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SAND LAND FARMING

A study of the impact of war-time conditions on the Nottinghamshire Sand Area

by

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FOREWORD.

Farming profits move up and they move down but all the time farming practice pursues the even tenor of its way. The skilful farmer modifies his practice to meet changing circumstances. In exceptional cases he may effect revolutionary changes. But generally the basic threads run through year in and year out. It is not entirely conservatism on the part of the farmer that is responsible for this. There are many sound economic reasons. In most of its aspects farming is a long term job and although the good farmer is often characterised by a certain amount of "in and outness" a careful look at his methods usually shows a fairly marked continuity of policy. Farming, too, is much more dependent than are other industries on environment. Geographical and geological factors limit farming possibilities in many ways and if flouted, are liable to prove implacable enemies. It is the permanent factors of this kind that are responsible for the large variety of farming types found even in a small country such as England. In some districts the soil is heavy, in others it is light. In yet others the rainfall is high and elsewhere it is low. Arising from the multiplicity of combinations of the governing geographical and geological factors involved is a multiplicity of farming types, each with its characteristic practices and problems.

Even under static conditions a study of each separate type, a description of the most successful methods and a comparison with practices in other areas would yield useful results. But economic life is not static and probably at no time in our history have changes been faster than at present. The physical environment remains the same but the economic, social and political environments have undergone and are undergoing great changes, all of them calling for a reconsideration of basic farming practices in order to fit the industry better to meet the needs of the community.

In some cases the modifications required will be of a minor nature. In others they may call for major changes. But whatever the degree of adjustment required, a knowledge of past and present practice is invaluable if it is to be carried out with the maximum degree of efficiency.

The object of this report is to supplement the considerable literature on the sand lands of Nottinghamshire with an analysis of farming practices on the Sand during the years since 1936. Farmers in the area have been called upon to make a great effort in food product-

ion. Under the stress of conditions they have willingly and speedily effected modifications of their practice which under normal circumstances might have taken many years to bring in. Now with the possibility of a return to more settled times they are wondering what their next moves should be. Will it be better to return to the traditional practices of retaining fertility or are new and possibly improved methods likely to give the best results? Is barley growing likely to be the best bet in the years to come or would it be better to go in for ley farming and concentrate on milk production? These and many other problems are constantly before their minds.

The right course hinges on what is going to happen in the future and this in turn is dependent on many things. But, however difficult it may be to forecast what is likely to happen next year or in ten years' time, the lessons of the past and the problems of the present have a value in the formulation of policy. In this report a survey is made of some aspects of past and present Sand land practice. The economic results of farming in the area during recent years are analysed and suggestions for the future are made. It is hoped that these suggestions will instigate practical thought and experiment which in turn will go a long way to point the right direction for the future.

WILLIAM E. HEATH.
Provincial Agricultural Economist.

INTRODUCTION.

The main agricultural problem of the Nottinghamshire Sand area lies in the inherently low fertility of its soil. Economically it shares the fate of all infertile farming areas; they are marginal areas which, in general, barely yield sufficient to cover the over-all costs. The profits earned by farmers in the more prosperous years have rarely been sufficient to enable them to acquire adequate capital for essential re-equipment. Often they have not been sufficient to offset the losses of some other years. The rents which farmers have been able to pay have rarely been adequate to meet legitimate estate costs incurred by landlords and the evidence of some failure to maintain farm houses and buildings in adequate repair as well as the more general failure to expend capital on modernising farm buildings arises from the low rents received. A decline in the profitableness of the industry is felt immediately by farmers occupying such relatively infertile soils. Any prolonged period of low profits in farming would inevitably result in some of the land in the Sand area becoming derelict, but, because of the practical difficulties associated with the realisation of tenants' capital expended in improvement of the land, many occupiers hold on hoping for an improvement. Their sons and daughters most likely would leave the land and seek employment elsewhere, and this would aggravate the position of local farming still further. Thus there is a great risk that under such conditions many farming families in areas of low fertility would find themselves living in dire poverty. The economic and social risk is a very real one and it is for this reason that every consideration must be given to future forms of organisation and land management of such areas under changing economic conditions within the industry.

DESCRIPTION OF THE AREA.

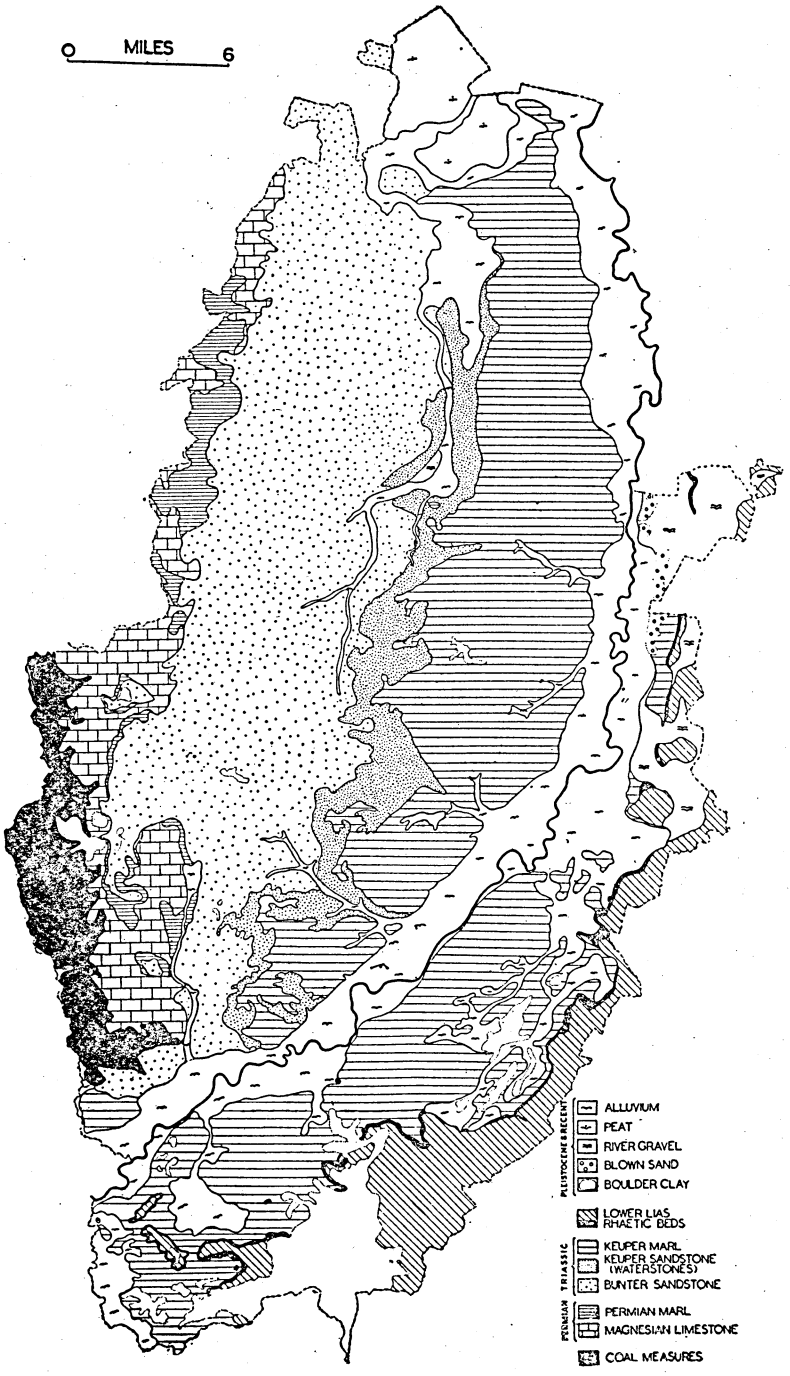
Much detailed information on the geography and history of Nottinghamshire, with particular reference to the Sand area and its farming is contained in various publications. Important amongst these are the Report of the Land Utilisation Survey of Britain, Part 60, Nottinghamshire, by K.C. Edwards, M.A.[1] and Dr. S. M. Makings' The Economics of Poor Land Arable Farming[2]. Only the chief characteristics of the area are summarised here.

The area variously referred to as Nottinghamshire Sand, Sherwood Forest area or Forest Sand Sheep and Arable Region covers 39 parishes in the county of Nottingham and extends from the northern outskirts of the city of Nottingham to the parish of Harworth in the north, and roughly from the line drawn through Worksop and Mansfield in the west to the main road leading from Oxton, through Ollerton and Blyth to Bawtry in the east. The area, represented in terms of the solid geology and of the land use, is shown on the maps 1 and 2 (page 14 and 15).

Nottinghamshire Sand occupies more than a quarter of the total area of the county. It lies entirely within the drainage basin of the river Trent. The area varies in elevation from 200 to 400 feet, with some small portion around Mansfield rising to 500 or even 600 feet above sea level. Of the total area of Nottinghamshire covering just under 537,000 acres, about 400,000 acres, i.e. approximately 75 per cent, are in agricultural use. The Sand area has a higher proportion of agricultural land under tillage crops than any other area within the county, and much of the development of agricultural holdings in the Sand area was in the past fostered by landowners who spent the wealth derived from coal on the improvement of their land properties. In 1924 woodlands covered 30,000 acres or less than six per cent of the total area. Since then the area under trees has been extended as a result of the activities of the ForestryCommission, local authorities and private landowners. The modern afforestation programme with concentration on conifers differs, however, from the traditional forest conditions on the Sand where in many instances ancient oaks have long since passed their most useful stage and have fallen into useless timber. Small woods are distributed fairly

1 *K. C. Edwards, M.A., (London).* The Land of Britain. The Report of the Land Utilisation Survey of Britain, Part 60, Nottinghamshire. Edited by *L. Dudley Stamp, B.A., D.Sc., London,* 1944.

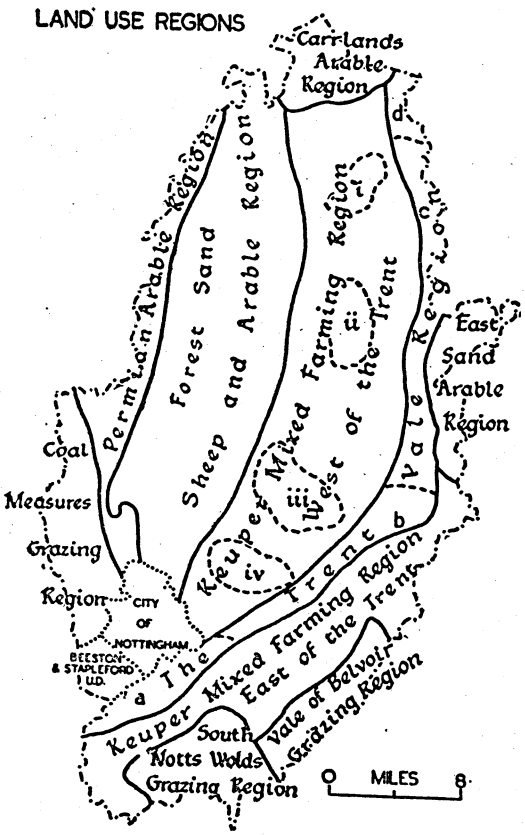
2 *S. M. Makings, Ph.D., B.Sc., (Econ.), N.D.A.* The Economics of Poor Land Arable Farming, London, 1944.



Map 1. The Solid Geology of Nottinghamshire.
From The Land of Britain. The Report of the Land Utilisation Survey of Britain edited by *L. Dudley Stamp, B.A., D.Sc.*, Part 60. Nottinghamshire, by *K. C. Edwards, M.A.* (London). London, 1944.

evenly over the whole area of the county but the greatest concentration of the woodland acreage is found in the Sand area, which was partly the original site of the great Sherwood Forest.

Only a small proportion of the occupied persons in the county are engaged in agriculture. According to the 1931 census, out of the total of 339,000 persons in all occupations, only 15,000 were engaged in agriculture and allied occupations. In addition there were about 1,000 persons within the city area engaged in agriculture and allied occupations. About 80 per cent of the total county population are town inhabitants concentrated mainly in the area of greater Nottingham, Mansfield, Worksop and Newark. The first three of those are the



Map 2. The Land Use Regions of Nottinghamshire.

From The Land of Britain. The Report of the Land Utilisation Survey of Britain edited by L. *Dudley Stamp, B.A., D.Sc.*, Part 60. Nottinghamshire, by *K. C. Edwards, M.A.* (London). London, 1944.

only sizeable urban centres in the Sand area. Coal mining employs more people than any other single industry in the county. In 1931, 206 per 1,000 males, 14 years old and over, were engaged in coal mining and quarrying, 77 per 1,000 were metal workers and 41 textile workers. At the same time 128 per 1,000 women of 14 years of age and over were engaged in the textile industry or in the manufacture of textile goods and articles of clothing. Although the chief mining area is situated on the western fringe of the county, new mining settlements have also been built in other parts of the Sand area. Ollerton is a good example of such a settlement, while new coal mines have been developed as in Calverton.

