

University of Cambridge
Department of Agriculture

Farm Economics Branch

Report No. 16

(Issued August, 1930)



No. 3

Sugar Beet in the
Eastern Counties
1929

Being the Final Report on an Investigation into the Financial
Results of Sugar Beet Growing, and the Principal Factors
Influencing Them, during the Three Seasons 1927, 1928 and
1929, with Particular Reference to the Latter Year.

BY

C. BURGESS, M.A., DIP. AGRIC. ECON.

AND

P. E. GRAVES

FER & SONS LTD., CAMBRIDGE

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DIAGRAM I.

Distribution of the Costed Fields during the three years 1927, 1928 and 1929,
in relation to the Factories.



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FARM ECONOMICS BRANCH, 1930

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Acknowledgments

ONLY those who have an intimate knowledge of time-sheet costing methods can appreciate the sacrifice of time and care which an investigation of this type, on a large scale, demands from those who undertake to provide the fundamental material. During the last three seasons one hundred and fifty-two Eastern Counties farmers have, for varying periods, supplied the Department with detailed particulars of the costs of production and circumstances surrounding the growing of five hundred and thirty fields of Sugar-Beet. The mass of information which has thus accumulated at the Department, amounting to over ten thousand completed forms of varying descriptions, bears testimony to the labour involved. Without liberal support of this nature, which has been given frequently at those periods of the farming year which make it most costly, this investigation could not have been carried out, and these growers, at least, have responded to and justified the Sugar-Beet Subsidy Act. The industry in general owes them thanks, and the Department is most grateful for their assistance.

The exacting and difficult task of co-ordinating and reconciling the Research Department with the Farm has been ably carried out by G. Ll. Rogers, Esq., M.A. His work has consisted largely of the unpleasant duty of questioning and cross-examining the growers, and the success which has been achieved is proof as much of his tact and discretion as it is of the forbearance and generosity of the farmers. The friendly, interested attitude of the growers, which is essential to reliable results, is largely due to his indulgence.

CHAPTER I

I. INTRODUCTION

THIS publication represents the final *Report* on an investigation into the financial aspects of sugar-beet growing in the Eastern Counties which was commenced in the autumn of 1926. Two interim *Reports*,* dealing respectively with the 1927 and 1928 sugar beet crop, have already been published, and this issue is intended to complete the series. In order to facilitate annual comparisons, the form of the present publication corresponds with that of its predecessors, but its objects are three-fold, viz.:—

- (a) To demonstrate the results of sugar-beet growing in the Eastern Counties in 1929, and to compare them with those of the two previous seasons;
- (b) On the evidence of three years' results, to draw attention to certain cause-effect relationships in the production of the crop; and
- (c) To provide a basis for determining fair contract prices.

Like its predecessors, this *Report* is of a comprehensive nature, and the number of readers who may find interest in each of its many sections will therefore be limited. The practical grower will undoubtedly find most interest in Chapter V, while those who want figures to show how the producers fared in 1929, in comparison with previous years, will turn to Chapter IV. Several new sections have been added, and in this respect attention may be directed particularly to sections (i), (j) and (k) of Chapter V. No account is given here, either of the system by which the basic *data* were obtained from those growers who co-operated in the investigation or of the methods employed in amalgamating and analysing the information thus collected. A full description of these technical details was given in Farm Economics Branch, *Report 9* (pp. 2-10), and further comment was added in *Report 13* (p. 4). In order to obtain comparability of results, and because there was no apparent reason for alteration, the same principles and methods have again been used.

If the choice could have been made, it would have been difficult to find three more suitable seasons for this investigation than those of 1927, 1928 and 1929. These years comprise one bad season, one "average" season and one good season. They include a drilling period with less than half, and one with nearly twice the normal rainfall, while the lifting operations have experienced even more diverse conditions. Indeed, it would be hard to imagine two more dissimilar seasons than those of 1927 and 1929, nor one which would combine them better than 1928. Based on such wide seasonal variations the results of this investigation, where they have been undisturbed each year, must be free from the old tag—"it all depends on the season."

* Farm Econ. Branch, *Report 9*, "Sugar Beet in the Eastern Counties, 1927." Farm Econ. Branch, *Report 13*, "Sugar Beet in the Eastern Counties, 1928."

