, cabbages, cauliflowers and broccoli, peas and beans picked green.

On the Chiltern Hills one progressive firm, with over a thousand acres, grows fruit extensively as well as vegetables. Fruit and vegetables are taken by motor-lorry from this farm direct to Covent Garden, Southampton, etc. In addition, hundreds of tons of fruit are bottled at their factory, near Marlow.

In the Aylesbury district fruit and vegetable culture is practised on a limited scale, and to a smaller extent vegetables are grown on a field scale in North Bucks.

There would appear to be ample scope for an extension of the acreage under fruit and vegetables as long as the grower realizes he is dealing with perishable crops, and knows how to make full use of alternative methods of their disposal, etc.

(3) *Flower Culture.*—On some of the smaller of smallholdings in close proximity to towns a very useful business has been worked up in growing and supplying cut flowers to hotels, restaurants, town houses, etc. The flowers are grown outside, and of varieties that are fairly easily grown. Obviously, this is rather a seasonal trade, and is fittingly coupled up with fruit culture and, to some extent, the growing of vegetables. Bee-keeping is often included, as the bees help to set the fruit. In this way a farmer with a son or two may make a useful living.

(4) *Seed-growing.*—There would appear to be ample scope on farms and smallholdings for developing the growing of many kinds of seeds—*e.g.* flowers, roots, vegetables, grasses, clovers, etc.

(5) Everyone realizes that much of the existing arable land is getting somewhat short of lime, but that the cost of lime and the labour involved in liming frightens most farmers. Lime shortage means that the land will be more difficult and costly to cultivate, while the crops obtained will be in many cases more or less disappointing. An effort is being made to avert this calamity by using nitrogenous and phosphatic manures containing calcium.

CHANGES IN CROPPING SYSTEMS IN HERTFORDSHIRE

By J. W. REID, N.D.A.
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EXAMINATION of statistics, beginning with the *Board of Trade Returns, 1866*, and ending with the *Ministry of Agriculture Returns, 1927*, gives the following information:

(1) The total area under crops and grass has fallen by 14,000 acres. This is probably due more to the urbanization of South Hertfordshire since 1866 and to the increase in the number of roads than to land actually going out of cultivation; but it is safe to assume that in recent years at least the latter factor has been exercising an increasing effect.

(2) The changing proportion of arable land to grass-land. Since 1866 there has been a steady decline in the area of land under arable cultivation, that has been much accentuated in the immediate past. In the space of sixty-one years 42,951 acres have been converted to permanent pasture, and 57,376 acres have gone out of arable cultivation. Arable land which in 1866 occupied 73 per cent. of the total area under crops and grass now occupies only 58 per cent. There is every reason to believe that in the near future the proportion will be still further reduced. Many farmers are laying down land to grass as fast as they can, and the fact that the decline is not more rapid is to some extent due to the farmers' inability to keep pace with their intentions.

These effects have been accompanied by the following changes: cereals and pulse crops have decreased by 48,000 acres, and roots and forage crops by 27,000 acres; seeds and clovers show a slight but continuous fall; the acreage under potatoes is small but steady; bare fallows have increased by 6000 acres.

Examination of the area devoted to individual crops brings out the following points:

(1) The decline in the wheat area until 1896, its rise from 1906 to 1913, and its rapid decline after 1923. In 1927, 12,155 acres less were grown than in 1866, and 10,123 acres less than in 1913.

(2) The comparatively rapid and continuous decline in the area of barley since 1876, less than one-third of the area then grown being cultivated in 1927. Since 1913 there has been a decline of 4289 acres.

(3) The increasing area coming under oats until 1906, and its

gradual but continuous decline since that year. In 1927, 3191 acres less were grown than in 1913.

(4) Rye, while never a crop of much significance, has also fallen away.

(5) The marked decrease in the bean area in 1927 as compared with 1866, and the continued fall after the war years.

(6) The reduction of the pea area from the substantial one of 6676 acres to the almost insignificant one of 458.

(7) The continuous decline in the area under turnips and swedes.

(8) The increase in the area of mangolds until 1913, and their decrease since that date.

(9) The comparative equality in the acreage under cabbages, rape, etc.

(10) The continuous decrease in the acreage under forage crops, such as lucerne, sainfoin, tares, etc.

(11) The increase in bare fallows until 1896, their decrease until 1913, and their rapid increase since that date.

(12) The great increase in the potato area in 1886 and its continuance at an approximate level of 5000 acres ever since.

Viewed as a whole, the outstanding changes are the reductions in arable area, in wheat and barley areas, in bean and pea areas, and in turnip and swede areas; the increases in bare fallowing, and the introduction of potatoes in increasing quantity from 1876-1886.

Farming in the Nineteenth Century

Much of the early farming appears to have been based on heavy applications of dung and chalk. It was no uncommon practice to put on dressings of from 80 to 120 loads of chalk per acre. To-day, in many parts of the county, there is a definite lime-deficiency. Dung was and still is largely used. Much of this was and still is purchased from London, and Arthur Young records that in the period about 1800 many poor people from Hatfield and St Albans made a practice of collecting the manure from the turnpike roads and selling it to neighbouring farmers. The price paid was two-pence per bushel. Soot and bones were favourite manures, and the former is still largely used.

Rotations commonly in use from 1800 to 1900 are set out in the following Table:—

1800—

(*a*) Heavy Land.	1. Fallow 2. Barley 3. Clover 4. Wheat	or	1. Fallow 2. Barley 3. Peas 4. Wheat

	1. Fallow 2. Wheat 3. Fallow 4. Barley 5. Clover 6. Oats	varied every second rotation with	1. Fallow 2. Wheat 3. Clover 4. Barley 5. Fallow 6. Wheat 7. Oats, Peas or Beans
(*b*) Light Land.	1. Turnips 2. Barley 3. Clover 4. Wheat and, if land was in good heart, 5. Peas or Oats		

1860—

(*a*) Heavy Land.	1. Fallow or Roots 2. Barley or Wheat 3. Clover 4. Wheat 5. Oats	1. Fallow or Roots 2. Wheat or Barley 3. Clover or Beans 4. Wheat
(*b*) Light Land.	Very similar to 1800	

1880—

(*a*) Heavy Land. (1) Fallow sown with mustard ploughed in; (2) Wheat; (3) Red Clover; (4) Wheat; (5) Barley or Oats; (6) Beans manured with F.Y.M. or dead Fallow; (7) Wheat; (8) Sainfoin; (9) Sainfoin; (10) Wheat.