The soils in this area, originating from the underlying rock of Triassic formation, belong to the group of Bunter Sandstone. They can be divided still further into the lower Mottled Sandstone type and Pebble Beds, the former characteristic of the area between Bawtry and Worksop and around Warsop, and the latter south of Worksop. The Lower Mottled Sandstone type of soil is superior to the Pebble Beds owing to its finer, loamy texture and somewhat higher retentiveness of water.

The main features of soil in the Bunter Sand belt of Nottinghamshire are, with local variations, the loose texture, high degree of acidity, insufficiency of humus and low retentiveness of moisture. The soil is, on the other hand, easily workable and responsive to warmth.

In Nottinghamshire the mean annual temperature is about 38°F. in January and about 61°F. in July. Over the last 60 years the yearly mean temperature has shown the relatively wide variation of about 22°F. Approximately 80 per cent of the frosts occur between November and mid-April with an occasional late frost occurring as late as mid-May. The rainfall is slight, from 22-30 inches per annum, and the greater part of the area receives less than 25 inches April is the driest and May the sunniest month of the year. The mean daily amount of sunshine over the year is about three and a half hours. Owing to the local influences of the river Trent and of the configuration of the landscape, the area is susceptible to mists and fogs which occur frequently and persist especially in autumn and in winter. The combination of insufficient rainfall with relatively short daily periods of sunshine in the important months of April and May is particularly undesirable from the farming point of view. But as meteorological records over the period of sixty years show, almost two out of every

three years have insufficient spring rainfall in the area. The insufficiency of spring rainfall suggests a desirable change in the planning of cropping this land, the development of crops suitable for light soil and also the development of winter sown crops more independent of the low spring rainfall.

According to the 17th century records a large part of the county, including the Nottinghamshire Sand area, was covered by forests. Sherwood Forest, according to the 1609 survey extended to 95,000 acres, or 18 per cent of the total area of the county and only a very small proportion of the land in that area was used for agricultural purposes. The farming area in those days extended between the Forest in the west and the river Trent in the east and in the Trent Valley. The chief products of the county were timber and wool.

Intensive timber felling throughout several centuries was accompanied by encroachments being made both by large landowners and squatters on the Forest land. The land thus acquired was cleared, enclosed and taken into cultivations and in this fashion large holdings were eventually established. The enclosure movement which started before 1700 and consisted, at first, mainly of enclosing land for pastures or temporary cultivation, gathered momentum in the 18th century and by 1800 the greater part of the land was enclosed[1].

The agriculture of the Nottinghamshire Sand area in the middle of eighteenth century was very backward according to Arthur Young[2]. A more detailed description of Nottinghamshire Sand farming is contained in Robert Lowe's report[3]. Although Lowe's remarks refer chiefly to the more advanced farmers of the period, they give an interesting account of the systems of farming then existing in the area. The Norfolk four-course rotation was generally practised (turnips, barley, clover, wheat). A rotation including six crops (turnips, barley, clover, wheat, turnips, barley) and three years of grass was used on better lands, and on poorer lands turnips were followed by oats and three or four years of grass. Turnips, a new crop, were included in every rotation and regarded as very important owing to their feeding value. Sheep breeding remained throughout the 18th century a mainstay of farming but, due to cross-breeding with Lincolns and Leicesters,

1 *W. E. Tate*, Nottinghamshire. Parliamentary Land Enclosures in the County of Nottingham, 1743-1868. Thoroton Society, Record Series, Vol. 5, 1935.

2 *Arthur Young*. Tour through East England, 1771.

3 *Robert Lowe*. A General View of the Agriculture of the county of Nottingham, 1794. Published by J. Nicol, Pall Mall, for the Board of Agriculture and Internal Improvement.

the original local small sheep, known for their fine wool, gradually disappeared. The introduction of sheep larger in size than the original local breed resulted in an increased demand for food and the land had to be cropped according to the needs of the sheep.

The increased demand for home-grown food during the period of the Napoleonic Wars stimulated further progress of farming in the area. There occurred an increase in the cultivation of turnips and the conversion of unproductive land into pasturage enabled farmers to increase their flocks of sheep. There then developed a new practice of wintering cattle in the yards and selling them out in the spring as forward stores to farmers seeking cattle for grass land fattening. The farmyard manure was carefully preserved and applied to the land, especially land sown under roots and barley. Some experiments were also made in the use of fertilisers and some new crops were introduced, e.g. swede-turnips, but these experiments, confined chiefly to the large estates had, at first, little practical value, except that they reflected the progressive spirit within the industry. On the whole, the contemporary descriptions of agriculture in the area[1]. tended to exaggerate the achievements of farming. Steady progress was made, stimulated by the developement of agricultural science and by the strong demand for home-grown food at this period. The progress, when comparison is made between farming then and farming in the preceding century, was especially noticeable[2]. But in the background there was, for the Nottinghamshire Sand farmer, always the shadow of the hungry, thin soil, and of the conditions of subsistence or near-subsistence farming. How deceptive was the appearance of progressive prosperity at the beginning of the last century was shown by the effects of the depression which followed the Napoleonic Wars and resulted in the agricultural community, generally, suffering many hardships and privations particularly affecting those living in the Sand area. The conditions of farming, including the Nottinghamshire Sand farming, improved and kept improving in the middle years of last century under the combined effects of the depression of the 1870's, and changing economy of the country, accompanied by imports of cheap food from overseas, put agriculture once more in a precarious position. The position in the Nottinghamshire Sand area was made more difficult because the practice adopted elsewhere of putting arable land down

1 *Robert Lowe.* Ibid.
R. W. Corringham. The Agriculture of Nottinghamshire. Journal of the Royal Agricultural Society, 1845.
Parkinson. On Improvements in Agriculture in the county of Nottingham since the year 1800. Journal of the Royal Agricultural Society. 1860.

2 *J. C. Chambers.* Nottinghamshire in the Eighteenth Century. 1932.

to grass and thereby economising on labour was impracticable on this light and hungry soil. Falling prices resulted in the reduction of the number of sheep on a national scale and in Nottinghsmshire it fell from 250,000 in 1892 to 142,000 in 1939. The decline in sheep population was, however, not only due to falling prices and at least to some extent it was the effect of growing labour difficulties, increasing number of cattle and increasing application of chemical fertilisers. Some development of dairy farming took place in the area, stimulated by the demand from the local industrial population for milk, but here too, the Sand farmers were at a disadvantage as compared with milk producers on more fertile lands in neighbouring areas. Other farming possibilities had to be explored and pigs and poultry as well as such crops as potatoes and sugar beet gained in importance. A temporary alleviation of the position was brought about by the First World War but farming in the area could not easily part with the old tradition of sheep and barley production and adapt itself to the changing needs of the country. The economic depression which set in in the early 1920's and the accompanying fall in prices of cereals affected farming in the area very seriously. Farmers were attempting to maintain the volume of output on their farms with reduced expenditure in order to offset the effect of low prices, but they often lacked sufficient technical and economic knowledge to carry out the re-organisation of their farms successfully. As a result a gradual decline in standards of farming followed, and the slump in prices in the early thirties increased the difficulties of farmers who tried to preserve the arable and sheep system on their farms[1].

The critical stage was reached in 1935 when the inherent disadvantages of the area were aggravated by the depression of the early 1930's and by a succession of four bad harvests. The area was recognised as a depressed farming area and a survey made at that time[2] revealed signs of neglect, disrepair, undermanning, undercultivation and understocking into which farms had fallen through the prolonged periods of economic difficulties. The introduction of the State subsidies, of which those on lime, oats and barley, and fat cattle were particularly promising to the Nottinghamshire Sand farmers, marks the beginning of a new period, and the sugar beet industry had a stabilising effect on the farming in the area.

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1 *H. G. Robinson.* Features of Nottinghamshire Agriculture. Journal of the Royal Agricultural Society. 1927.

2 *S. M. Makings.* Farming Forest Sand. Survey Study No. 4. Economics Department, The Midland Agricultural College. 1938.

TABLE 1.

PRICES OF AGRICULTURAL PRODUCTS. ENGLAND AND WALES.

	Unit	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Wheat	per cwt.	8 10	9 5	9 11	9 9	10 2	12 5	14 6	15 11	17 8	18 11	19 8	18 10	19 9
Barley	,, ,,	8 10	9 6	12 0	9 3	11 7	19 9	27 7	38 11	30 1	26 0	24 9	24 6	24 1
Oats	,, ,,	6 7	6 6	8 6	7 4	7 4	14 0	14 7	15 1	15 9	16 4	16 3	16 4	18 3
Potatoes	per ton	84 6	123 0	121 0	87 0	82 6	108 6	142 5	147 10	150 4	151 7	157 7	165 4	182 0
Sugar beet	,, ,,	38 9	39 8	41 6	46 1	49 6	65 6	67 10	85 11	85 3	81 2	89 3	90 10	104 10
Fat sheep	per lb.dead	10½	10¼	11½	8¾	9¾	1 1	1 2	1 3¼	1 3¾	1 4½	1 5½	1 6¾	1 11
Fat lambs	weight	11½	1 0¼	1 1½	10½	11½	1 2½	1 3½	1 5	1 5¼	1 6	1 7¼	1 8¼	2 1¼
Bacon pigs	per score	10 9	11 10	12 8	12 9	13 3	19 1	20 4	23 4	23 7	23 6	24 4	27 0	31 10
Pork pigs	dead	12 0	12 8	13 8	14 1	14 7	19 1	19 3	20 10	21 0	21 0	21 6	24 7	30 9
Sows	weight	7 5	7 9	9 4	9 7	10 6	15 5	15 0	15 0	15 0	15 0	15 0	15 4	17 1
Fowls	per head	3 5	3 4	3 6	3 8	3 9	4 10	6 0	6 6	6 6	6 0	6 6	8 2	10 0
Eggs	per 120	13 2	14 3	15 1	15 5	15 9	24 3	28 10	31 7	30 10	30 10	31 8	34 9	37 1
Milk	per gallon	11.5	11.3	1 0.3	1 1.2	1 1.3	1 5.4	1 8.6	1 10.7	1 11.2	2 0.3	2 1	2 2.8	2 8.7
Wool	per lb.	9¼	10⅛	1 4	8⅝	10⅝	1 1½	1 3⅝	1 5⅝	1 5½	1 5½	1 5½	1 5½	1 5⅜
Stores		£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
Dairy cows	per head	21 4	21 13	23 16	24 10	25 1	30 10	40 1	43 14	43 0	42 3	41 16	42 13	45 16
Store cattle	,,	10 12	11 8	13 4	13 9	13 16	16 4	18 16	20 1	20 12	21 8	21 3	22 16	24 16
Store sheep	,,	2 0	2 1	2 5	1 16	1 18	2 4	2 12	2 19	3 3	3 8	3 14	3 16	4 5
Store pigs	,,	1 9	1 10	1 12	1 15	1 18	1 17	2 6	2 11	3 0	3 9	2 15	3 2	4 14

NOTE. The above prices include Exchequer payments but exclude subsidy on the 1937 and 1938 crops of barley and oats under the Agricultural Act 1937 and the Agricultural Development Act, 1939. Prices of wheat and potatoes include acreage payments on (i) wheat based on estimated quantities sold, (ii) potatoes based on estimated total production.

Table 1 shows the fluctuations of the annual average prices of selected agricultural products most important for the area[1].

The fundamental farming system dictated by natural conditions and traditionally established in the area is arable farming in which about half of the crops provide farm revenue and the other half food for the livestock necessary for the maintenance of the soil fertility. There are, of course, various diversions from that system and the measure of their success depends on the general economic conditions, the managerial and technical ability of farmers and their resources of capital, and on the existing variations in the quality of soil.

The Norfolk four-course rotation though modified, still prevails, due in part to farming habits formed at a period when landlords made the acceptance of the rotation a condition in the tenancy agreement, but mainly because of its suitability to the light sandy soils. The rotation commonly used is:

1. seeds,
2. cereals,
3. root crops,
4. cereals.

Cereals include barley, oats, wheat and rye, and root crops include sugar beet, potatoes, mangolds, turnips and swedes. In this rotation green peas and vegetables occupy the same place as roots. The inclusion of new crops, i.e. cash root-crops and of wheat in the rotation and the expansion of livestock production in various forms illustrate the efforts of farmers endeavouring to preserve the most suitable system in its essentials but, at the same time, to augment returns by production of the speculative crops. The compromise between the orthodox farming system of the old days and adaptation of the available resources to the changing economic conditions has been accepted by most of the farmers. In livestock production, cattle-rearing with yard feeding in winter is most common. Sheep, dairying, poultry and pigs make a varying contribution to individual farm incomes.

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1 Central Statistical Office. Annual abstracts of Statistics No. 84 (1935-1946). Agricultural Prices and index numbers in England and Wales. Calendar years 1946 and 1947 and monthly prices. H.M. Stationery Office.

ANALYSIS OF FARMING 1936-1947.