2. THE SAMPLE

The 1929 results incorporate figures for 95 separate farms, distributed throughout the counties of Norfolk, Suffolk, Essex, Hertfordshire, Cambridgeshire, Bedfordshire, Huntingdonshire, the Isle of Ely, the Soke of Peterborough, and all three divisions of Lincolnshire. No less than 44 of these farms were represented in both the previous *Reports*, and 78 of them appeared in the 1928 *Report*. Only 17 new farms have, therefore, been introduced into the 1929 sample, and, of these, two are under the management of growers who had already co-operated in the earlier years. Table 1 shows that, in major characteristics at least, the sample has remained unchanged during the three years covered by the investigation, and that it is reasonably representative of normal conditions in the Eastern and North-Eastern Divisions of England.

The size distribution of the costed farms is almost unchanged. Seventeen per cent. are less than 100 acres in extent; 31 per cent. are between 100 and 250 acres, while 28 per cent. of the remaining 52 per cent. do not exceed 500 acres. The total area of the costed farms is 36,762 acres.

TABLE I
COMPARISON OF MAJOR CHARACTERISTICS OF FARMS COSTED DURING EACH YEAR
WITH NORMAL CONDITIONS

	Arable acreages as a % of total area under crops and grass.	Rent per acre.	Density per 100 acres.	
			Regular labour.	Working horses.
100 Farms costed in 1927	75	29/5	3·8†	3·2
100 Farms costed in 1928	74	30/10	3·9†	3·6
95 Farms costed in 1929	74	29/3	3·8†	3·4
All costed farms together . .	74	29/10	3·8†	3·4
E. & N.E. Divisions§ . .	69	29/-	3·2*	3·5

Sugar-beet was an entirely new crop to 3 per cent. of the costed growers, and only 2 per cent. were having their second years' experience. Nine per cent were growing their third, and 23 per cent. their fourth crop, while no less than 63 per cent. had had at least four years' experience *before* 1929. Over all the farms the total area of beet grown represented 15·7 per cent. of the arable land. These same farms had had 13 per cent. of their arable land under beet in 1928, and 11·2 per cent. in 1927. The corresponding figures for 1926 and 1925 were 8·1 per cent. and 4·5 per cent. respectively, but it must be appreciated that in these earlier years several of the farms were not growing beet at all. If the 60 farms which have grown beet continuously for five years are considered alone, the percentage of the arable land which this crop occupied has increased from 7·1 per cent. in 1925 to 10·5 per cent. in 1926, 13·7 per cent. in 1927, 14·7 per cent. in 1928, and 16·6 per cent. in 1929. This latter figure

* Does not include family labour.

† Includes family labour.

§ From *Ministry of Agriculture Annual Statistics* and *1925 Census of Production*.

must surely be approaching the maximum economic "average" under present rotational management.

The total area of beet costed in 1929 amounted to exactly 2,750 acres, and this represented just two-thirds of the total acreage grown by the farmers who supplied information. The distribution of this area over the Eastern Counties (given in Table 2), shows that the more important centres of production exert a proportionate weight in the sample. The total costed area amounts to 1·6 per cent. of the area grown in the counties represented, and 1·2 per cent. of the total acreage in England and Wales.

When the three years' results are combined, the sample includes 160 different farms, and 530 separate fields. The total costed area amounts to no less than 7089½ acres, and the total costed quantity of beet to 61,757 washed tons. This amount exceeds the quantity worked by the majority of factories during the 1928 campaign, and represents nearly 5 per cent. of the beet grown during that one year. From Diagram I (*Frontispiece*), which indicates the positions of the fields costed during the three years, it will be seen that the sample was widely distributed over the whole of the Eastern Counties.