(*b*) Light Land. (1) Swedes fed off with sheep; (2) Barley; (3) Clover; (4) Wheat; (5) Oats followed by: (1) Roots for sheep; (2) Barley; (3) Sainfoin; (4) Sainfoin; (5) Sainfoin; (6) Wheat; (7) Oats.

The fallow system was not much pursued except on the heaviest soils and where the land had become so foul as to make a complete fallow the only satisfactory method of cleaning it, turnips being grown wherever they possibly could. Wheat was an important crop, and next in importance came turnips and swedes.

Clover was grown clean, and is said to have been cultivated in Hertfordshire as long as, or longer than, in any part of the kingdom. Lucerne and sainfoin are mentioned as being grown in small quantity. Tares were very generally grown on heavy land for soiling the work teams. This was a common practice in 1740 before it was practised elsewhere. Red clover was not regarded as a safe crop oftener than once in eight or ten years, and winter beans were increasing in favour as a substitute for this crop.

Mangolds were coming into use about 1860.

Milk production for the London market seemed to commence about this time, and it is recorded that the milk was conveyed in tin cans night and morning by railway from Hatfield.

Some time about 1850 the commercial cultivation of water-cress appears to have begun.

About 1880 there was a large influx of Scotsmen into the county and they introduced the potato crop into their general cropping. Between 1880 and 1881 the acreage under potatoes rose from 2912 to 4404. To-day it is still an important crop on many farms lying in a line between Knebworth and Rickmansworth, but elsewhere in the county it is not much cultivated and the heavy soils are not suitable for its proper growth. Formerly the practice was to dung the land heavily with London dung, which was plentiful and easily obtained. The dung was placed in drills under the seed, now it is put on the flat and ploughed in.

There was also a very considerable trade in hay with London.

Recent Developments

In more recent times, within the past twenty years or so, some of the developments that stand out most clearly are as follows:

(1) The use of marrow-stem kale in place of white turnips about ten or fifteen years ago.

(2) The growing of many hand-thinned roots is proving uneconomical owing to the high labour-cost involved, and more and more land is being fallowed rather than cropped. A further development is the sowing of more root crops, such as kale broadcast, and penning them off. Even beans are sometimes broadcast or drilled close. These practices are likely to grow in future.

(3) The transition from arable sheep-feeding to grass sheep. Formerly, breeds such as the Wiltshire, Hampshire Down, Dorset Horn and Lincoln were kept on arable land, but the high cost of growing roots and the changing public demand for mutton have replaced these by sheep kept on grass-land, mainly Half-breds and Mashams.

(4) The development in the production of milk. Dairy-farming has increased many times over within the past fifty years and now is an important factor in farm economy, particularly in the south and west of the county. Much of the milk goes to the urban areas of the county and some to London, but, despite the large quantity of milk produced, the county is not self-supporting, more particularly in the Watford area.

(5) The use of silos as a means of preserving green fodder has been revived within the past ten years. The capital outlay is heavy, but the crop is cheaper than roots to cultivate and is generally a good smotherer of weeds. Its cultivation, while increasing in the years before 1925, does not seem to have made much progress since.

(6) The introduction of brussels sprouts in the north-east of the county within the past ten years. This crop, formerly almost confined to the Biggleswade area of Bedfordshire, has been spreading into Hertfordshire in increasing area each year. In 1927 over

1200 acres were grown. While normally occupying part of the root acreage, in a few cases it is being grown continuously on the same land. How far this latter practice can be carried appears to be doubtful, the determining factor being the incidence of diseases —such as finger and toe.

(7) The introduction of the sugar-beet crop, which in 1927 occupied 2000 acres. Sugar-beet has been introduced also as part of the root-break and as a continuous crop on the same land. Great hopes were expressed that it might help to solve some of the difficulties of the Hertfordshire farmers, but the realization has not been up to the expectation, and the tendency now is to reduce the acreage under this crop. The heavy labour bill is undoubtedly the chief drawback to the maintenance of this crop in the rotation. Distance from a factory is another factor.

(8) The area under fruit is increasing, mainly in the direction of soft fruits such as black-currants. A few farmers have planted considerable areas with this crop, but it is doubtful if there will be much further increase on the farms. Cherry orchards have spread into West Herts from Buckinghamshire, and there is an annual cherry sale at Hemel Hempstead. In the east of the county and down the Lea Valley are apples and plums, most of which have been planted during the past forty years.

(9) Probably the most important development that has taken place in the utilization of land is the introduction of the glass-house industry in the Lea Valley. While scarcely agricultural, its great importance as an example of intensification of production in Hertfordshire merits more than passing mention. Its growth is almost a romance; and the glass-house area is now located in the three counties of Herts, Middlesex and Essex, the greatest acreage being in Hertfordshire. The total area is 1400 acres, of which 850 acres are in Herts. The capital involved is about £5,000,000, of which over half is in this county. The number of growers is about 600, and the men and women employed number 6000, taking about £500,000 in wages annually. Tomatoes and cucumbers are the principal crops grown, with miscellaneous crops such as grapes, roses, ferns, palms and carnations. The estimated turnover in Hertfordshire alone is £1,500,000. The following Table gives an idea of the acreage occupied by the different crops:

	Total	*Herts*
Tomatoes	875	560
Cucumbers	275	178
Miscellaneous	250	122

The miscellaneous acreage includes 75 acres grapes and 75 acres under roses.

Equally striking is the size of the individual units, a few varying from 30 to 40 acres in extent.

(10) Market gardening as distinct from agriculture is also developing, and some farmers are devoting more attention to market-garden crops.

With regard to rotations the position to-day is exceedingly complicated. The four-course rotation is still practised on the heavy land, and the five-course on the lighter soils; but there are endless variations, and some farmers do not work to any particular rotation, cropping their land in such a way as to secure the best possible cash return. Three white crops may be grown in succession. Potatoes may come into the course at close intervals, and, as already mentioned, there is a very marked increase in the area under grass.

As for live stock, changes in public demand have led to greater attention being paid to early maturity in cattle, sheep and pigs. Poultry-keeping on the farm is developing to a marked extent.

Summary

To sum up, recent developments in cropping in Hertfordshire have been mainly along two lines: (1) the transition from arable to grass, and (2) the diversification of the root crops. How far these changes are affecting the economic position of the industry it is difficult to judge. In some cases improvement may have been effected, in others nothing has been achieved. The chief trouble is undoubtedly the cost of labour and low prices, and farmers are more and more tending to fight shy of those crops which have a high labour requirement.