1. DESCRIPTION OF THE FARM MANAGEMENT SURVEY SAMPLE.

The Farm Management Survey which started on a national scale in 1936 covered, among other areas, the Nottinghamshire Sand area. The Survey provides an accumulation of valuable data about farming conditions in the area. Details of the size and distribution of the farming sample in the sand area during the last twelve years are given in Table 2 and Table 3.

No farms of less than 50 acres were included in the sample because, although farms of that size exist in the area, the size commonly ranges from 100 acres upwards. In this connection it should also be remembered that no direct comparison can be made between the size group distribution of farms included in the Farm Management Survey sample and the county figures given in the last column of table 2. The latter represent the proportion of holdings of various sizes but they are not necessarily complete farming units. According to the Ministry of Agriculture and Fisheries, out of the total number of 5,228 holdings in Nottinghamshire, 2,981, or 57 per cent, are holdings not exceeding 50 acres and nearly half of that number are below 5 acres in size. But these holdings include a large number of residential properties, which in a practical sense do not consist of agricultural land. On the other hand there are many cases where two or more holdings, as recorded in the official returns, form in fact one single unit farmed by the occupier.

2. ANALYSIS OF FARM RECEIPTS.

1. *Arable Crops.*

The changes which have taken place in the system of farming in the area are reflected in the history of the use of farmland made during the period of the last twelve years. The analysis of cropping records over that period, shown in Table 4, not only reveals the trends developing in the production of various crops, but also illustrates in the proper perspective the relative importance of each crop as a source of farm revenue. In the first place there is an evident increase of arable land in relation to the total acreage of farms under review. Its importance has increased from 67.5 per cent in 1936 to nearly 77 per cent at the present time. The increase in arable area on the Sand during the Second World War is greater than one might have ex-

TABLE 2.

SIZE GROUP DISTRIBUTION OF FARMS IN FARM MANAGEMENT SURVEY SAMPLE.

Size Group (acres).	NUMBER OF FARMS												1936-1947		Perecntage distribution of ail holdings over 50 acres in the county[1]
	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	Total number of farm years	Percentage distribution of farming years by size groups.	
50—100	4	5	9	8	6	5	5	5	5	5	6	6	69	19.3	36.3
101—150	5	4	8	5	4	3	6	5	5	3	6	5	59	16.5	23.5
151—200	6	7	5	3	5	5	5	6	8	6	4	5	65	18.2	16.5
201—300	10	7	7	6	6	5	9	7	7	5	5	5	79	22.1	13.9
301—400	4	3	4	3	2	4	4	4	4	5	5	6	48	13.2	5.8
401—500	1	1	—	2	1	—	—	1	1	1	—	—	8	2.3	2.1
501 and over	2	1	3	4	4	4	4	2	2	2	1	1	30	8.4	1.9
TOTAL	32	28	36	31	28	26	33	30	32	27	27	28	358	100.0	100.0

1 Ministry of Agriculture and Fisheries. Agricultural Statistics 1939-1944. England and Wales. Part I. 1947.

TABLE 3.

ACREAGE OF FARMS IN FARM MANAGEMENT SURVEY SAMPLE.

YEAR	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947
No. of farms	32	28	36	31	28	26	33	30	32	27	27	28
Total acreage	7386	5925	7756	7851	7046	6700	7793	6762	7098	6384	5328	5754
Average acreage of farm	230.8	211.6	215.4	253.3	251.6	257.7	236.2	225.4	221.8	236.4	197.3	205.5

TABLE 4.
ANALYSIS OF LAND USE.

	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947
	%	%	%	%	%	%	%	%	%	%	%	%
Wheat	10.15	10.20	10.00	11.30	8.38	9.70	9.38	14.68	12.29	10.15	6.56	8.55
Barley	2.98	4.22	4.43	5.44	7.70	7.42	7.41	9.86	10.15	11.21	13.36	11.91
Oats....	15.35	14.32	17.59	16.00	21.32	16.16	12.68	11.31	10.64	11.51	11.56	9.36
Other corn	2.25	2.36	1.04	0.64	0.72	3.26	4.70	4.32	3.30	3.69	2.74	3.47
Total cereals	30.73	31.10	33.06	33.38	38.12	36.54	34.17	40.17	36.38	36.56	34.22	33.29
Sugar beet	3.35	2.36	2.80	3.60	3.16	3.91	4.89	5.22	5.34	5.37	5.27	5.68
Potatoes	2.67	2.69	3.06	3.31	2.29	5.47	5.87	5.73	6.84	5.80	6.86	7.98
Other root crops	10.58	9.83	8.27	9.05	10.57	11.27	8.98	8.19	8.13	7.57	8.14	6.61
Total roots	16.60	14.88	14.13	15.96	16.02	20.65	19.74	19.14	20.31	19.74	20.27	20.27
Beans and peas	0.69	0.07	0.63	0.96	0.73	3.10	1.77	0.84	1.25	0.56	1.45	1.64
Other tillage crops	2.88	1.19	2.08	2.68	2.15	2.28	2.51	1.79	2.68	2.22	1.75	2.68
Bare fallow....	0.39	0.96	0.17	0.31	0.49	0.66	0.22	0.19	0.48	0.89	—	0.01
Total tillage crops	51.29	48.20	50.07	53.29	57.51	63.23	58.41	63.13	61.10	59.97	57.69	57.89
Temporary grass for hay	4.43	10.81	5.06	10.07	9.12	5.07	6.97	7.29	6.39	8.91	8.56	9.53
Temporary grass for grazing	11.77	10.29	14.56	10.92	12.18	9.81	10.58	8.56	10.02	9.45	0.02	9.57
Total temporary grass	16.20	21.10	19.62	20.99	21.30	14.88	17.55	15.85	16.41	18.36	17.58	19.10
TOTAL ARABLE	67.49	69.30	69.69	74.28	78.81	78.11	75.96	77.98	77.51	78.33	75.27	76.99
Permanent grass for hay	4.43	3.53	4.13	2.49	3.95	2.51	1.81	1.55	1.68	1.76	1.44	1.23
Permanent grass for grazing	19.20	18.94	21.16	20.65	14.68	17.60	20.31	17.98	18.48	18.06	20.73	19.84
Grass orchards	—	—	—	—	0.02	0.02	—	0.01	0.01	—	0.01	0.05
Total permanent grass	23.63	22.47	25.29	23.14	18.65	20.13	22.12	19.54	20.17	19.82	22.18	21.12
Rough grazings	8.62	8.14	4.13	1.58	1.89	0.94	1.29	1.49	1.35	1.39	2.12	1.51
TOTAL CROPS	99.74	99.91	99.11	99.00	99.35	99.18	99.37	99.01	99.03	99.54	99.57	99.62
Woodlands	0.24	—	0.36	0.50	0.38	0.55	0.33	0.37	0.34	0.16	0.15	0.17
Buildings, roads, etc.	0.02	0.09	0.53	0.50	0.27	0.27	0.30	0.62	0.63	0.30	0.28	0.21
TOTAL ACREAGE	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

pected and shows the capacity of the local farmers to respond to demands to increase the arable acreage. The farmers' responsiveness is due to the fact that in the main they are well versed in arable practices. Very little persuasion had to be exercised in this region by the County War Agricultural Executive Committee and arable targets set were almost invariably exceeded. This increase of about 14 per cent is consistent with the national ploughing up campaign and is accounted for by a corresponding decrease in the acreage of permanent grass and rough grazings. In this connection it is interesting to note that ploughing up mainly affected rough grazings. Between 1936 and 1947 the area of rough grazing in relation to the total farm acreage decreased by about 83 per cent, whereas the area of permanent grass in the same period was reduced by only 11 per cent (from 23.6 per cent in 1936 to 21.1 per cent of the total acreage in 1947). The area of temporary grass, though varying from one year to another shows little change in relation to the total farm acreage.

As regards the tillage crops, the most significant changes have taken place in the group of cereal and root-crops. There occurred a slight decrease in the proportion of total acreage under wheat, which fell from 10.1 per cent of the total area in 1936, to 8.5 per cent in 1947. On the other hand, since 1936 there has been a considerable increase in the acreage of barley, which represented three per cent of the total acreage in 1936, and increased to almost 12 per cent in 1947. With the emphasis laid on the production of cash crops, the acreage under oats was reduced from 15.3 per cent of the total area in 1936 to 9.4 per cent in 1947, but at the same time there was an increase in the acreage of other corn, mainly rye and mixed corn for feeding. From 1936 and particularly from 1941 there was a steady decline in the acreage occupied by feeding-roots, chiefly turnips and swedes, whereas cash roots, i.e. sugar beet and potatoes show a steady increase of acreage. Sugar beet, which in 1936 occupied 3.3 per cent of the total acreage, amounts now to 5.7 per cent and the increases in the acreage under potatoes is more remarkable still, rising from 2.7 per cent in 1936 to almost 8 per cent of the total acreage in 1947. This is another example of the farmers' responsiveness to the demands imposed by the war conditions. The pre-war acreage of potatoes in the county was between six and seven thousand acres whereas the war time targets for the county were fixed in the region of 25 000 acres the responsibility for finding the necessary extra labour for harvesting the crop resting with the County War Agricultural Executive Committee. During the last twelve years the proportion of farmland under beans and peas more than doubled, but as regards the remaining tillage

TABLE 5. ANALYSIS OF FARM RECEIPTS.

Year		Wheat	Barley	Sugar beet	Potatoes	Other crops	Crop subsidy	Total crops	Cattle	Sheep & wool	Pigs	Poultry & eggs	Horses	Milk	Total livestock and livestock products	Sale of machinery	Produce to house perq. & misc.	Total receipts
1936	£/100 acres	53.0	7.8	32.2	65.5	18.5	—	177.0	106.3	133.3	92.2	35.2	3.3	88.5	458.8	—	33.2	£669.0
	% of total receipts	7.9	1.1	4.8	9.8	2.8	—	26.4	15.9	19.9	13.8	5.3	0.5	13.2	68.6	—	5.0	100%
1937	£/100 acres	47.8	21.1	40.3	49.8	43.3	6.5	208.8	146.5	186.4	112.7	37.6	5.9	86.5	575.6	—	34.6	£819.0
	% of total receipts	5.8	2.6	4.9	6.1	5.3	0.8	25.5	18.0	22.7	13.7	4.6	0.7	10.6	70.3	—	4.2	100%
1938	£/100 acres	40.7	12.6	48.9	50.3	60.7	19.0	232.2	143.0	120.7	123.9	36.5	2.1	118.1	544.3	—	36.5	£813.0
	% of total receipts	5.0	1.5	6.0	6.2	7.5	2.3	28.5	17.7	14.8	15.2	4.5	0.3	14.5	67.0	—	4.5	100%
1939	£/100 acres	49.6	34.2	68.4	38.6	60.6	47.6	299.0	192.7	195.9	127.7	26.9	7.1	96.3	646.6	—	38.4	£984.0
	% of total receipts	5.0	3.5	7.0	4.0	6.3	4.8	30.6	19.7	19.8	12.8	2.7	0.7	9.8	65.5	—	3.9	100%
1940	£/100 acres	77.5	59.0	70.1	66.4	157.4	28.9	459.3	235.5	270.9	97.9	29.7	5.8	101.3	741.1	—	46.6	£1247.0
	% of total receipts	6.2	4.7	5.6	5.3	12.6	2.3	36.7	19.0	21.8	7.8	2.4	0.5	8.1	59.6	—	3.7	100%
1941	£/100 acres	62.2	78.7	92.3	81.0	117.8	50.2	482.2	171.0	237.8	103.4	21.4	9.4	119.1	662.1	7.2	46.5	£1198.0
	% of total receipts	5.2	6.6	7.7	6.7	9.8	4.2	40.2	14.3	19.8	8.7	1.8	0.8	9.9	55.3	0.6	3.9	100%
1942	£/100 acres	75.4	149.0	145.5	214.2	97.2	61.3	742.6	148.5	279.8	82.4	14.5	9.8	171.8	706.8	4.0	46.6	£1500.0
	% of total receipts	5.0	10.0	9.7	14.2	6.5	4.1	49.5	9.9	18.5	5.5	1.0	0.7	11.5	47.1	0.3	3.1	100%
1943	£/100 acres	137.8	218.2	155.8	209.3	124.8	102.5	948.4	214.3	264.5	109.3	15.9	9.4	196.0	809.4	15.2	55.0	£1828.0
	% of total receipts	7.5	11.9	8.5	11.5	6.8	5.6	51.8	11.8	14.5	6.0	0.9	0.5	10.7	44.4	0.8	3.0	100%
1944	£/100 acres	136.5	190.2	156.5	293.8	74.6	124.3	975.9	215.9	196.16	97.1	21.6	5.64	145.4	681.8	13.0	55.3	£1726.0
	% of total receipts	7.9	11.0	9.1	17.1	4.4	7.2	56.7	12.5	11.3	5.6	1.2	0.3	8.4	39.3	0.8	3.2	100%
1945	£/100 acres	92.0	238.5	189.6	225.8	103.0	120.0	968.9	247.0	256.0	68.0	27.0	2.4	111.0	711.4	9.3	57.4	£1747.0
	% of total receipts	5.3	13.7	10.9	12.9	5.9	6.9	55.6	14.1	14.7	3.9	1.5	0.1	6.4	40.7	0.5	3.2	100%
1946	£/100 acres	79.8	187.9	175.0	298.9	125.2	85.6	952.4	241.3	236.6	36.9	39.2	17.4	158.0	729.4	14.6	63.3	£1755.7
	% of total receipts	4.5	10.7	10.0	17.0	7.2	4.9	54.3	13.7	13.2	2.1	2.2	1.0	9.1	41.3	0.8	3.6	100%
1947	£/100 acres	79.2	244.9	199.3	278.9	174.5	91.3	1068.1	290.5	346.6	44.2	50.7	6.7	111.2	849.9	12.1	80.4	£2010.5
	% of total receipts	3.9	12.2	9.9	13.9	8.7	4.5	53.1	14.5	17.2	2.2	2.5	0.3	5.6	42.3	0.6	4.0	100%

crops, which include kale, linseed and all types of the market garden crops, there was no change in acreage apart from the usual annual variations.