TABLE 2
COUNTY DISTRIBUTION OF THE COSTED AREA

County.	Covered by the present enquiry.			Total acreage under sugar- beet in 1929.	Costed acreage expressed as a % of total acreage under beet.
	Farms.	Fields.	Acres.		
Norfolk	31	62	1202½	53,438	2·2
Suffolk	26	60	787½	37,880	2·1
Isle of Ely ..	8	19	228½	19,492	1·2
Kesteven (Lincs.)	7	17	164	11,989	1·4
Essex	5	9	75	7,873	1·0
Cambridgeshire ..	4	7	87½	8,487	1·0
Soke of Peterborough	4	4	36	2,663	1·4
Hertfordshire ..	3	4	35½	1,452	2·4
Holland (Lincs.) ..	3	4	89½	6,363	1·4
Lindsey (Lincs.) ..	2	3	10½	15,349	0·1
Bedfordshire ..	1	1	10½	1,921	0·5
Huntingdonshire ..	1	1	23	7,237	0·3
Totals	95	191	2,750	174,144	1·6
England and Wales	—	—	—	229,918	1·2

CHAPTER II.

THE following chapter contains a short statistical summary of material relating to the methods of growing and manuring, and to the yield, tare and sugar content of beet produced on different types of soil. This account is primarily of theoretical interest, and a discussion of the practical significance of these various factors is deferred to Chapter V.

1. FIELD DATA.

The 95 separate farms which are represented in this *Report* provide *data* relating to 191 separate fields, or 18 more than were included in the 1928 *Report*, and 9 more than were obtained in 1927. Fifty-four of the 95 farms contributed only a single field for costings purposes, and a further 16 supplied material for two fields each. Eight and nine farmers gave information relative to three and four fields each respectively, and five more growers contributed equally 25 costs. The remaining three farmers supplied no less than 20 sets of figures, one of them being responsible for eight separate fields.

The average size of the individual costed fields which, in 1927, was 12½ acres and, in 1928, 12 acres, has risen again to the former figure. Again, however, just over half the costed fields were less than 10 acres in extent. Nevertheless, the number of fields exceeding 20 acres in size has increased to 18 per cent. of the total, while only 17 per cent., as compared with 22 per cent. in 1928, lie between 10 and 15 acres.

It will be recalled that, in 1927, sugar-beet was grown after a white straw crop on 60 per cent. of the fields. In 1928 the comparable figure was 62 per cent., and this year it shows a further slight increase to 66 per cent. Wheat and barley account for one-fifth and one-quarter, respectively, of all the preceding crops, and oats appear in exactly the same proportion of cases (17 per cent.) as in the previous year. Sugar-beet followed sugar-beet almost as often as it followed wheat, while root crops of one kind or another preceded beet in almost exactly one-third of the cases. In several cases sugar-beet was being grown in 1929 for the third successive time. It was suggested in the earlier *Reports* that two successive crops of sugar-beet might be an economic proposition, but a warning was given against extending this practice to a third year. The 1929 results support this suggestion and, at the same time, illustrate the necessity for repeating the warning. This subject is referred to in Section (d) of Chapter V.

The 1927 sugar-beet crop was followed by barley on 48 per cent. of the costed fields. In 1928 the same crop accounted for 50 per cent., and in 1929, 54 per cent. of the succeeding crops. Oats and wheat are following the 1929 sugar-beet on 9.5 per cent. and 8.5 per cent. of the fields, respectively; so that white straw crops comprise 72 per cent. of the succeeding crops. Comparable

figures for the previous two years were 76 per cent. in 1928 and 67 per cent. in 1927. As in the previous year, sugar-beet is following sugar-beet in just over 19 per cent. of cases, and in more than a quarter of these it is the third successive beet crop. Root crops of one kind or another represent 27 per cent. of the crops following the 1929 sugar-beet.

The average quantity of seed sown (if the two fields which had to be re-drilled and the four on which a spacing drill was used are excluded) was just 15 lb. per acre. This suggests a more satisfactory state of affairs than actually exists, for no less than one-third of the fields received less than the average, while only one-quarter exceeded that amount. These figures indicate, however, a slightly heavier seeding than in 1928 when just 40 per cent. of the fields received less than 15 lb. per acre. The 16 fields grown on the ridge averaged only 13½ lb. of seed per acre. As would be expected, there is again a tendency towards heavier seeding where closer drill spacing is adopted. The increase, however, is not sufficient to maintain the same number of seeds per unit of drill length. For the guidance of growers in this connection the following figures are given. In order to maintain the same number of plants in a yard of drill row the rate of seeding must increase by rather over ½ lb. per acre for each decrease of one inch in the distance between the rows. An example of the exact figures is as follows:—If 24 in. drills require 15 lb. of seed per acre, then 22 in. drills will require 16½ lb., 20 in. will require 17½ lb., 18 in. will require 18½ lb., and 16 in. will require 20 lb. of seed per acre.