There is an increased interest in and demand for labour-saving devices, and a growing inclination to adopt cheaper, if less correct, methods.

While a few farmers may be doing well, the great majority are having a hard fight. Hertfordshire agriculture is in a parlous state. Farmers generally are alive to the need for something being done. So far, escape has eluded them. They keep on hoping for conditions to improve, but hope, while a valuable asset, is scarcely a marketable commodity.

RECENT CHANGES IN NORTHAMPTONSHIRE HUSBANDRY

By W. A. STEWART, M.A.

County Agricultural Organizer, Northamptonshire

On examining the figures of the acreages of agricultural land and of the principal farm crops in 1914 (the last year uninfluenced by the war), in 1919 (the year after the cessation of hostilities), and in the two recent years, 1926 and 1927, the most striking feature is that the acreage of arable land is 15,600 acres less in 1927 than

in 1914. On the other hand, the area of permanent grass has increased to the extent of only 6500 acres. Taking the figures for the "total area under crops and grass" there were 517,316 acres in 1914 and 508,229 acres in 1919. There is, therefore, a "loss" or "disappearance" of some 9000 acres from the agricultural land of the county. These 9000 acres will be accounted for in various ways—land absorbed into industrial or urban areas, land used for building, gardens, pleasure- and recreation-grounds, road-making, etc. There are also some 2300 acres now classed as "rough grazings," and not now included in the crop and grass area. This reduces the figure for "lost agricultural land" to about 6700 acres. In 1919 the total arable area was (approx.) 188,000 acres, or nearly 30,000 acres more than in 1914, and 45,000 acres more than in 1927.

Although the total arable area is 15,600 acres less in 1927 than in 1914, the wheat area is reduced only to the extent of some 2500 acres. Barley has gone down to the extent of 13,700 acres, or over 40 per cent. Oats have remained fairly constant. The bean average is less by 4200 acres—a 30 per cent. reduction. Potatoes have increased by some 750 acres, and sugar-beet has gone up from 0 to over 2000 acres.

The most notable figures, however, are those for temporary leys and for roots for feeding. Temporary leys are shown to have increased by 7500 acres. Possibly this figure may be inflated, as the area of temporary grass and clover in 1914 was unusually low, and it is not unlikely that in 1927 some land which will eventually become permanent pasture was returned as temporary. Roots for feeding have decreased by some 6600 acres.

These figures confirm, generally, observations made during the last few years. Farmers appear to favour the wheat crop in preference to barley, partly because the market has been less uncertain than for barley, and partly because the work in connection with wheat-growing has fitted in better with the general organization of the farm labour. Spring oats are now found to be very uncertain on account of their being subject to frit-fly attacks; and it is generally recognized, in most districts, that unless spring oats are drilled early in February it is unsafe to attempt to grow them.

The figure quoted for the increase in the acreage of temporary leys illustrates the change that is taking place with regard to rotations. It has become common to have two-year leys in preference to one-year seeds or clover. In certain cases, also, land is being laid down for four, five or six years, with the intention of breaking it up again after fertility has been accumulated by the agency of wild white clover. Generally, two-year leys are not proving altogether satisfactory, as they fail to improve the fertility of land to the same marked extent as temporary leys of three years'

duration laid down with wild white clover in the mixture, like those employed in the North. So far, two years have not been found sufficiently long to allow wild white clover to get properly established.

Clover sickness has been fairly common in the past, and partly as a precaution against this disease, but more with a view to the general improvement of the fertility and healthiness of the arable land, more attention is being paid to liming. It is becoming customary to give a dressing, generally equivalent to about 10 cwt. ground lime per acre—once in the rotation—usually applied in the autumn or early winter to the young seeds or clover ley.

The area of roots for feeding has gone down from some 19,600 to some 13,000 acres, and this reduction of 6600 acres in the root area, together with the increase in grass-land, has brought about noticeable changes in the systems of live-stock husbandry, as regards both cattle and sheep. Although the figures for live stock do not show that there has been any considerable increase in the number of fattening cattle, farmers have now reduced facilities for wintering fattening stock, with the result that increasingly large numbers are being offered in the autumn months, and prices for fat cattle are at a low level at this time of year. From February onwards there are insufficient numbers of fat cattle produced locally to supply the local requirements. It has been customary to "import" fat stock from the Norfolk area in spring, but apparently the supplies available from that source are now smaller, and in the spring months of 1928 prices rose sharply. A comparatively high level of prices prevailed until grass-fed cattle came on the market in relatively large numbers.

It would seem likely that these seasonal fluctuations are likely to continue, with heavy supplies of fat cattle and low prices in the autumn, and scarcer supplies and a sharper demand in the latter part of the winter and in spring. An important and serious problem has therefore arisen as to the wintering of cattle, now that there is more grass and fewer root or forage crops for stock-feeding. It is not an easy problem to solve, but possibly some partial solution may be found in the application of the new system of grass-land management. An extension of the grass-growing season in autumn should lengthen the period during which fattening stock could be kept at grass without loss of weight. On the Moulton Experimental Farm young cattle of about two years old have increased in weight up to the end of October, maintained their weight in November, but required help in the form of concentrated feeding-stuffs and hay to maintain condition from 1st December onwards. Another way of tackling the problem would be to make more hay, but a practical difficulty arises in this connection, as normally grass-land farms have only sufficient labour and equipment to deal with a limited hay area.

Any considerable extension in hay-making would therefore involve the necessity for employing more labour and possibly also for more expenditure on hay-making implements and machines.

There has been a marked increase in the number of dairy cows kept and in milk-selling since 1914.

With regard to sheep, the reduced root area and the increased acreage of grass-land have brought about a change in the class of ewes kept. Although it was not customary in the past to fold ewes on arable land prior to lambing, it was a comparatively common practice to feed a limited quantity of roots to ewes on grass, and it was fairly general to fold ewes and lambs on roots after lambing. This is no longer possible to the same extent, and sheep-breeders have given up the Down or Down cross ewes and replaced them with grass-land ewes, of which the principal is the Scotch Half-bred or Border Leicester—Cheviot Cross (erroneously called locally the Border-Leicester). Others which have given satisfaction are the Kerry Hill, Clun, Cheviot, Greyface and Masham ewes.

Last spring, fat sheep, off roots, made good prices, and one would appear to be on reasonably safe ground in looking forward to a keen demand for fat sheep again this spring, both because "teg" sheep seem to be scarce, largely on account of the fact that big numbers of lambs are now killed fat, and because of the reduced acreage of roots available for winter fattening. A recent investigation has shown that some 32 per cent. of the lambs bred in the Market Harborough district are sold as fat lambs.