Table 5 represents an analysis of the cash receipts of the farms in the area during the twelve years from 1936 to 1947. The total cash receipts in £ per 100 acres increased threefold from £669 in 1936 to £2,010 in 1947. Receipts from the sale of crops in 1936 amounted to £177 per 100 acres and in 1947 they amounted to £1,068 per 100 acres, which is a sixfold increase. But the importance of crops as a source of farm revenue may best be assessed by a comparison of receipts from the sale of crops in relation to the total farm receipts. In 1936 they were responsible for 26.4 per cent and in 1947 for 53.1 per cent. Those changes were due to a variety of reasons but the most important were rising prices, the war time ploughing-up programme and crop subsidies (acreage payments), and the economic conditions discouraging sheep farming during the war years. Among the above factors, the ploughing-up campaign seems to be relatively the least important in stimulating crop production in the area. As already mentioned the acreage of arable land in the area increased by about 14 per cent during the twelve years ending in 1947. For the whole county of Nottingham arable land increased from 179 thousand acres in 1939 to about 253 thousand acres in 1947[1] which in relation to the total acreage represents an increase of about 20 per cent. The difference between the relative changes in arable acreage in the Sand area and in the county is due to the fact that the former area previously had a much higher proportion of arable land than was common for the rest of the county. There was also a limited acreage of grassland in the Sand area on which farmers could draw for arable production without upsetting the organisation of their farms.

Prices, subsidies, shortage of imported concentrates and discouragement of sheep farming by lack of adequate price incentives were the real factors responsible for the increasing importance of the arable crop production in the area. All these factors created favourable opportunities for the production of crops but at the same time they introduced a certain artificiality into the system of farming.

The average yields per acre of the chief arable crops cultivated in the area together with county and national averages are shown in Table 6.

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1 Ministry of Agriculture and Fisheries. Agricultural Statistics, 4th June Returns.

It appears that, from the point of view of output per acre, barley and oats are the crops most successfully grown in the area. Sugar beet and potatoes are moderately successful and wheat is the least successful crop. It should be stressed, however, that the degree of success with which the above crops are grown in the area is relative and not absolute. Comparison of twelve years average yields for the area with national averages shows that the latter are higher in the case of each particular crop.

An analysis of the cropping record (Table 4) and of crop sales (Table 5) shows that although the absolute receipts from wheat sales increased from £53 per 100 acres in 1936 to £79 per 100 acres in 1947, the proportion of land under wheat during the same period was reduced by 16 per cent and the share of receipts from wheat sales in the total farm receipts declined from 7.9 per cent in 1936 to 3.9 per cent in 1947. This decline in importance of wheat was due to the relatively greater increases of receipts from other sources.

With local exceptions the soils of the Nottinghamshire Sand area are not suitable for wheat production. The fact that before the Second World War a considerable quantity of wheat was produced in the area was due to the stimulating effect of the Wheat Quota, introduced in 1932, which fixed the price per cwt. received by farmers at 10s. 0d. providing that the over all production did not exceed prescribed limits, (when production exceeded the limits, the price per cwt. was likely to be less than 10s. 0d., but it never fell below 9s.0d. per cwt.) Prices of other cereals were not raised above the market level and costs of production of wheat and of other cereals being equal in the area the price stimulus acted in favour of wheat.

The production of barley, traditionally associated with the Nottinghamshire Sand farming was very much in decline before the Second World War. Barley is often regarded as a typical cereal crop for the light, thin soils. But it should be remembered that the acidity of the Nottinghamshire Sand soils does not favour the growth of barley. Barley's place in the rotation is therefore due not so much to its suitability to the soil conditions as to the long established farming tradition of the area. The malting qualities of the barley grown in the area are inferior not only to imported varieties but also to those produced elsewhere at home. In 1936 barley occupied 3 per cent of the total farm acreage in the area. Since then its importance grew steadily, until in 1945 the acreage exceeded that of wheat and continued to increase still further amounting to about 12 per cent

TABLE 6.
AVERAGE YIELDS PER ACRE OF THE CHIEF CROPS.

CROP	NOTTINGHAMSHIRE SAND FARMS												Average 1936-1947	Ten years average for Notting-hamshire (1934-1943)*	Ten years average for England & Wales (1934-1943)*
	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947			
Wheat cwts.	13.4	13.0	16.0	15.1	12.4	11.5	14.3	14.5	13.5	14.3	17.9	11.7	13.9	17.7	18.5
Barley cwts.	16.0	13.1	20.5	17.6	13.4	11.0	18.3	15.9	15.7	19.5	18.4	14.5	16.1	15.9	16.7
Oats cwts.	12.7	14.1	18.1	16.8	12.1	10.0	15.7	15.8	15.5	18.4	17.8	14.3	15.1	15.8	16.2
Sugar beet tons	5.9	7.1	7.1	8.8	7.1	6.8	6.5	6.7	7.5	8.0	8.2	5.9	7.1	—	9.2
Potatoes tons	5.0	5.6	5.6	4.9	5.6	6.4	5.6	6.0	6.4	7.1	6.6	4.7	5.8	6.2	7.0

* Ministry of Agriculture and Fisheries. Agricultural Statistics, 1939-1944. England and Wales. Part I. 1947, and United Kingdom, Part I, 1947.

of the total acreage in 1947. The recovery of barley production stimulated by the control of cropping and by the rise of prices, ranging from 9s. 3d. per cwt. in 1938 to nearly 39s. 0d. in 1942, was even more remarkable as regards its importance as a source of cash income to the farmer. From about £8 per 100 acres in 1936 receipts reached £244 per 100 acres in 1947. In 1936 sales of barley represented just over one per cent of the total farm revenue, but by 1947 they were responsible for over 12 per cent of the total and became, next to potatoes, the chief cash crop in the area.

Oats constitute an important crop in the area. It is a hardy crop thriving on lighter acid soils, and twelve years record from the sample farms shows that it provided yields only slightly lower than those of the county and national averages.

Although some sales of oats, particularly since the outbreak of the Second World War, have taken place, the crop is an important feeding crop for the livestock. An idea of the importance attached to oats may be derived from the figures representing the proportion of farm acreage under oats in various years under review (Table 4). Until 1941, and with the exception of 1947, oats occupied at least 15 per cent of the total farm acreage. Since 1941, however, a decline in acreage set in due to the extension of acreage under cash crops, and the area under oats in 1947 amounted to just over 9 per cent of the total acreage.

Of other cereal crops, rye and mixed corn should be mentioned as supplementary feeding crops and the volume of their production in the area is usually dictated by the local natural conditions.

Cereals as a group occupy a leading position in Nottinghamshire Sand farming and the area covered by them rarely falls below 30 per cent of the total farmland acreage. But from the point of view of farm revenue cereals are second in importance to the group of root crops.

During the last twelve years there has been slow but continuous increase of the acreage under roots. In 1936 they occupied about one sixth of the farm acreage and in 1947 their acreage was equal to about one fifth. Within that overall increase of acreage under roots, some important changes were taking place as regards both the acreage covered by each particular root-crop and their value as a source of farm income. Feeding-roots, i.e. turnips, swedes and mangolds are all grown in the area and turnips are particularly popular

owing to their suitability to the light sandy soil and a shorter growing season. The root-crop is of great importance partly because of the shortage of grass and partly because of the need to have cleaning crops on thin soils which so easily become overgrown with weeds. There is, however, a noticeable reduction of acreage under feeding:roots in the area over the period of the last twelve years. Between 1936 and 1947 the relative importance of the acreage under feed-roots has been halved. Its effect on the supply of home grown food for livestock was to some extent offset by the increased supply of sugar beet tops and pulp resulting from the development of the sugar beet production.

Of the two cash root-crops grown in the area, i.e. sugar beet and potatoes, the potato crop is the most important. A scrutiny of the potato yields in the area shows that they are about equal to those of the county and national averages. Light soils, moderate rainfall and early dry-out in the spring favour the growth of potatoes. On the other hand, however, late frosts in spring and dry conditions later in the season create risks of failure. Some early varieties of potatoes are grown in the area, particularly on the land adjoining local urban and mining communities, but production is generally confined to "second early" or main crop potatoes. Potato production is concentrated in the northern part of the area, where the potato acreage often exceeds 10 per cent of the total acreage. The potato acreage in 1936 accounted for 2.7 per cent of the total area. In subsequent years the acreage increased and in 1947 was nearly 8 per cent of the area. The cash value of the crop gained a considerable importance, both absolute and relative, as a source of farm income. Receipts from the sales of potatoes amounted in 1936 to £65 per 100 acres and by 1947 had increased to £278; the increase was from 10 to 14 per cent of total receipts.

Potato production under normal unrestricted marketing conditions is a speculative enterprise, but with the rising prices, assured markets and the stimulating effect of acreage payments, it developed during the last twelve years into one of the chief cash crops of the area.

Production of sugar beet in the area occupies a singular position. The crop was not introduced into the country, except on an experimental scale, until after the First World War. Sugar factories at Kelham near Newark and at Colwick near Nottingham were built in 1921 and 1924 respectively.

The first experiments in growing sugar beet on the Nottingham-

shire Sand were not encouraging. This was due mainly to the natural lime deficiency of the soil and to the high manurial requirements of the crop as well as to the lack of experience in sugar beet growing on the part of the farmers. In the early years an opinion began to grow in the area that the crop could not be grown successfully. But subsequently steadily rising prices of sugar beet, its attractiveness as a cleaning crop and as an additional source of food for the livestock, helped to overcome the initial difficulties. The facilities offered by the sugar factories in providing growers with beet pulp, waste lime and seeds stimulated further production and it is interesting to note that the last twelve years have witnessed a steady development of the crop in the area and its establishment as a promising and important source of income. The acreage under sugar beet does not, as a rule, exceed six per cent of the total farm acreage, although in some localities (notably Clipstone near Mansfield) it occupies over 10 per cent of the farmland. In 1936 the crop occupied only 3.3 per cent of the total acreage whereas in 1947 it occupied 5.7 per cent. The income from sugar beet increased more than sixfold and whereas in 1936 it accounted for less than five per cent by 1947 it represented just under ten per cent of all farm receipts.

Peas are another cash crop found on many farms, but their success depends on the degree of firmness of the soil and adequate liming. In addition some market gardening crops are grown on a commercial scale. This group of crops, which includes carrots, cabbage, brussels sprouts, cauliflowers, onions, celery, etc. has grown in importance as a source of farm income. It should, however, be pointed out that market gardening on a commercial scale, particularly under the conditions of farming in the Nottinghamshire Sand area, is a very speculative business. In order to turn the production of market garden crops from a casual and speculative venture into a serious business proposition several factors would have to be seriously considered. Marketing possibilities need exploring and marketing channels must be efficiently organised to ensure the success. Capital must be made available in order to finance the necessary re-organisation of the farms, the adaptation of existing or the erection of new buildings and the inevitable increase in the number of workers employed. There is also need for experimental work in the area to provide information on cultivations and manuring under sand land conditions. Farmers must also be given more training and advice in the general technical aspects of production and marketing of market garden crops.

The acreage of all these crops, with the exception of peas where there was an increase, remained fairly stable during the last twelve years. There was, however, a marked increase in their importance as a source of farm income, both absolute and in relation to the total farm receipts. These crops were bringing in £18 per 100 acres in 1936 and in 1947 their contribution amounted to £174 per 100 acres. The above figures represented in 1936 nearly three per cent of the total receipts and about nine per cent in 1947.