No less than 45 per cent. of the fields were drilled at 20 in. or 21 in. between the rows, the former distance being slightly more popular than the latter. Only 14 per cent. exceeded these distances, while 41 per cent. were drilled at narrower widths. The "mode" is, for the third year in succession, exactly 20 in. If the ridged fields are excluded, just 95 per cent. of the fields were drilled at 18 to 22 in. between the rows. It is here that the results of experience are seen, for two years previously less than 70 per cent. of the fields came within these limits.

With two exceptions it was the intention of all the growers represented in this *Report* to chop their beet out to 8 in., 9 in., or 10 in. between the plants. More than half the fields were intended to be at 9 in., and the over-all average was just above that figure. It will be recalled that similar figures were obtained in 1928, but that, in the same year, the plant to plant distance was measured along more than three miles of drill length in 40 separate fields, and that the actual average distance between plants was 14 in. It is obvious, therefore, that the growers' estimate in this connection is far from reliable. The same will not be the case, however, where the distance between the rows is concerned, because this is set at a definite figure according to the size of the drill.

On the costed fields drilling commenced in the first week of April, and was all completed by the beginning of June. In the previous years it had not been finished until a fortnight later. It is satisfactory to record a very definite tendency to drill earlier. In 1927, 26 per cent. of the fields were drilled by the

end of April; this figure was increased to 33 per cent. in 1928, and to no less than 55 per cent. in 1929. In this latter year a further 25 per cent. were completed during the first ten days of May, and after the middle of that month only 12 per cent. were still undrilled. In 1929, therefore, sowing appears to have taken place quite a week before it did in 1928, and a fortnight earlier than in 1927.

The farmer's interest in the variety of seed which he uses continues to grow. It was an astonishing fact that in 1927 less than a third of the growers were familiar even with the name of the seed they had sown. The following year just half were conversant with the variety of seed used, and in 1929 only 5 per cent. could not supply this information. In this latter year many growers were also familiar with the type of the variety which they were using. It is interesting to record that, over the three years, the Kleinwanzleben and Kuhn varieties together account for just two-thirds of the beet grown, and that, of these two, the latter is slightly the more popular. It is very obvious that Kuhn is more popular on the lighter soils, for 50 per cent. of the beet in the very light soil class was grown from this strain, while only 27 per cent. of the medium to heavy soil growers used the same variety. This is not the only indication of the suitability of Kuhn to the lighter soils. Kleinwanzleben appears to be equally popular on all soils, and, of the other varieties, Dippe has made up the deficiency on the medium and heavy soils and Marsters is grown more often in the fens than elsewhere. From the available material it is difficult to make any concrete suggestions in this connection beyond stating that there can be little doubt of the superiority of the "E" type (i.e. the heavy yielding type) on most soils, so long as the contract scale of prices is unaltered in favour of higher sugar percentages.

2. MANURING

The proportion of fields to receive a dressing of dung has been maintained at rather over half (54 per cent.) of the total. The larger acreage of beet grown, has, however, necessitated a reduction in the average dressing, which has fallen from over 11 loads per acre in 1928 to under 10 loads per acre in 1929. Fish manure was again the most popular alternative organic manure, and 12 per cent. of the fields were dressed with this. On one-third of these fields, however, the fish manure was in addition to dung. Only 2 per cent. (4 fields) were treated with sewage or sludge, and one field received soot. Shoddy and meat meal were not used at all on the fields costed in 1929. Just 30 per cent. of the sugar-beet fields had been manured with dung for the preceding crop, but it is surprising to find that exactly half of these were dunged again for the beet. Some of these, of course, did not receive a full dressing on both occasions. Altogether 73 per cent. (as against 81 per cent. in the previous *Report*) of the fields was dressed with dung or treated with sewage, either directly for the sugar beet or for the preceding crop.