It is true that sugar-beet tops are providing a new and useful winter food, and although yields comparable to those of swedes and kale have been secured, so far, the tops on many farms have not been very fully utilized.

Pigs have fluctuated in numbers in Northamptonshire as elsewhere during the period under review, but the number of pigs kept does not appear to have affected the general systems of husbandry to any appreciable extent. It has been the object on the Moulton Farm to demonstrate a system of pig-keeping whereby the breeding pigs and young stock are maintained in such a way as to fit in with the ordinary farm policy. By using shelters on runners, which can be moved quite easily by yoking a horse to a shelter, and by devising suitable fences, it has been possible to enclose the pigs and to keep them on grass or arable land at different seasons, as found convenient. On arable land they are used to "glean" the potato ground and to consume sugar-beet tops or green crops as required —with considerable economy in concentrated feeding-stuffs and to the benefit of the land by means of well-distributed pig manure.

Although the returns do not show a marked increase in the acreages of small fruit and orchards, a change has taken place in the attitude towards fruit, and by attention to modern methods of

fruit-growing the productiveness of the fruit area has been considerably increased.

Poultry-keeping has come to be regarded by farmers as an important adjunct to the farm, and a large number of farmers are now paying special attention to poultry and are keeping fowls on a commercial scale. An important change has been from the ordinary nondescript barn-door fowl to definite breeds. Cockerels from trapnested stock are much more commonly used than formerly, and attention is paid to proper methods of feeding and management. In connection with the improvement of laying stock, the County Agricultural Education Authority has helped materially by running a Cockerel Distribution Scheme whereby selected cockerels from stock with high trapnest records are distributed to farmers at a reasonable price. In recent years there has been an increased demand for cockerels under this scheme.

On the lighter-land farms—those with about one-third arable and two-thirds grass—where milk-selling is practised, where sheep are kept, and where attention is paid to side-lines like poultry and fruit, the prospects are relatively brighter. On heavy-land arable farms, however, the outlook is depressing. One farmer who farms on an extensive scale—who employs steam tackle, has large fields suitable for large-scale farming, and generally farms just about as well as is possible under present-day conditions—has lost money although his yields of wheat have been above the average. On another heavy-land farm just over the Northamptonshire border 1000 acres of arable land have been left derelict since last year. A third heavy-land farm (300 acres arable, 100 acres grass) with good buildings, and once regarded as a productive and desirable holding, cannot be let, although 8s. per acre would be accepted from a suitable tenant. It is indeed hard to see how farmers with arable farms on the poorer classes of heavy land can continue to carry on under existing conditions.

AGRICULTURAL CONDITIONS IN NOTTINGHAMSHIRE AS AFFECTED BY RECENT CHANGES

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In the past, farming systems have to a large extent been ruled by soil and climatic conditions. In Notts nearly one-fifth of the total area is uncultivated, due largely to the extensive "waste" land of Sherwood Forest on the Bunter formation. The main agricultural areas are formed by Magnesium Limestone, Bunter and Keuper geo-

logical formations, the Bunter being composed of light sandy soils, suitable for sheep-folding, and the Keuper of rather retentive soils, considerable areas of which are down to permanent pasture, where a good deal of grazing has been and is carried on. The development of the coalfields and the consequent mushroom-like growth of new areas of increased population, and the increasing demand from the larger towns and industrial areas for liquid milk, market-garden produce and smaller joints of meat, have had a marked influence on changes during such a short period as the last ten years.

The fact that no less than 16,000 acres have been lost to agriculture in the last ten years is, however, somewhat alarming; this is probably in the main due to the rapid extension of industrial areas and the return of several thousand acres of poor land to rough grazings and waste. The reduction of arable land by nearly 29,000 acres and the increase of grass-land by 13,000 is of interest, and the fact that no less than 2312 acres were laid down to permanent pasture in the one year 1926-1927 shows that the movement in this direction is a very definite and far-reaching one.

The relatively low prices for cereals in comparison with costs of production are reflected in the total decrease in the areas of wheat, barley and oats, of 34,390 acres as compared with 1918, and of 13,000 acres as compared with 1915—*i.e.* before the ploughing-up period.

While the potato area has remained unchanged, the swede, turnip and mangold acreage has suffered a drop of over 7000 acres, but sugar-beet has jumped from 29 acres to 5561, taking the place of the old root crops for the most part. This, however, has not materially affected either the permanent labour or number or type of stock kept, as sheep and cattle are run over the land and fed on the "tops" pretty nearly as long as if the land were in roots.

The tendency to keep seeds leys down for two and sometimes three years where possible, and to have a rather extended area for hay and grazing, will account for the increased acreage of nearly 9000 acres.

During the last ten years there has been a reduction of nearly 5000 horses of all ages used for agricultural purposes—*i.e.* 900 less actual working horses (which is probably due to the reduced arable area, and very little, in the writer's opinion, to the motor tractor) and 3000 unbroken yearlings and two-year-olds—due to the rather depressed markets that have prevailed. It should, however, be mentioned that there has been a decided improvement in this direction during the past year, and it is probable that the numbers of young stock will rise.

Cows and heifers in milk or in calf have increased by nearly 3000 head since 1918, and 6000 since 1915, whereas store bullocks and feeding beasts have decreased by about the same number.

Sheep, on the other hand, have not changed in numbers during

the last ten to fifteen years to any great extent, except during the two or three years immediately following the war; but if we go back as far as 1911 we find there has been a drop of something like 50,000 head. In other words, sheep have given way to this extent to increased milk production and the cultivation of saleable crops such as potatoes and sugar-beet.

The pig population is notorious for its ups and downs—due to market conditions—so that it is not wise to take much account of the increased figures shown in the returns as indications of any permanent change.

There has been a very definite increase in the numbers of poultry kept on farms. Figures are not available for the ten-year period, but for one year only—*i.e.* 1926-1927—there was an approximate increase of 47,550 fowls; and when it is realized that the type of birds kept and the general management have improved on the whole to a very marked degree, it will be appreciated that the increased egg production is enormous, and has indeed, in some cases well known to the writer, proved a very valuable and profitable change of policy. It is estimated that the poultry population has increased by 25 per cent. during the last ten years, and, more important still, that the egg output probably has increased by 60 per cent.