It should be stressed that there is a need for experimental work on leys in the area. The dry and acid soils of Nottinghamshire Sand do not favour the development of hay producing rotation grasses. Farming in the area is handicapped by the shortage of grass and hay. White clover, which is more resistant to drought and acidity, remains a mainstay of the local rotation grasses, but there is a real need for production of some suitable grass mixtures which would ensure a satisfactory yield of hay. In this connection lucerne might be introduced on a larger scale into the area. It is already grown successfully on some farms. Some investigation and experimenting seems also indicated on growing lupin in the area. Lupin is grown successfully both as a "green manure" and feeding crop in other countries under conditions similar to those of the Nottinghamshire Sand and because of its use for the maintenance of soil fertility as well as for stock feed, farmers should examine its possibilities.

2. *Livestock Production.*

During the twelve years covered by the records there was a steady decline in the importance of livestock production as a source of farm revenue in the Nottinghamshire Sand area. Although receipts increased from £458 per 100 acres in 1936 to £849 in 1947, they represented only 42 per cent of the total farm receipts in the latter as compared with nearly 69 per cent in the former year.

Table 7 indicates the general trends in livestock population of Nottinghamshire since 1936 and with the exception of cattle it shows a decline for all classes, though some recovery in recent years may be observed in the numbers of poultry. Table 8 represents livestock population in the area (except poultry, since no records of poultry numbers were kept on the farms in the sample). These figures reviewed in conjunction with the movement of prices (Table 1) provide an interesting background to the analysis of the livestock production in the area.

The position of sheep requires special attention. The common practice in the area is for farmers to have a ewe flock for breeding.

TABLE 7.
LIVESTOCK POPULATION IN NOTTINGHAMSHIRE*.

YEAR.	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947
Type of Livestock	NUMBERS											
Total cattle and calves	94,612	95,720	96,574	99,348	106,324	100,634	100,199	103,856	105,439	107,520	109,804	107,240
Sheep and lambs	122,905	129,422	140,777	142,326	142,326	107,254	98,701	83,989	66,560	64,892	65,796	62,116
Pigs	52,139	48,602	47,909	48,569	45,053	25,179	26,319	23,343	23,381	31,776	24,935	20,437
Horses	14,641	14,390	14,434	14,075	13,590	13,354	12,447	11,809	11,295	10,633	10,056	9,061
Poultry	823,492	717,121	759,348	767,508	755,680	576,175	509,097	405,853	444,824	527,247	551,807	593,381

* Ministry of Agriculture and Fisheries. Agricultural Statistics. June 4th Returns. Final figures.

TABLE 8.

LIVESTOCK POPULATION IN THE NOTTINGHAMSHIRE SAND AREA.

(Numbers per 100 acres).

Year	No. of farms	Cattle and calves	Sheep and lambs	Pigs	Horses
1936	32	14.6	53.8	10.4	2.5
1937	28	15.3	54.5	10.6	2.5
1938	38	14.1	54.9	14.3	2.4
1939	32	14.7	53.2	9.7	2.0
1940	29	14.9	56.9	8.1	1.8
1941	26	14.0	67.0	6.8	1.7
1942	33	15.5	44.3	6.8	1.6
1943	30	17.7	40.8	6.7	1.6
1944	32	18.6	41.7	6.8	1.6
1945	27	18.6	41.3	6.4	1.5
1946	27	18.7	56.4	3.5	1.4
1947	28	18.1	32.7	2.9	1.1

Home bred and purchased lambs are fattened on the root-crops in winter. Some farmers, however, maintain a "flying flock" of sheep for fattening, the size of flock being determined by the amount of feeding crops available. Makings[1] stressed in his report that there was a serious under stocking with sheep in the area in relation to the effective use of feeding crops and grass. Comparison of his figures for 1936-1939 with those for the last five years in the area (Table 9) shows that there was relatively little change in sheep production.

In 1937 sheep were responsible for over 20 per cent of the total farm receipts on the recorded farms, and although their importance declined in later years, the decline was not extensive, and in 1937 receipts from this source provided over 17 per cent of the total farm revenue and were more important than those from any other single enterprise. In that year they were more than two and a half times greater than those of 1936 (See table 5). This is consistent with the general structure of Nottinghamshire Sand farming under the existing economic conditions. Since 1935 there has been a rise in prices of all types of livestock and livestock products. The choice of alternative types of combinations of enterprises is indicated, however, not by the level of prices alone, but by the level of costs of production in relation to prices. In addition there are other serious considerations, e.g. resources available, farmer's skill and his preference for some specialised form of production usually born out of local farming tradition. An enquiry into the costs and returns of sheep breeding

1 *S. M. Makings, Ph.D., B.Sc. (Econ.), N.D.A.* The Economics of Poor Land Arable Farming, London. 1944.

TABLE 9.

NUMBERS OF SHEEP-KEEPING FARMS AND SHEEP SALES.

	1936	1937	1938	1939	1943	1944	1945	1946	1947
No. of farms in the sample	31	28	38	32	30	32	27	27	28
No. of farms keeping sheep as % of total sample	90.3	78.5	73.6	65.6	70.0	68.7	77.7	70.3	77.7
No. of sheep sold per 100 acres	54	71	48	62	72	53	57	52	62

and feeding and into the place of sheep in the farm economy in the East Midlands in 1942-44[1] revealed that some opportunities for making profits in arable sheep farming existed, and these opportunities, it was stressed, lie in improved management. But it should be pointed out that some farmers on the most intensive Nottingham Sand land farms often regard sheep as a convenience for feeding off the unwanted crops rather than an essential part of their farming system. Generally speaking there are two alternatives as regards sheep. It may be more economic for a farmer on better land to discard sheep completely and to concentrate on cash crops. This tendency is reflected in the comparison of the decline of sheep population in counties associated with arable sheep farming and the counties of grass sheep type. The decline in the number of sheep in the latter type of counties was relatively smaller and since 1943 has turned upwards[2]. It may be necessary, however, for a farmer on poor land to retain sheep and to minimise or to offset his cash losses arising from that department by improvements in management. The heavy decline in sheep population in the country indicates that the majority of farmers have taken the first alternative. On the other hand the retention of sheep as the chief livestock enterprise by some 70 per cent of the Nottinghamshire Sand farmers shows that they are regarded as an essential part of the farming economy. The improvement in sheep management is a serious and urgent matter. The scope for improvement covers a large field. Costs of production of feeding-roots should be lowered, the size of flocks should be economically adjusted to the acreage and labour available, the quality of existing flocks should be improved and the sheep disease and mortality rate should be lowered still further (now about 3 per cent in feeding and 8 per cent in breeding flocks).

1 *S. M. Makings, Ph.D., B.Sc., N.D.A.* and *A. J. Wynne, B.Sc., N.D.A.* The economics of arable sheep farming in the East Midlands. Midland Agricultural College. 1945.

2 *R. N. Dixey.* Changes in the sheep population of England. The Farm Economist, Vol. V, Nos. 9 & 10, 1947.

Income from cattle is next in importance to that from sheep. Absolute receipts from sales of cattle in 1936 amounted to £106 per 100 acres and by 1947 rose to £290 per 100 acres, but the importance of cattle as a source of revenue declined. Between 1936 and 1940 inclusive receipts from cattle accounted for from 15 to 19 per cent of farm revenue. After 1940 they contributed between 10 and 14 per cent. The enterprises consist of store rearing and winter yard fattening. Over 50 per cent of the farmers have this type of cattle enterprise and its place in the system of farming is conditioned by the need to produce farmyard manure in order to maintain soil fertility. The arable system of farming normally ensures a supply of straw and root-crops for yard winter feeding and manure production. Under those conditions the price incentive in cattle production becomes of secondary importance and the decision of a farmer as to the direction and extent of his interests in cattle is usually based on the need for manure on one hand and the amount of feeding stuffs available on the other. It should also be remembered that under the conditions favouring the expansion of the arable crops the manurial requirements of the soil rise thus calling for further increase of cattle as a source of manure. Farmers in the area are well aware of the intimate relationship between crops and livestock and, generally speaking, they never regarded cattle feeding as anything more than a subsidiary source of profit and a factor in maintaining the land fertility[1]. Sheep remained the most important agent for maintaining soil fertility and it will be observed that in spite of rising prices of cattle since the outbreak of the Second World War income from cattle has declined in importance in relation to the income from sheep. Today store raising constitutes the main part of the cattle enterprise in the area, though it should be stressed that it is not regarded by the farmers in the area as a major specialised undertaking. The evidence from the recorded farms suggests that relatively few cattle are sold fat and the main emphasis is on the production of bullocks to be sold to feeders as forward stores and of heifers for sale to dairy farmers.

Commercial milk production is comparatively new to the area and except within the immediate neighbourhood of the urban and industrial centres, its development followed the depression of the the 1930's. In spite of the inherent difficulties of poor quality pastures and a short summer grazing period due to dry conditions, the enterprise was gaining in importance and by the outbreak of

1 *W. Bond, B.Sc., N.D.D.* and *S. Makings, Ph.D., B.Sc., N.D.A.* Survey Study No. 7. The Economics of yard cattle feeding under war conditions. Midland Agricultural College, Department of Agricultural Economics, 1946.

TABLE 10.

MILK FARMS AND SALES OF MILK IN NOTTINGHAMSHIRE SAND AREA.

Year	Total No. of farms	Average acreage	No. of farms selling milk	Average acreage of a milk selling farm	Receipts from milk in £/100 acres	Milk sales as a percentage of total receipts of milk selling farms
						%
1936	32	230.8	23	229.1	123.9	18.62
1937	28	211.6	17	211.8	142.5	18.96
1938	36	215.4	23	180.4	220.9	25.20
1939	31	253.3	16	206.3	229.0	21.56
1940	28	251.6	14	170.9	298.4	25.70
1941	26	257.7	14	189.3	301.2	26.74
1942	33	236.2	20	202.0	331.4	21.87
1943	30	225.4	17	182.2	428.2	22.82
1944	32	221.8	17	183.3	311.4	20.91
1945	27	236.4	13	190.0	286.8	16.12
1946	27	197.3	16	186.1	282.8	16.88
1947	28	205.5	12	220.5	229.3	13.61

the Second World War milk sales amounted to over 14 per cent of the total farm receipts (Table 5). On the milk selling farms receipts from milk amounted, in 1938, to over 25 per cent of the total farm receipts (Table 10). From 1938 until 1944 the relative value of the milk sales on the milk selling farms remained largely unchanged (over 20 per cent). Since then a downward tendency may be observed. The natural conditions on the area make it apparent that Nottinghamshire Sand is not suited to the development of milk production on a large scale unless adequate supplies of cheap purchased concentrates are available. Further expansion of milk production in the area is therefore likely to be dependent on the individual farmers' preference and technical skill, on his resourcefulness, on the amount of capital available, quality of his grassland and on natural conditions on the farm being above the average standard.

Should the Sand farmers contemplate the development of milk production, an extra effort would be required on their part. Some initial outlay of capital would be necessary in starting milk production. Farmer's initiative and technical skill would have to be exercised in producing home grown foods supplementary to purchased concentrates, and the whole enterprise would call for more labour and this factor, particularly under the present conditions of shortage of labour, would have to be seriously considered.

Little can be said about the changes taking place in the number of horses in the area beyond the fact that it shows signs of continuous and heavy decline common to all other areas. The decline is due to the displacement of horses by machinery. Income from sales of horses does not exceed one per cent of the total farm receipts and clearly indicates that no horse breeding and selling on a large scale exists in the aea.

The pig population in the county has declined since 1936 by about 50 per cent. In 1936 receipts from sales of pigs amounted to £92 per 100 acres and in 1947 to £44 per 100 acres, and the decline in importance of pigs as a source of income was even more remarkable representing a drop from 13.8 per cent in 1936 to only 2.2 per cent of the total farm receipts in 1947. This decline, however, was not unexpected, and it was due to the general agricultural policy of those years. Although every farmer in the area keeps one or two pigs for home use, their failure to develop the pig enterprise on a commercial scale seems to be inconsistent with the opportunities which the local farming conditions provide. Farm buildings, especially on large farms

are often in excess of the present actual requirements and they could be adapted to pig production. The rough grazing land which at present has little farming value could be used for pig-runs, thus not only providing the necessary sites for the enterprise, but also gradually improving the fertility of the land. The arable system of farming would ensure adequate supplies of straw and fodder for the developmemt of pig production. Although details of costs of production are not available, it is known that some farmers who developed their pig enterprises, have made a financial success of it. With the mining communities close at hand there should also be some opportunities for raising the stores required for domestic fattening. Farmers who successfully expanded their pig production probably had more technical knowledge and personal preference for pigs than most of the Sand farmers, and they were able to plan their farming policy in such a way that the pig enterprise fits economically into their system of farming. But most of the farmers in the area, though aware of the possibilities attached to pig production do not feel confident enough to face the risks and the initial outlay of capital. Pig production undertaken on a commercial scale imposes many demands on the farm resources. Specially designed buildings are required or the old buildings must be substantially altered and adapted to the new use. This is not only necessary for the accommodation of animals, but also for the efficient preparation and distribution of food and for sanitary reasons. The person in charge of the enterprise must possess a good knowledge of pig breeding and feeding and must be capable of organising and adjusting production according to the changeable demands of the market and to the available resources of food. These requirements vary, of course, with the size of an enterprise, and the degree of intensity of production. It should also be remembered that in spite of the progress made by veterinary science and the precautionary measures which may be taken, the concentration of a large number of pigs creates a risk of infectious disease and such risk should not be disregarded by the farmer.