By a coincidence, sulphate of ammonia was used on exactly the same proportion of fields ($36\frac{1}{2}$ per cent.) as in 1928. Again it was the only artificial nitrogenous manure on half these fields. On nearly 15 per cent. of all the fields it was followed by a top-dressing of nitrate of soda, and on a further 2 per cent. the subsequent top-dressing was nitrate of lime. On three fields ($1\frac{1}{2}$ per cent. of the total number) sulphate of ammonia was used in conjunction with both these latter manures. Nitrate of soda was used altogether on nearly 39 per cent. of the fields. In previous years it was not used as extensively as sulphate of ammonia. On $2\frac{1}{2}$ per cent. of fields it was used in addition to nitrate of lime, so that it was the only nitrogenous artificial applied to 20 per cent. of the crop. Nitrate of lime was put on nearly 10 per cent. of all the fields, but two-thirds of these were supplemented with either sulphate of ammonia, or nitrate of soda or both. Altogether one or more of the above artificial nitrogenous manures were applied to 62 per cent. of the fields—an advance of only 1 per cent. on the 1928 figure, and 6 per cent. on the 1927 figure.

In 1927 the proportion of fields which were dressed with superphosphate was 34 per cent. This figure was increased to 44 per cent. in 1928, and for the year under consideration has risen to 47 per cent. A bone manure of some kind was applied to 11 per cent. of all fields, but in only two cases (1 per cent. of all fields) was it used without superphosphate. The only two users of rock phosphate also used superphosphate, and one grower used basic slag alone. Artificial phosphatic manure of one kind or another was therefore applied to $48\frac{1}{2}$ per cent. of the fields. Corresponding figures in 1927 and 1928 were $43\frac{1}{2}$ per cent. and $45\frac{1}{2}$ per cent. respectively.

It will be remembered that after 1927 the popularity of kainit as a potassic manure decreased with the more extensive use of muriate of potash. The 1929 figures show that the position is unchanged, for the proportion of fields receiving kainit in that year shows a small decline to 21 per cent., while that receiving muriate is unchanged at 19 per cent. Seven per cent. of the fields were dressed with potash salts, and only 1 per cent. with sulphate of potash. Five fields received both kainit and muriate, and one had kainit and potash salts. The proportion of fields receiving an artificial potassic manure in 1929 was, therefore, $42\frac{1}{2}$ per cent. This figure represents a decrease of $5\frac{1}{2}$ per cent. since 1928 and $11\frac{1}{2}$ per cent. since 1927. Section (k) of Chapter V shows that the results of *heavy* potassic manuring during the last three years have not been encouraging, and the decrease in its use is probably due to the observation of this point by the growers.

After falling from $43\frac{1}{2}$ per cent. in 1927 to $31\frac{1}{2}$ per cent. in 1928, the number of fields which were dressed with a "patent" sugar-beet mixture shows a further decline to 28 per cent. in 1929. These "patents" were more often than not used in conjunction with dung, and frequently followed by a nitrogenous top-dressing, but other artificials were also sometimes used, so that in only two cases was the "patent" the only manure.

Only 5 out of the 191 fields of sugar-beet were grown without direct manuring of any kind, but one of these was after a crop of swedes which had been folded. Two of the remaining four were on good fen soils, and one of these was heavily limed. The other two were on one of the sewage farms, and had been treated in the previous year. Altogether 7 per cent. of the fields were dressed with lime.

It has been suggested that the reason for the decrease in the "average" dressing of dung was the increase in the acreage of beet grown, and the same cause may be responsible for the tendency towards smaller applications of artificials. The "average" dressings of both nitrate of soda and nitrate of lime have decreased to just over 1 cwt. per acre, and superphosphate has fallen by $\frac{1}{2}$ cwt. to $2\frac{1}{2}$ cwt. per acre. The "average" rate of application of muriate of potash has been maintained at just over 1 cwt., but the dressing of "patent" mixtures has decreased to almost $4\frac{1}{2}$ cwt. per acre. The two exceptions to this general fall are sulphate of ammonia, which averages $1\frac{3}{4}$ cwt. per acre as compared with 1 cwt. in 1928, and kainit which has increased from 4 cwt. to $4\frac{1}{2}$ cwt. per acre.

For reference purposes there are provided, in Appendix D, details of the manuring of each field costed during the three years 1927, 1928 and 1929. To facilitate comparisons the various artificial manures have been converted into their manurial equivalents and expressed in pounds of nitrogen, phosphate, and potash. The peculiar qualities of organic manures render unsatisfactory the conversion of dung and fish manure on a unit basis, and these are, therefore, given in separate columns. The quantity of lime applied is also shown.