With regard to the size of holdings, there has not been any serious change during the past ten or fifteen years, the most marked being the increase of those from 50 to 150 acres and, in spite of the Smallholding Movement, the decrease in those of approximately 1 to 50 acres. There is a growing demand for holdings of about 100 to 150 acres by men of moderate capital, who desire to run general mixed farming, associated with milk production to provide ready money.

Markets.—There has been a noticeable change recently in the size of animals sent in fat to market. The demand for smaller joints has had its influence in this direction. Porkers of about 8 to 10 stone are in greater demand than heavier pigs, and the same applies to the two-year-old bullock. Most sheep-breeders move a fair proportion of their lambs fat, and the type of sheep has entirely changed from the June Lincoln to Crossbreds—the Hants, Oxford and Suffolk rams being largely used. Many favour the North Country sheep, and large numbers of hoggs are brought into the county to be fed on roots, or grazed during the summer on the grass-land areas in the South.

The movement for clean milk and the public demand for a better milk have had their effect on the general improvement of management, resulting in some cases in the sale of Certified and Grade A. A recent development has been the formation of Co-operative Societies run by farmers for the sale of milk and making surplus into cheese. Another change is the transference of Stilton cheese-

making from the home to the factory. There has also been a large increase in the numbers of small producer-retailers, particularly in the West or industrial areas.

The tendency in this county is to become more intensive. We have a type of young men coming forward who are availing themselves of all possible scientific information which can be applied with profit in practice. For example, they are rationing their stock right through, and are keenly interested in the economic side of their farming business. They are studying soil and manurial conditions very closely, and are out to take full advantage of any advice that we, the educational bodies, can give them; and I say without the slightest hesitation that these men are to-day doing quite well on their farms, even in spite of the depressed market conditions.

Conclusions.—The main changes that have taken place during recent years are:

(1) The decrease of arable land and proportional increase of permanent pasture.

(2) The reduced area under roots and mangolds is being replaced to a large extent by sugar-beet.

(3) The variation of the rotation to include seeds leys of longer duration, and the growth of saleable crops such as potatoes and sugar-beet.

(4) The reduction of sheep when compared with the 1910 period, the tremendous fall in numbers just after the war, and the gradual return to about 10,000 head short of 1914 numbers.

(5) The increase during the past fifteen years in cow-keeping and the sale of milk to its present steady level.

(6) The demand for smaller joints of meat has influenced the size of animal sent fat to market.

(7) The decided improvement in methods of management and feeding of farm live stock and manuring of crops and grass-land, and the keen desire of many young farmers to avail themselves of scientific and technical instruction that has direct relation to farming practice.

(8) Apart from the demand for holdings of from 100 to 150 acres there appears to be little change except in the decrease of the smallholdings of from 1 to 50 acres and of farms of over 300 acres.

RECENT BREAKS FROM THE OLD ROTATION IN SUSSEX

By H. DREWITT

Colworth, Chichester

My remarks refer to the Southdown country and the plain between it and the sea in West Sussex.

The foundation of farming in this part of the world is found in

the Norfolk or four-course system—probably no finer method of maintaining the fertility of the land in Eastern and Southern England has ever been thought out, and that is why landlords are so careful to stipulate in their leases and agreements that the farm shall be left in four-course lain. Its central point was the root crop, which provided the means of keeping a large head of stock on the farm throughout the winter; on the lighter soils sheep would consume the root crops on the land. The sheep stock might be a Southdown flock, a Down crossed flying flock for the production of fat lambs (many thousands of Dorset Horn and Hampshire Down ewes were brought into Sussex annually for this purpose), or wether lambs for fattening would be bought in the autumn when the amount of keep available could be estimated with fair accuracy. A more detailed account of the cropping of the district as it was some twenty years ago is given in Hall and Russell's *Soils of Kent, Surrey and Sussex.*

Another feature of the four-course system was the regular flow of work which kept the permanent staff of both horses and men steadily employed throughout the seasons, without alternate rushes of work and then slackness. It was a method needing a large amount of capital which was turned over very slowly, but it did not require much brain power; one had only to look over the hedge as one drove to market or church to see what one's more prosperous neighbours were doing, and then follow their example.

Nowadays these happy times are long past: one man is making wholesale milk production the principal feature of his farming, another is breeding sheep on a large scale, while a third has a milk round in the nearest town and perhaps combines with it the sale of poultry, vegetables, or even flowers. The one thing that no one specializes in is corn production.

The acreage of clover grown for feeding or haymaking has much diminished, and leys for two or three years are taking its place; this automatically cuts down the wheat crop which used always to follow the clover. The seeds mixture for the longer leys is made up of some Italian and perennial rye-grass, cow-grass, timothy-grass, and possibly a little wild white clover. These longer leys are followed by roots or oats, as wheat seldom does well after grass.

When white winter oats became popular they were frequently sown in place of wheat; they have the great advantage of being ready to harvest, thrash and sell early, thus providing some money early on in the harvest.

The greatest changes in the rotation are seen where the fallow crops come in; very few swedes are grown, and the disciples of Mr Boutflower are equally chary of growing mangolds. This eliminates to a large extent two very expensive crops. In their place many farmers are content to sow mustard to plough in, or, when they have a ewe flock, to feed off. Marrow-stem kale to feed

off before Christmas is grown to an increasing extent, as it requires little hoeing. Of course there is not so much keep produced, but then not so many sheep are kept; the marrow-stem may last until the end of February, then the turnips are fed, and after that the swedes and mangold (if any). The sheep used to go on to swedes about 1st December. The mustard is sown and ploughed in chiefly by cow-keepers who have given up growing mangold.

Sugar-beet on the deeper soils provides a root crop that is saleable, and which at the same time leaves a considerable residue that can be fed on the ground by sheep, or carried to the yards and stalls for cattle. This crop, if the price paid for it continues to be sufficient, would seem to help in the solution of the difficulties of providing a fallow crop which will leave a balance on the right side of the cash-book.

Flockmasters have always to provide a late piece of roots to feed off in the latter half of April; this used to be sown with cuckoo oats and rarely produced more than ten sacks of light oats to the acre. Now this land can be sown with sugar-beet, which usually does well after the root crop and saves a portion of the expensive preparation of the land.

Perhaps a clean field may be sown with trefoil and mown next season to provide an extra hayrick, and then be broken up and put in with turnips. Then, instead of the vetches being followed by turnips, mustard may be sown, to be ploughed in or fed off as circumstances may require.

Catch-cropping such as I have just described plays havoc with any settled scheme of rotation, for so much depends on the character of the season, particularly the amount of the rainfall, and changes may have to be introduced when the cultivations are half completed.