Poultry ought, also, to play a more important part in the local farming economy. From Table 7 it will be seen that the sharp decline in the poultry population in the county after 1939, due to restrictions in supplies of food, has now been arrested and the numbers are now roughly at the level of 1940-1941 figures. Very similar tendencies are noticed in the Nottinghamshire Sand area except that the recovery went slightly ahead of the county as a whole and the importance of poultry as a source of income stands now at the level of 1939-1940. Table 5 illustrates the decline and subsequent recovery in the importance of poultry as a source of farm income in the area. In 1936 sales of

poultry and eggs were bringing about £35 per 100 acres and constituted 5.3 per cent of the total farm receipts. By 1942 they dropped to only £14 per 100 acres (one per cent of the total receipts). In 1947 the receipts from poultry and eggs reached £50 per 100 acres and accounted for two and a half per cent of total farm revenue.

Most farmers in the area keep poultry in varying numbers mainly for their own requirements. But in general poultry is underrated and indeed often ignored by many of the farmers in the area. The flock is still very much the responsibility of the farmer's wife and the farmer is neither interested nor inclined to effect any alterations or improvements.

The natural conditions of the area and the prevalence of the arable type of farming are favourable for the expansion of the poultry departments. However, before such expansion can take place farmers' attitudes will have to undergo a fundamental change and even then considerable effort will have to be made in providing them with sufficient technical knowledge of poultry husbandry to make the investment of additional capital worth while.

Concluding the analysis of farm revenue it should be stressed that the last twelve years have brought many important changes to the farming in the area. The most striking change has taken place in the relationship between the crop production and the livestock production as sources of farm receipts.

Sales of crops which twelve years ago accounted for about 26 per cent of the total receipts amounted to over 53 per cent in 1947. Stress was laid on cash crops and among those barley, potatoes and sugar beet assumed particular importance.

Contribution of livestock production to the farm revenue declined within the period under review from nearly 70 per cent to about 40 per cent. The importance of sheep production remained largely unchanged. Milk production has declined slightly in the last few years. There was, however, a marked decline in cattle and a very heavy decline in pig production. As regards poultry, the initial decline had been overcome and it is now well on its way to recovery.

3. ANALYSIS OF FARM EXPENDITURE.

The analysis of farm expenditure presented in Table 11 provides further illustration of the changes taking place in the area.

TABLE 11. ANALYSIS OF FARM EXPENDITURE.

Year		Livestock	Foods	Seeds	Manures	Rent, rental value & rates	Repairs	Fuel	Paid labour	Contract	Haulage	Miscellaneous	Equipment	Total expenditure
1936	£/100 acres	126.7	145.3	27.4	34.7	58.5	12.1	—	165.2	—	—	43.8	7.3	£621.0
	% of total expenses	20.4	23.4	4.4	5.6	9.4	2.0	—	26.5	—	—	7.1	1.2	100%
1937	£/100 acres	216.2	165.8	27.4	34.2	63.1	13.5	—	158.6	—	—	58.8	30.9	£768.0
	% of total expenses	28.1	21.6	3.6	4.5	8.2	1.8	—	20.6	—	—	7.6	4.0	100%
1938	£/100 acres	166.0	207.8	31.6	43.9	70.1	15.6	—	186.5	—	—	57.0	33.8	£812.3
	% of total expenses	20.4	25.6	3.9	5.4	8.6	1.9	—	23.0	—	—	7.0	4.2	100%
1939	£/100 acres	266.1	168.9	34.2	59.8	66.1	24.2	22.3	202.6	9.8	17.3	20.5	44.8	£936.6
	% of total expenses	28.4	18.0	3.7	6.4	7.1	2.6	2.4	21.6	1.0	1.8	2.2	4.8	100%
1940	£/100 acres	291.7	198.6	48.2	66.1	72.7	22.4	31.7	202.0	12.6	18.4	27.2	41.5	£1033.1
	% of total expenses	28.2	19.2	4.7	6.4	7.0	2.2	3.1	19.6	1.2	1.8	2.6	4.0	100%
1941	£/100 acres	208.9	119.6	87.7	100.7	70.6	26.7	40.9	258.6	11.8	16.8	30.3	71.5	£1044.1
	% of total expenses	20.0	11.5	8.4	9.6	6.8	2.6	3.9	24.8	1.1	1.6	2.9	6.8	100%
1942	£/100 acres	214.7	81.8	92.3	110.1	73.5	43.0	42.6	332.8	19.3	27.0	45.3	57.4	£1139.8
	% of total expenses	18.8	7.2	8.1	9.7	6.4	3.8	3.7	29.2	1.7	2.4	4.0	5.0	100%
1943	£/100 acres	260.0	74.4	103.0	141.5	78.8	59.8	48.3	388.3	35.0	25.9	81.2	81.4	£1377.6
	% of total expenses	18.9	5.4	7.5	10.3	5.7	4.3	3.5	28.2	2.5	1.9	5.9	5.9	100%
1944	£/100 acres	257.5	83.9	96.7	145.3	80.8	65.3	48.5	441.8	37.3	27.6	38.9	67.4	£1391.0
	% of total expenses	18.5	6.2	7.0	10.4	5.8	4.7	3.5	31.8	2.7	2.0	2.8	4.8	100%
1945	£/100 acres	252.3	99.3	107.4	133.2	76.3	68.2	58.1	442.4	32.5	30.0	37.5	53.2	£1390.4
	% of total expenses	18.1	7.1	7.7	9.6	5.5	4.9	4.2	31.9	2.3	2.2	2.7	3.8	100%
1946	£/100 acres	316.0	92.6	99.4	155.7	82.4	75.2	47.3	432.5	31.1	29.8	34.8	114.0	£1510.8
	% of total expenses	20.9	6.1	6.6	10.3	5.5	5.0	3.1	28.6	2.1	2.0	2.3	7.5	100%
1947	£/100 acres	212.7	83.6	148.3	170.9	85.4	85.2	61.3	485.9	36.1	26.9	42.1	154.5	£1592.9
	% of total expenses	13.4	5.3	9.3	10.7	5.3	5.3	3.9	30.5	2.3	1.7	2.6	9.7	100%

The overall expansion of arable production and a relative decline in the importance of livestock enterprises is reflected in the corresponding items of expenditure on livestock, foodstuffs, seeds, manures and machinery.

Total farm expenditure has grown steadily since 1936 from £621 per 100 acres in that year to £1,592 per 100 acres in 1947.

Purchases of livestock which before 1939 held a prominent place in the total farm expenditure were, despite the increases in prices, nearly halved by 1947. This decline was accompanied by a more than proportionate decrease in expenditure for food, due to the reduced livestock population and the growing scarcity of foodstuffs on the market, but the expansion of the arable area resulted in an increased supply of home grown foods. In 1936 expenditure on livestock purchases accounted for 20.4 per cent and in 1947 for 13.4 per cent of the total farm expenditure. The expenditure on livestock rose from £126 per 100 acres in 1936 to £212 in 1947. The comparative expenditure on foodstuffs in 1936 amounted to about £145 and by 1947 it decreased to about £83; in relation to other items of farm expenditure this decrease was even more pronounced, namely, from 23.4 per cent of total expenditure in 1936 to 5.3 per cent in 1947.

Expenditure on seeds and manures shows a steady growth over the last twelve years. The purchases of seeds and manures amounted, in 1936, to about £27 and £34 per 100 acres respectively. The corresponding figures for 1947 were £148 and £170 per 100 acres respectively. Purchases of seeds increased from 4.4 to 9.3 per cent of the total farm expenditure. Expenditure on manures rose from 5.6 per cent of total expenditure in 1936 to 10.7 per cent in 1947. Expenditure on new machinery increased from just over £7 per 100 acres to £154 per 100 acres, an increase of from one to nearly ten per cent of farm expenditure. The increase in expenditure on seeds, manures, and machinery is a natural outcome or the expanding arable production. The general improvement in the financial conditions of farming has encouraged farmers to increase capital expenditure on farm machinery. The shortage of labour experienced since 1939 was also a serious factor influencing the purchases of new farm machinery.

The increased expenditure on new machinery was accompanied by a steady increase in expenditure on repairs. Cost of repairs in 1936 amounted to £12 per 100 acres or two per cent of the total farm expenditure but by 1947 it had grown to £85 per 100 acres and to 5.3 per cent of the total expenses.

Special attention is drawn to the expenditure on labour. Paid labour alone amounts to over 25 per cent of the total farm expenditure and when unpaid family labour and the hire of agricultural contractors are included, the total amounts to about 35 per cent of the total expenses in 1947.

The types and numbers of agricultural workers in the county since 1936 are shown in Table 12. The main point arising from this table is the decline in the number of regular male workers from 1936 to 1943. From 1943 there is a very slow, though steady, increase in the number of regular male workers, and a decline in numbers of casual male and both regular and casual female workers.

In 1947 the total of all workers was 46 per cent higher than the number recorded in 1939. Regular male workers increased by about five per cent. In the Nottinghamshire Sand area the ratio of workers to land increased by 7 per cent during the same period (Table 13).

The slow increase in the regular labour force in Nottinghamshire Sand area combined with the expansion of its arable production indicates that the weight of this problem in the area lies in the adequate supply of casual labour. There was a decline in the numbers of casual male workers from 1936 to 1938 followed by a steady increase which reached its highest point in 1943. From 1943 onwards a decrease set in again and in 1948 the number of casual male workers corresponds to that of 1942. The effects of the decline in numbers of casual male workers were offset by the use of prisoners of war and later to some extent, by the European Voluntary Workers. The number of women workers, which prior to 1943 was increasing steadily, declined from 1943 onwards, and, although due to changes in classification, the interpretation of the available data is difficult, there still exists a general tendency to a decline in numbers of women workers. Under the conditions of an overall scarcity of labour and an expanded arable area this may constitute a good case for further mechanisation of farming. Since, however, neither the size of farms nor the capital resources of the farmers would justify a large scale investment in machinery, there may be scope for further development of machinery pools in various forms. The labour policy in the area will naturally depend on the durability of the present economic conditions and in the event of a reduction of the arable area it would have to be adjusted accordingly.

TABLE 12.

TYPES AND NUMBERS OF AGRICULTURAL WORKERS IN NOTTINGHAMSHIRE [1].

Type of workers	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948[2]
Regular													
Men (excluding prisoners of war)	7,261	7,039	6,677	6,704	6,402	6,422	6,354	6,184	6,274	6,400	6,821	7,041	7,217
Women & girls (excluding Women's Land Army)	402	380	311						768	700	619	569	549
Women's Land Army	—	—	—	294	397	585	1,115	1,427	971	914	449	357	391
Prisoners of War	—	—	—	—	—	—	—	—	616	1,492	2,181	2,170	374
Casual													
Men (excluding prisoners of war)	1,092	1,001	762	931	981	1,185	1,554	1,806	1,626	1,581	1,373	1,327	1,558
Women and girls (excluding Women's Land Army)	250	301	261	470	767	966	1,331	1,527	961	937	755	821	893
TOTAL WORKERS	9,005	8,721	8,011	8,399	8,547	9,158	10,354	10,944	11,216	12,024	12,198	12,285	10,982

1 Ministry of Agriculture and Fisheries. Agricultural Statistics.
2 Ministry of Agriculture and Fisheries. Agricultural Returns, England and Wales, 4th June, 1948. Provisional results.

TABLE 13.

DISTRIBUTION OF ADULT MALE REGULAR WORKERS (PAID) ON NOTTINGHAMSHIRE SAND FARMS.

	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947
Number of workers per farm	2.3	2.0	2.5	3.3	2.8	2.8	2.3	2.4	2.8	3.0	3.1	3.0
Number of workers per 100 acres	1.0	0.9	1.1	1.3	1.1	1.1	1.0	1.0	1.2	1.2	1.5	1.4
Proportion of farms **not** employing adult male regular workers (%)	18.7	14.2	8.3	9.6	17.8	19.2	18.1	16.6	9.3	14.8	7.4	7.4

As regards the remaining items of farm expenditure (Table 11) it may be observed that the relative importance of rent, rental value and rates decreased after 1936. Expenditure under that heading amounted in 1936 to 9.4 per cent of the total, and in 1947 it represented about 5 per cent of all farm expenses. Machinery depreciation figures not included in the summary of expenditure but shown in Table 14 indicate an increase in the later years due to the process of re-equipment which took place on the farms.

TABLE 14.

MACHINERY DEPRECIATION (in £ per 100 acres).