The tractor has also influenced the rotation, since it provides a valuable reserve of power; it can be worked long hours whenever it is necessary, and never eats on Sundays.

Possibly the new forms of artificial manures, and still more their relative cheapness, may stimulate further changes in the rotations, but progress in this direction would be more rapid were it possible to supply the soil with lime in a less expensive manner than can now be done; we have all been drawing extensively on the reserves of lime supplied by our fathers and grandfathers, and there are signs that this draft is becoming an overdraft.

Another feature which is changing the character of the rotation in the district to which my remarks refer is the establishment during the last ten years of ranks of bungalows all along the sea-coast, which from June to September are filled with a population which requires large quantities of dairy produce, fruit, vegetables and a little meat; naturally, efforts are being made to supply this demand at our doors.

On the Southdowns the changes are in quite another direction: here the primary condition is to reduce expenses, particularly labour, consequently the wheat area is cut down to a minimum; very few root crops which want hoeing are sown, their place being partly taken by rape and turnips. Grass is rapidly increasing in acreage; much of it is called temporary, but probably only time will be needed to convert it into permanent pasture. This movement would be much accelerated if it were not for the expense and difficulty of fencing and providing a water-supply on the chalk. The real Southdown Hill flock is becoming a thing of the past, and in many cases nothing is taking its place; no one who has the capital to found one will take a large hill farm.

To sum up shortly, I would say that the influences at work to-day in the district of which I am speaking are:

Firstly, the break up of the landed estate system, which leaves the new owner-occupier free to farm his land as he likes throughout the whole term of his occupation.

Secondly, the effort to get a more rapid turnover of the capital in the farm.

Thirdly, the desire to supply the demand for what may be termed the less essential foods.

Lastly, and all the time, the dire necessity of reducing expenses.

RECENT CHANGES IN THE SYSTEM OF HUSBANDRY IN SOUTH LINCOLNSHIRE

By J. C. WALLACE, M.A.
County Agricultural Organizer, Northants

Perhaps in no part of the country has so great a change in the system of farming taken place as in South Lincolnshire. This change is comparatively recent—within the lifetime of the present-day farmers. Forty years ago the district was chiefly pasture and wheat; to-day it is all arable. In the eighties the district was, if anything, in a worse plight than other parts of the country, but the change which has taken place in the system of husbandry has made it one of the most prosperous areas in the country. Farming in South Lincolnshire has, since the beginning of the present century, been a profitable undertaking, and this prosperity has been due to the fact that the farmer has been willing to change, and did change, his system of farming.

The remarkable feature is that this change, when it began, was in direct opposition to that which was taking place in other parts

of the country. Arable farming was in a serious plight, and land generally was tumbling down to grass. No better grass could be found anywhere than in South Lincolnshire. Long famed for its wonderful pastures, described by Arthur Young as the "glory of Lincolnshire"—pastures which would carry a bullock and a half per acre, as well as four sheep in summer and two in winter—it might reasonably have been expected that the proper solution to the difficulties of that period would have been the preservation and further development of these pastures. But the reverse has happened. In direct opposition to the increase in the acreage of permanent pasture in other counties in England, there has been a gradual increase of arable land in South Lincolnshire. Gone are all the wonderful pastures, the bullocks and sheep; gone is the old six-course rotation which held sway on the arable land of the larger farms, and instead there has developed one of the most intensive systems of farming, with the potato crop as its centre, ever practised in this country. The acreage of potatoes alone has increased in Lincolnshire from 40,352 acres in 1883 to 112,778 acres last year, and practically all that increase has taken place in the alluvial and fen districts surrounding the Wash.

This remarkable change from grass to arable at a time when the reverse was taking place in all other parts of the country is well worth consideration. This change in the system has not been achieved by the migration of new blood, such as has taken place in some other districts, but has been entirely brought about by the farmers born and bred in the district. A great deal of it is due to one or two pioneers such as William Dennis, who realized that the soil of the district was more profitable for the growing of potatoes than for the feeding of bullocks. In went the plough, and as the pasture disappeared the farmers' bank balance increased.

Definite figures to show what has taken place are difficult to get hold of. Earlier figures generally relate to Lincolnshire as a whole, and give no idea of the changes which have taken place in South Lincolnshire. That the greater portion of the area was pasture is quite definite. There was a large bullock and sheep population. The arable land was devoted chiefly to the growing of wheat, the rotation being a six-course one—fallow, oats, wheat, seeds, wheat, barley. At the present time the bullock and sheep population has sunk to very low figures, and the six-course rotation has become, at least in the maincrop potato areas, a three-course one, in which the potato predominates.

I am aware that there has been an economic incentive behind the farmer in bringing about this change in his system of cropping, but in addition there is the very important personal aspect. The South Lincolnshire farmer has always been somewhat of an adventurer. His training has been such as to make him easily adapted to

a change of system. Farming in the district has undergone many changes since the land was first reclaimed. In the early days oats were largely grown and were exported to the Continent. Later, wool became the staple industry, and large quantities were exported. Still later, bullock-feeding was a prominent feature, and in the early days of the nineteenth century oats had again become a prominent feature and were again being exported from Boston Docks in large quantities.

Potato-growing was attempted in the district as long ago as the year 1800, when one large farmer grew 200 acres for cattle food, but although he got a good crop it ruined him. In the fifties and sixties, however, potato-growing had become profitable, and its cultivation was becoming common in the Wainfleet district, mostly amongst small freeholders. At that time the district contained a large number of small freeholders. In the parish of Freiston no one farmed more than 40 acres. These men were also attempting other crops, such as celery, cabbage, cauliflower, etc. On the larger farms such crops as turnip, swede, mangold and mustard were being tried for seed purposes. On the freeholds there were of course no restrictions as to cropping, and even on the larger rented farms restrictions were very easy.

The South Lincolnshire farmer was therefore not trained to any strictly stereotyped system, and this explains to some extent why he so readily adapted himself to the new system once it had been demonstrated to him by Dennis and others. Pasture land suitable for growing potatoes soon became very valuable, and some very high prices were paid for it. Practically all the land in the district has now been bought by the farmers themselves, and it is only very rarely that a farm can be rented. The average value of the land in the county is probably £80 per acre, but double this price has occasionally been paid for land in the early districts.

The new ploughed-up land is very fertile, and can be used for the growing of early potatoes for fifteen and more years in succession. In the early districts no definite rotation is adopted. In the maincrop areas a more or less definite system is in operation, but the farmer generally is never averse to changing his cropping to suit economic conditions. For instance, the acreage of seed crops such as mangold, mustard, etc., changes upwards and downwards according to contract prices.