Year	No. of farms	Machinery depreciation
1937	24	21.7
1938	22	30.0
1939	26	26.4
1940	26	31.5
1941	24	42.5
1942	33	52.6
1943	30	48.8
1944	32	52.7
1945	27	50.2
1946	24	56.8
1947	26	84.4

Fuel, contract work and haulage expenses in the first three years of the survey are hidden in the miscellaneous group of expenses in table 11. This is due to the fact that owing to the changes in the method of recording farm expenditure in those years fuel expenses were often combined with expenses on motor or tractor repairs and contract work with haulage. They are, however, presented separately in Table 15.

TABLE 15.

FARM EXPENDITURE ON FUEL, CONTRACT WORK AND HAULAGE IN 1936, 1937 & 1938.

(in £ per 100 acres).

Year	No. of farms	Fuel	Contract work	Haulage
1936	32	6.56	6.13	7.53
1937	28	12.83	9.27	10.76
1938	36	12.05	7.23	11.53

Expenditure on fuel has increased threefold since 1939. In 1939 it amounted to £22 and in 1947 to £61 per 100 acres. There was

also an increase in the relative importance of expenditure on fuel which rose from 2.4 per cent in 1939 to 3.9 per cent of the total expenses in 1947. The rise in expenditure on fuel is consistent with the increasing mechanisation of farms. The expenditure on haulage shows a rise from about £17 per 100 acres in 1939 to about £26 in 1947. The survey shows that increasing use is being made by farmers of the services of contractors. Expenditure on contract work increased fourfold from £9 per 100 acres in 1939 to £36 in 1947, and its importance in relation to total expenditure doubled during the last nine years (1.0 per cent in 1939 and 2.3 per cent in 1947). One of the reasons for increased dependence on contract work was the fact that the farmers were encouraged during the war years to use contractors' equipment rather than to buy expensive and scarce machinery themselves.

Changes in farm expenditure which have taken place during the last twelve years are consistent with the trends revealed by the analysis of farm receipts. The decline in the importance of livestock production is reflected in declining expenditure on purchases of livestock since 1936. This was accompanied by the decline in expenditure on feeding stuffs.

Steady growth of expenditure on seeds and manures followed the expansion of arable farming. The most remarkable changes have taken place in the expenditure on machinery which has grown from 1 per cent to nearly 10 per cent of the total expenditure between 1936 and 1947. Increased mechanisation of farming entailed a threefold increase in expenditure on fuel. Expenses on repairs have grown from 2 per cent to over 5 per cent of the total. Both haulage and contract work register an increase of expenditure. The cost of labour remains the chief item of expenditure amounting to about 35 per cent of the total farm expenses and showing a steady increase since 1940.

4. FINANCIAL RESULTS.

In the early years of the survey the collection of financial information did not include a full opening and closing inventory of farming assets. It was then felt that in general farming practices underwent only small changes and that a fairly reliable picture of the changing financial conditions of the industry could be obtained by confining the study to a comparison of the expenditure and income.

Table 16 shows the relationship of farm expenditure to total receipts. It shows that the narrowest margin of cash income existed

in 1938. Since the outbreak of the Second World War this margin widened and reached its maximum of expenditure amounting to about 75 per cent of receipts in 1943. After 1943 the margin narrowed and in 1947 farm revenue exceeded expenditure by about 21 per cent. The improvement in financial conditions during the early war years was consistent with the national economic policy for those years. It enabled farmers to capitalise and to finance the increased production, which was expected from them.

TABLE 16.

FARM EXPENDITURE IN RELATION TO FARM RECEIPTS.

Year	Total expenditure as a percentage of total receipts.
	%
1936	92.8
1937	93.8
1938	99.9
1939	95.2
1940	82.8
1941	87.2
1942	76.0
1943	75.4
1944	80.6
1945	79.6
1946	86.1
1947	79.2

Table 17 illustrates the changes which have taken place in the total valuation of farm crops, livestock and machinery over the period of eleven years. Table 18 represents the changes in the valuation of farm machinery only. The extent to which the process of re-equipment has taken place is reflected in the fact, that the valuation of farm machinery which accounted for about £150 per 100 acres at the end of 1937 rose by 1947 to nearly £400. There were also significant changes in the importance of farm machinery in relation to the total valuation. The value of machinery, generally speaking, rose from about 23 per cent to 31 per cent of the total valuation between 1937 and 1947, but during the intervening years there was, at first, a slight increase in the relative importance of machinery, followed, from 1939 to 1942, by a decrease. The highest yearly increases in total valuations occurred during 1939-1942 and this indicates that the process of re-equipment of farms was not confined only to machinery. Changes taking place in the economic conditions of the country since the last war could not remain without effect on the financial position of farming. A tendency to a narrowing of the margin of farming profits is visible and process of capitalisation on the farms is slowing down.

TABLE 17.

ANALYSIS OF CROPS, LIVESTOCK AND MACHINERY VALUATIONS*.

Year	Valuation	Valuation £/100 acres	Difference between opening and closing valuations £/100 acres
1937	Opening Closing	589 625	+36
1938	Opening Closing	641 589	−52
1939	Opening Closing	568 639	+71
1940	Opening Closing	678 741	+63
1941	Opening Closing	1,007 1,158	+151
1942	Opening Closing	1,129 1,249	+120
1943	Opening Closing	1,286 1,279	−7
1944	Opening Closing	1,299 1,226	−73
1945	Opening Closing	1,237 1,333	+96
1946	Opening Closing	1,334 1,497	+181
1947	Opening Closing	1,425 1,254	−171

* The year 1936 is omitted due to the lack of data for the opening valuation. Valuations for 1937, 1938, 1939 and 1940 do not include crops valuations.

There is no information available as to the amount of tenant-right or liquid assets involved and consequently the interest on the tenant's capital cannot be calculated. Table 19 serves, however, as a general guide to farm incomes, and the last column of that table represents the total farm income which includes the balance between the expenditure and opening valuation on one side and revenue and closing valuation on the other, and the cash equivalent of unpaid wages to the farmer and his wife.

TABLE 18.

THE ANALYSIS OF MACHINERY VALUATIONS IN RELATION TO THE TOTAL VALUATIONS.

Year	Machinery valuation	Machinery valuation in £ per 100 acres	Machinery valuation as a percentage of the total valuation
			%
1937	Opening	128.8	21.8
	Closing	148.3	23.7
1938	Opening	157.3	24.6
	Closing	148.4	25.1
1939	Opening	161.6	28.4
	Closing	162.3	25.4
1940	Opening	180.0	26.5
	Closing	183.5	24.7
1941	Opening	180.7	17.9
	Closing	206.5	17.8
1942	Opening	207.4	18.3
	Closing	217.4	17.4
1943	Opening	226.7	17.6
	Closing	244.3	19.1
1944	Opening	267.7	20.6
	Closing	269.3	21.9
1945	Opening	263.6	21.3
	Closing	264.1	19.8
1946	Opening	250.4	18.7
	Closing	287.1	18.9
1947	Opening	328.4	23.0
	Closing	388.1	30.9

Except in 1938 the sample of returns showed a favourable balance in each of the eleven years. But in some years a high proportion of returns showed losses. Table 20 shows the number of farms which made no income or made losses as well as the amount of losses made.

The country-wide effects of unfavourable weather conditions in 1947 were equally severely felt in the Nottinghamshire Sand area and therefore the number of farms which made losses in that year may be regarded as an exception. Even so, there has been an increase in the number of financial failures in farming since 1943 and this fact coupled with the cumulative effects of such failures is sufficient to cause some anxiety over the future of farming in the area. The

TABLE 19.
TOTAL FARM INCOMES.

Year	Opening valuation	Expenditure	Total	Closing valuation	Receipts	Total	Total Income
	in £ per 100 acres						
1937	589	777	1,366	625	826	1,451	+ 85
1938	641	778	1,419	589	805	1,394	− 25
1939	568	783	1,351	639	844	1,483	+132
1940	678	984	1,662	741	1,220	1,961	+299
1941	1,007	976	1,983	1,158	1,138	2,296	+313
1942	1,129	1,140	2,269	1,249	1,499	2,748	+479
1943	1,286	1,377	2,663	1,279	1,827	3,106	+443
1944	1,299	1,382	2,681	1,226	1,726	1,952	+271
1945	1,237	1,390	2,627	1,333	1,746	3,079	+452
1946	1,334	1,537	2,871	1,515	1,745	3,260	+389
1947	1,425	1,570	2,995	1,254	1,926	3,180	+185

signs of decline in farming profits in the Sand area constitute a first warning. There is still a narrow safety margin of the farmer's wage, and it would not be a novelty to the farmer to forfeit that wage if that would mean a chance of "hanging on" until better times come. But generally speaking, farmers have only limited bank balances to draw upon and carrying on with business under those circumstances inevitably leads to declining efficiency, neglect and eventually bankruptcy.

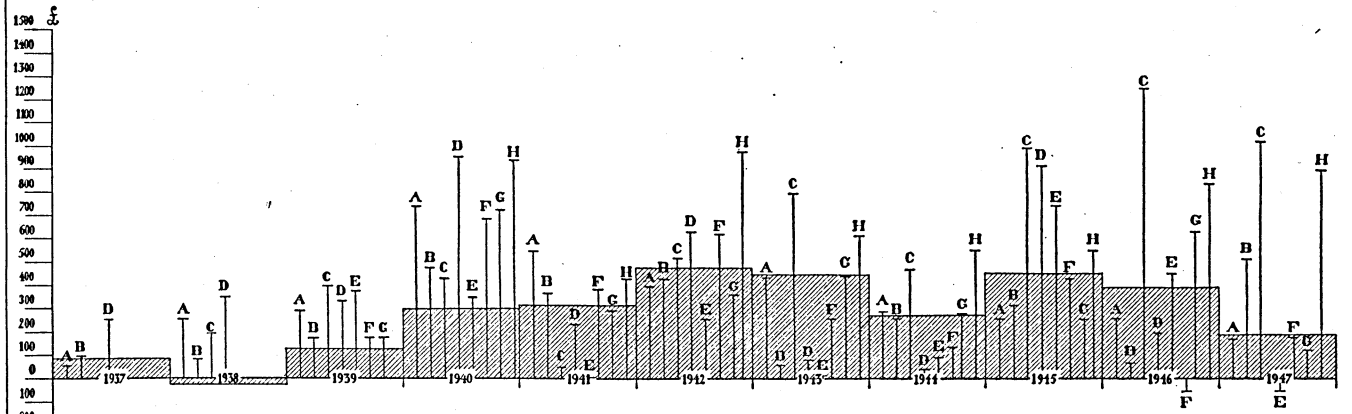
TABLE 20.

ANALYSIS OF MINUS FARM INCOMES.

Year	Total number of farms	No. of farms showing minus farm income	Farms showing minus farm incomes as a percentage of all farms	The average minus income in £ per 100 acres
			%	
1937	25	6	24.0	116.0
1938	23	13	56.5	101.4
1939	25	3	12.0	286.0
1940	26	—	—	—
1941	24	2	8.3	49.5
1942	31	—	—	—
1943	30	—	—	—
1944	31	5	16.1	229.0
1945	27	1	3.7	61.0
1946	22	2	9.0	41.5
1947	26	11	42.3	147.0

Eight farms have been selected out of the total number of farms in the sample and their yearly incomes presented in the Diagram A. The farms included in the diagram are not outstanding in any way. They were selected because of the length of their records. Their acreage and the length of the period covered by the Farm Management Survey in respect of those farms are as follows:

Farm	No. of years covered by Farm Management Survey	Acreage
A	11	86
B	11	294
C	10	65
D	10	100
E	9	82
F	9	334
G	9	169
H	8	525