The system generally has produced a type of farmer keenly alive to the business side of farming and also keenly alive to new ideas and possible improvements.

RECENT CHANGES IN CHESHIRE HUSBANDRY

By W. B. MERCER, B.Sc.
County Agricultural Organizer, Cheshire

From an agricultural standpoint Cheshire can be divided into two portions—north and south. The latter is nearly all heavy grass devoted to cheese and milk-selling. North Cheshire is, from the viewpoint of the present Conference, more interesting, though even here it is lack of change rather than change which I have to record.

There is much light free working soil, which alone is cultivated, and the 30 inches of rainfall is well distributed, so that a wide range of cropping is possible. Dairying has from time immemorial been the feature of the area, and the rapid development of the great market of Lancashire has confirmed the practice. This market offers an outlet for other farm produce too. Potatoes (which can be harvested from mid-June onwards), corn, straw and hay are all saleable. Town manure is still available—and for many years Irish labour has flocked hither for the potato crop.

Typically the farms are small—we call 200 acres a large farm, and in all Cheshire there are only sixty-seven holdings over 300 acres—and worked by a family with or without a small permanent staff of labour, plus Irish labour in summer-time for the potato crop on the larger holdings. The head of a family farm is apt to look askance at modern views on labour and labour costing. To him his small staff, whether paid in cash or kind, is like the rent—a fixed overhead charge. Even the potato crop on a small farm is part of the routine, while on the larger farms it is an affair of so much Irish labour and may be considered apart from the farm altogether. For the rest, every proposition concerning the management of the land resolves itself into this—can it or can it not be compassed by the permanent staff? Anything which they can do is not looked upon as costing anything, since the dairy herd necessitates a certain staff, and that staff is available for other work in any case. On the other hand no change of cropping which requires extra labour is likely to be very acceptable. I think it is probably true to say that cost of food-stuffs for dairy cattle is with us a greater source of anxiety than labour. Every crop, however, offers two distinct alternatives —direct sale or utilization by dairy stock. It is unlikely that any crop will fail in both directions, hence cropping systems are likely to remain fairly stable; food-stuffs for cattle which can be produced on the farm and thus reduce heavy cost of purchased cakes are likely to be very popular. Cropping changes therefore are likely to be of a minor rather than a major character.

The position as regards area under grass is as follows :—

Arable and Grass Land	*Per Cent. Permanent Grass*	
	1915	1928
Cheshire County	62·43	65·3
Six Northern Petty Sessional Divisions only .	47·8	46·5

Rotation. — I can detect no noteworthy change in rotational systems. The arable area is all under five or six years' rotation, with grass occupying two or three years. Here and there rapid conversion of poor old permanent turf to new grass by ploughing and immediate reseeding is now resorted to. We have been very successful with this method on a poor farm in the smoke-damaged area east of Manchester.

Corn-growing.—The area under corn does not alter greatly. In discussing this we have to remember that farmyard manure is produced in such large quantities as to be a by-product on many farms, and that, where short, it is often supplemented by town dung. Hence a good yield is not difficult to attain.

Oats.—Whether taken after lea or after heavily dunged roots the danger of lodging is very great, hence we greatly favour a variety which will stand. For this reason Marvellous oats have attained to great popularity despite their coarseness. The Swedish varieties crop heavily and are far better quality, but even these valuable attributes scarcely give them a position above Marvellous. Winter oats gained greatly in popularity during the first years after the war on account of the season of sowing, earliness of ripening, and their power of suppressing annual weeds such as charlock, but two winters of severe frosts have driven most people back to very early sowing in spring.

All straw crops are valuable to us as litter.

Wheat.—The demands of the poultry market and the reasons I have already referred to make wheat a profitable crop. Indeed, save that we are prone to sow too late — a result of following potatoes or roots—and to get a poor crop in consequence, I should say wheat is as profitable as any crop we can grow except potatoes. Our damp winters, with alternations of frost and thaw, are a serious handicap, and winter hardiness is therefore the first requirement of a variety. At Reaseheath we have tested a large number, but cannot find anything so *safe* as the local standard variety, Standard Red. In most years some one variety will surpass it in yield, but over a period of years it would undoubtedly stand first.

In the root section a definite alteration is to be observed — I think it is the one legacy of the arable dairying campaign—and that is marrow-stem kale. Both as a self crop and as a second crop after early potatoes it has now become a thoroughly established minor crop. We at Reaseheath can find nothing better for autumn feed for dairy stock.

There are several noteworthy features in connection with potato cultivation. Everyone admits the superior cropping power of Scotch seed—we all buy a certain amount every year. But a good many of our potatoes are for the early market, and in this business earliness is at least of as great consequence as weight of crop. It is commonly held by the early growers that "once grown" seed gives a crop which is marketable earlier than that from Scotch seed. I believe this is true, though I have not established it experimentally. Certainly the seed sprouts much earlier.

Our method of growing earlies, involving a half splitting of the drills after farmyard manure has been carted in and marking of the furrows with a holing machine prior to planting, represents, I think, a recent local evolution—at any rate I have not seen the method elsewhere. As regards use of machinery in lifting, a census would probably show definite retrogression. I certainly know a good many farmers who own spinners, but will not use them.

A very interesting situation has developed in the past three years over manuring of earlies. We apply large quantities of artificials to the open drills before the sets are planted. Three years' trials at Reaseheath and at other centres in the county have all gone to show that no combination of artificials we can devise materially alters the yield in the early stages—indeed many dressings seem to check it, so for the time being we are rather in a quandary. I think the explanation lies in the manner of application. Of course considerable increases are obtainable in the case of crops lifted late in the season.

Sugar-beet has been tried over a fair area, but with labour and other costs approximating to those of potatoes, and maximum receipts in the region of £30 per acre, most farmers who have tried the crop in an experimental way incline to return to their earlier love. Certainly sugar-beet is not on the increase; only 152 acres were grown in Cheshire in 1927, and of this one-third in the purely dairy-farming area, around Nantwich.

FRUIT AND VEGETABLES AS AN ADJUNCT TO THE FARM

By H. V. TAYLOR, O.B.E., B.Sc.
Ministry of Agriculture

The association of the above crops seems to suggest either that fruit and vegetable growing has been adopted on the farms when the recent changes in husbandry took place, or that these crops are ripe for adoption when such changes are made. Past experience shows that a continuance of years economically bad to the grower

is the greatest incentive to change, and, in consequence, the economic aspect must loom largely in any considerations of the subject. When studying the Blue book (Cmd. 2815, issued in 1927) of the *Agricultural Output of England and Wales, 1925*, the author was impressed with the statement that the total value of the agricultural output of England and Wales in 1925, which was estimated at £225,000,000, is equivalent to an average gross output of fully £8, 10s. per acre of the total area under crops and permanent grass, after making allowance for the rough grazing. As much feeding-stuff is imported, all the products are not, of course, entirely the output of the soil of this country alone. The figure of £8, 10s. per acre is then somewhat higher than the true figure. When it is further recalled that, on the average, the landlord's capital is £31 per acre and the tenant's capital is £14 per acre—with wages near 30s. per week per man—the figure of £8, 10s. gross output suggests that the present-day farmers and the landlord would have some difficulty in earning much return on the capital involved.

That being the case, it may repay study to see whether, by growing some special crops, the soil—perhaps by more intensive cultivation—could not be made to return a higher figure, for that is the side of the subject which specially attracts.

From the Blue book the following Table can be compiled:

Crop	*Acreage*	*Total Value sold off Farm*	*Return per acre*
Wheat . . .	1,500,000	£12,070,000	£8 0 0
Potatoes . . .	493,000	11,830,000	23 12 0
Fruit[1] . . .	274,989	9,720,000	35 7 0
Vegetables[1] . .	185,437	8,400,000	45 6 0

The figures show that by growing wheat the value of the corn sold off the farm gives a return of £8 per acre, to which the value of the straw—perhaps another £1—should be added to give the true figure. By growing potatoes the return is a much higher average for the whole country. The figure was £23, 12s. By growing fruit (including all kinds) the average gross money return was as high as £35, 7s., and by growing vegetables the return reaches the very high level of £45, 6s. per acre. But fruit is a comprehensive term, and to get a clearer idea it is necessary to analyse each fruit crop in more detail. This is done most conveniently by compiling the facts together in the form of a Table, thus:

[1] Glass-house crops not included.

Crop	*Acreage*	*Value of Output*	*Value per acre*
Strawberries . .	29,300	£1,410,000	£48 0 0
Black-currants .	11,700	660,000	56 8 0
Gooseberries . .	16,100	550,000	34 3 0
	No. of Trees		*Per Tree*
Apples: culinary and dessert . .	12,102,000	3,750,000	0 6 2
Apples: cider .	2,727,000	290,000	0 2 2
Cherries . .	741,000	1,130,000	1 10 0
Plums . . .	5,105,000	1,180,000	0 4 7

The statistics for the tree fruits do not record the acreage, but give the number of trees. Cherry-trees, of which sixty to seventy are grown to the acre, yielded in 1925 the surprisingly high return of £1, 10s. per tree—which represents a very high acreage return. Both plums and apples are more thickly planted, and though the returns per tree are but 6s. 2d. for culinary and dessert apples and 4s. 7d. per tree for plums, the returns per acre would again be substantial.

The figures for the small fruits are easier to obtain, for acreage figures are given. Gooseberries give the smallest return, of £34, 3s. per acre. It should be remembered that gooseberries are frequently grown under the tree fruits, so that the true acreage return would be obtained by adding the two returns together. Strawberries—in a poor year—gave the small return of £48 per acre, whilst black-currants gave the very high return of £56, 8s. per acre. It seems, therefore, that the fruit crops are real money crops.

So much for fruit crops. Now as to the vegetable crops, the returns for which are given in the following Table:

Crop	*Acreage*	*Value*	*Value per acre*
Green peas . .	43,500	£1,070,000	£24 12 0
Cabbages . .	35,200	2,080,000	59 0 0
Cauliflowers and broccoli . .	18,100	1,680,000	93 0 0
Brussels sprouts .	21,300	1,020,000	48 0 0

Of these the green-pea crop returns but £24, 12s. per acre, the cabbage crop £59 per acre, cauliflower and broccoli the high return of £93 per acre, and brussels sprouts but £48 per acre. In all cases these crops occupy the soil for much less than the year, and it is the practice to take more than one crop per year. For instance, the brussels sprouts usually follow the early potato crop—as also does the broccoli and spring cabbage. High though these figures are, they by no means express the real gross money return per acre secured by growing such crops.

The return per acre from the production of fruit and vegetables, although large, has not induced to any great extent the ordinary farmer to practise their cultivation, for their production is confined mainly to that class commonly known as "Fruit and Vegetable Growers." The official statistics (Cmd. 2815) state that the number of holdings in which half the area or more appeared to be devoted to these crops was 28,400, with a total area of 379,000 acres; as the total area of fruit and vegetables is but 470,426 acres, only a small area of these crops can exist on the farms proper.

Whilst fruit may be grown successfully in most soils, and in all parts of the country, its commercial production is limited to the areas where soil, aspect and climate are agreeable. These crops demand much attention if fruit of a marketable standard is to be obtained. The successful cultivation of market apples to-day demands an expenditure of at least £10 per acre in sprays, of which at least three must be made annually, apart from the cost of tillage, manuring and pruning. Harvesting, storage and marketing are operations which need much labour, and entail further expenditure. The production of soft fruits is even more extravagant of labour, whilst harvesting time is one of the greatest possible anxiety, for the ripening period is only too short.

In successful vegetable-growing the land has to be made fat with abundant manures, and constantly cultivated, often with hand labour. All this means much expense.

To engage in this type of business means the employment of more labour—incidentally paid at a rate somewhat higher than the ordinary rate for an agricultural worker, as the following figures for typical counties of England show: Somerset—a typical agricultural county—employs per 1000 acres 28·7 total workers; Kent and the Isle of Ely—typical fruit counties—employ 66·8 and 63·3 respectively; whilst Middlesex and London—typical vegetable counties—116·2 total workers per 1000 acres.

The author refrains on this occasion from giving figures for the cost of production of the fruit and vegetables for the reason stated—that they are considerably higher than for agricultural crops. In addition, the labour troubles are more numerous; the fight with insects, fungus and bird pests much greater; whilst the marketing problems are immensely more important and difficult than for farm crops.

Fruit crops can well be combined with farming, as the Kent growers have shown. Vegetable-growing is more difficult, for soils have to be made very rich indeed for vegetable culture, so that corn grown on them lodges badly.

However, the farmer who is prepared to accept these additional worries and financial burdens, coupled with the task of acquiring a capacity for marketing, has a distinct future with these new crops. The demand for them is increasing, and prices for most kinds show no tendency to fall.

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