THE NOTTINGHAMSHIRE SAND AREA

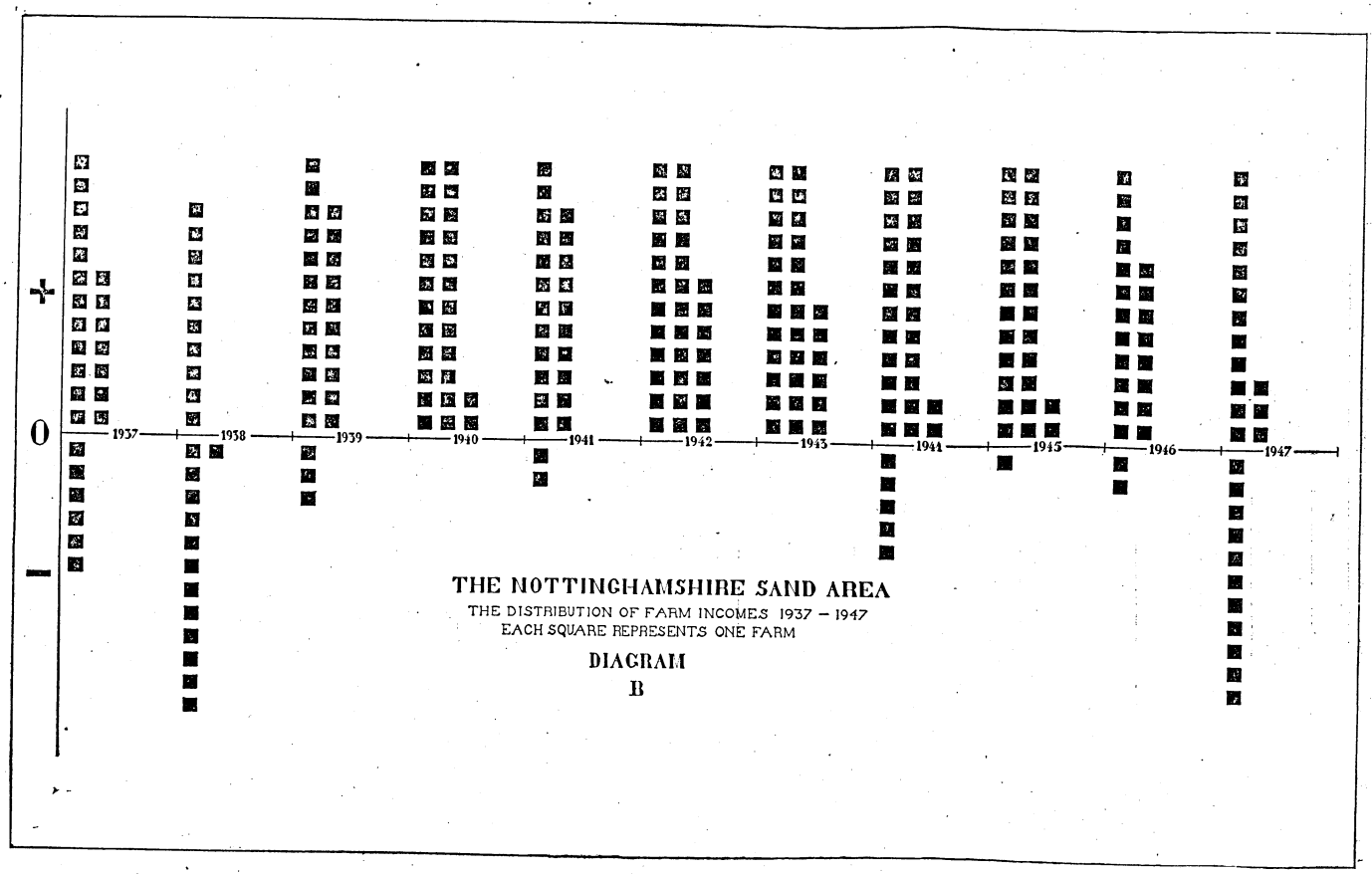
THE BALANCE OF FARM INCOMES 1937 – 1947.

£ PER 100 ACRES

SHADED AREAS REPRESENT THE AVERAGE BALANCE BASED ON THE WHOLE SAMPLE

VERTICAL LINES MARKED BY A CAPITAL LETTER REPRESENT THE BALANCE OF THE EIGHT SELECTED FARMS.

DIAGRAM A



THE NOTTINGHAMSHIRE SAND AREA

THE DISTRIBUTION OF FARM INCOMES 1937 – 1947
EACH SQUARE REPRESENTS ONE FARM

DIAGRAM
B

The significance of this diagram lies in the concentration and in the extent of incomes, made by the farms. In the last two years a downward trend of farm incomes may be observed.

The second diagram (B) illustrates distribution of farm incomes of the whole sample over the period of eleven years and in that diagram the tendency for the number of farms making minus income to increase in the recent years is pronounced.

Table 21 illustrates changes which have taken place in the field of prices of agricultural products, wholesale prices and the cost of living since 1936.

TABLE 21.

COMPARISON OF INDEX FIGURES REPRESENTING CHANGES IN WHOLESALE AND AGRICULTURAL PRICES AND IN THE COST OF LIVING DURING THE LAST TWELVE YEARS.

Year	Agricultural prices England and Wales 1936/38 =100 all products*	Wholesale prices 1938 =100*	Working class cost of living index. September 1st 1939 =100*
1936	94	93.0	95
1937	103	107.2	99
1938	103	100.0	101
1939	103	101.4	102
1940	142	134.6	119
1941	171	150.5	128
1942	183	157.1	129
1943	185	160.4	128
1944	192	163.7	130
1945	197	166.7	131
1946	208	172.7	131
1947	241	189.1	131†

* Central Statistical Office. Monthly Digest of Statistics, 1947 & 1948. H.M.S.O.
† June 17th, 1947.

Important trends are shown by the movement of prices of non-agricultural products and by changes in the cost of living, in spite of the fact, that the accuracy of the latter is often challenged.

The rise of wholesale prices and the rise of the general cost of living accompanied by the declining purchasing power of the pound sterling should be borne in mind when an economic appreciation of farming conditions is made and profitableness of farming industry is considered.

CONCLUSIONS.

Before the war the economic situation of farmers in the Nottinghamshire Sand area was at a very low ebb. Conditions were very much better during the war years but have recently shown signs of deterioration and farmers are very much afraid that they may drift back to the low standards experienced during the pre-war years.

The risk is a very real one because the low inherent fertility of the soil seriously limits the opportunities for change to systems of farming which are less affected by overseas competition. The soil is hungry and lacking in humus content. The old traditional system of barley, roots and sheep has been modified by the substitution of sugar beet for swedes and turnips, but it is still far too rigid in character and does not provide the small farmer with the necessary scope for earning a reasonable income.

If this area is to remain under cultivation it will be necessary to consider possibilities of widening the scope of farming or of eliminating the smaller farms which under the present system cannot be expected to provide occupiers with reasonable returns.

Any recommendations that are made must take into account not merely the need to provide the agricultural community with a reasonable standard of living but also with opportunities for enjoying a social and cultural life with the minimum of inconveniences to the individuals. Because of the difficulties created by policies which cause depopulation of the countryside difficulties associated with the provision of social amenities of educational, religious or political activities and of public services—the elimination of the small farm should be recommended only after all other possibilities have proved impracticable.

The essential need is to increase net output per acre and this must be done either by the introduction of new crops or of livestock or by the reorganisation of the present systems of farming.

Sheep are at present the largest single source of farm revenue from the livestock enterprises and the main agent of maintaining the fertility of the land in the area. But there is a scope for improvements in sheep management generally, and the question should be carefully considered whether the present policy of keeping breeding and feeding flocks should be continued or whether it would be more advantageous from the farmers' point of view to dispense with breeding flocks and

to concentrate on sheep fattening. At present breeding flocks benefit from the good state of pastures in the spring but owing to deterioration of those pastures in summer they tend to lose condition by the time roots are ready for folding. The turn-over in livestock production could be increased and speeded up if only flying flocks of sheep were maintained on the Sand farms. Other types of livestock, namely pigs and poultry, would have an extra opportunity for feeding in the periods of absence of sheep from the farm in late spring and summer.

It may be argued that it would be undesirable for the Sand land farmers to depend for their store lambs on the outside sources and that such policy would aggravate the price problem. There are examples of Sand land farmers who have been encouraged to practice the system of long grass leys with some success and in those cases the maintenance of breeding flocks was possible without suffering a falling off in condition during summer. In addition the maintenance of breeding flocks assists in developing and in improving the resistance and adaptability of sheep to the local conditions. Where breeding and feeding flocks are maintained, pig and poultry production would have to be developed independently from the sheep stocking and the possibility of buying suitable feeding stuffs would determine the development of pig and poultry production.

The pig and poultry production must be developed in the area if the net output per acre is to increase. There are two ways of developing pig and poultry production. Both types of livestock will to some extent be dependent on purchased foods. Rough grazings may not offer much food, especially later in the year, but they will provide pigs and poultry with an excellent ground for excercise, and they will improve the fertility of the land in no lesser degree than sheep, consequently bringing rough grazings into cultivation. Folding of pigs and poultry will have to be fitted into the improved system of farming and the local natural and economic conditions will determine how far those enterprises can be developed.

Whereas the more extensive system of pig and poultry production may be adopted generally, some farmers, particularly those who have sufficient technical knowledge and capital at their disposal, may develop, as major enterprises, more intensive pig and poultry production. Those pig or poultry enterprises would be highly dependent on purchased concentrates, but farmers would gain from the higher turn-over and the lower costs of production per unit.

Sheep, pigs and poultry offer in the Sand area more opportunities than cattle. Their higher adaptability to the inferior pasture conditions makes them extremely valuable agents for improving the fertility of that land the manurial requirements of which are the greatest. They increase the turn-over, and their production is more adjustable to the short period fluctuations in prices.

Cattle rearing and feeding and milk production have, generally speaking, little immediate prospects of development because of the low yield of home grown fodder crops and the shortage of purchased foods, labour difficulties and the inadequate supplies of water in some parts of the area. As pointed out earlier, any substantial development of milk production or cattle rearing will remain limited to those few farms which have relatively good pastures and where the farmers are able to make further increases in the production of home grown foods to feed the cattle.

But before any substantial increase can be obtained from crops it will be necessary to increase the humus content of the soil. The technical problems are considerable and much experimental work on both arable crops and pasture mixtures is required. In the main, crop production must be planned for the production of livestock and livestock products. As regards grassland there is need to provide farmers with more detailed information on seeds mixtures and on management under the special conditions of the Sand land area. Observation shows that the quality of the permanent pastures is low and that leys quickly deteriorate. If the density of grazing stock is to be increased, there must be a considerable improvement in both the quality of the herbage and in the amount of grass produced. Farmers require advice on mixtures which are most likely to withstand drought conditions during the early summer. Inevitably the leys will deteriorate more quickly on the Sand lands than on soils with higher capacity for retention of moisture, and it will therefore be necessary to give careful thought to the costs of establishment of leys in relation to the length of their life.

Until the humus content in the soil and its fertility generally are increased no visible and permanent improvements in the yields and quality of arable crops can be expected. There are, therefore few profit making opportunities in the production of cash crops under the conditions of competitive marketing and before the fertility of the land is substantially increased. If livestock enterprises are going to be the main source of the farmer's income, his policy

of arable crop production should be concentrated on feeding crops rather than cash crops. Among the cash crops, sugar beet has the best prospects of remaining or even expanding in the area. The yield tends to be low, but the sugar content is about average and the tops amounting to about five tons per acre provide useful keep for sheep. Some other cash crops, of a market garden variety, e.g. carrots, peas and beans may and will be grown locally on the land which has proved particularly suitable for their production.

The humus building properties of various crops should seriously be taken into consideration and the selection of crops should be determined not only by the highest output per acre they yield but also by the effect on the fertility of land.

As regards crop production generally, the suitability of various new crops to the area, especially cocksfoot, lucerne, serradella[1] and lupin must be thoroughly examined. All these plants are grown successfully under soil conditions very similar to those of the Nottinghamshire Sand. If they could be fitted into a progressive system of farming which must be devised for the area, they would offer many opportunities either for direct feeding or silage, or, as in the case of lupin, by ploughing in and increasing the compactness and humus content in the soil.

There are two important points which should be remembered in replanning of the Nottinghamshire Sand farming. All necessary changes in farming practices pivot round the essential problem of improving the fertility of soil. There is no way of achieving that by process of a single operation and therefore only a gradual and slow improvement can be expected. The rate of progress will depend on a correct balancing of various enterprises into a pattern which will not only secure the adequate level of living standards for the rural community but also will be most advantageous to the land.

The other important point is the question of agricultural experimentation. There are many farming problems requiring further examination. The usefulness of these experiments will depend on their continuity and on the application of a scientific method in their conduct, but in any case they must be carried out under the local conditions.

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1 An annual leguminous plant capable of growing on dry, poor sands, sown in spring to produce pasturage lasting only a year but readily eaten by sheep. Ploughed in by itself or in mixture with lupin, serradella is also used for enriching poor dry sands.

As regards changes in the external conditions of the immediate environment of the area it is unlikely that they would affect farming to any serious degree in the near future. The possibilities are being examined and plans devised by the county authorities, Ministry of Town and Country Planning and the Ministry of Agriculture and Fisheries in respect of future movements of population, urbanisation and land utilisation. Many of these plans are still in the stage of ideas rather than concrete proposals, but they have a real bearing on the problem.

Still less can be said about the general economic conditions in so far as they affect agriculture in the area. It is evident that the present agricultural policy in Britain aims at creating an efficient agricultural industry and that in its drive for higher production it does not neglect any means of assisting the farmer in the achievement of that aim. Agricultural policy is only a part, and in a highly industrialised country a minor part, of the general economic policy, but obviously general economic policy must play a large part in determining the future lines of development of any component of the national economy.

From the point of view of the farming in the Nottinghamshire Sand area it is sufficient to realise that farming practices must sooner or later be subjected to modifications and adjustments arising from an ever changing set-up of the economic world. The realisation of those facts should stimulate every section of the community into taking effective steps which would ensure and improve its resistance in the face of economic pressure.

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