3. YIELD, TARE, SUGAR CONTENT AND "TOPS"

(a) *Yield.*

The simple average of the washed yields from the 191 costed fields is 9.386 tons per acre. This figure compares with 9.035 tons in 1928 and 7.711 tons in 1927. The 1929 yield therefore represents an increase of approximately one-third of a ton above that of 1928. In the same two years the average yields for the whole of England and Wales were 7.8 tons in 1928, and 8.7 tons in 1929. The average yield from the costed sample for 1929 is thus much more in line with that for the country as a whole, although it is still some 13 cwt. per acre greater. As has previously been suggested, the main cause of this difference lies in the greater proportion of fenland beet included in the costed average.

The individual field average washed yields varied from 3.9 tons to no less than 19.4 tons per acre. Less than 5 per cent. gave a yield of under 5 tons per acre, while nearly 17 per cent. yielded over 12 tons, and 40 per cent. yielded more than 10 tons per acre. Only 2 per cent. of the fields in 1927, and 10 per cent. in 1928, gave yields in excess of 12 tons per acre. When the three years' results are combined, the average washed yield is 8.711 tons per acre.

Such a figure is suggestive of a reasonable achievement on "average" land under "normal" circumstances.

(b) *Tare.*

At the beginning of the lifting season it seemed as though the 1929 deliveries were going to be cleaner, on the average, even than those of the previous year. The early October and November rains, however, resulted in the later deliveries containing a higher proportion of dirt, and the tare for the whole season on the costed sample averaged 12.1 per cent. against 11.3 per cent. in 1928 and 17.3 per cent. in 1927. For the whole country the average tare in 1929 was 11.1 per cent. The range in field average percentage tare was from 3.34 per cent. to 26.08 per cent. Less than six per cent. of fields, however, returned a tare of under 5 per cent., while a quarter gave more than 15 per cent. Just over one-third of the fields averaged under 10 per cent. dirt and tops. Among the unusual achievements of the season may be mentioned that of one grower who delivered seven consignments, amounting to nearly 60 tons of beet, in such a clean condition that no deduction was made on account of tare.

It is satisfactory to be able to record that the average addition to the tare which results from any necessary re-topping at the factory amounts over-all to approximately $1\frac{1}{2}$ per cent. of the weight of the roots. There are, of course, exceptional cases, and some individual deliveries may, on account of the method of sampling, have given disappointment, but on the whole topping seems to have reached quite a satisfactory state of efficiency. The extremes in the costed sample are represented, on the one hand, by a field with an average top tare of $5\frac{1}{2}$ lb. per cwt., and, on the other, by 23 deliveries from another field without a single deduction on account of re-topping. It cannot be doubted that the former of these two fields should have been topped more heavily, but it is equally possible that the latter was over-topped. The one is as uneconomic as the other. As a general rule it may be suggested that so long as the top tare averages between $\frac{3}{4}$ lb. and 2 lb. per cwt. the grower can be satisfied that his men are doing their work with reasonable efficiency, but outside either of these limits his attention is demanded.

Care in topping is usually called for at the beginning of the lifting season, for practice is required before proficiency is obtained. A typical example of this is provided by one grower who delivered 150 consignments. The first 30 of these had an average top tare of nearly 4 lb., while the second 30 averaged just under 2 lb. per cwt. The third and fourth batches of 30 deliveries gave average top tares of $\frac{3}{4}$ lb. and $\frac{3}{8}$ lb. per cwt. respectively, and the last batch averaged only $\frac{1}{2}$ lb. per cwt. Such a record suggests that, at first, the men who were topping were out of practice, while by the end of the season they had become careless and were over topping.

As is the case with sugar content, the top tare varies considerably from factory to factory. Indeed, it would be surprising if it were otherwise, where so much depends upon the human factor. In the costed sample the average

top tare at one factory amounts to more than twice that returned by another factory working under similar conditions. But the factory to factory difference is actually more than these average figures suggest, for, while at the one 52 per cent. of the consignments were not penalised at all on this account, at the other only $\frac{1}{2}$ per cent. escaped the analyst's knife.

(c) *Sugar Content.*

The average sugar content of the costed sample in 1929 remained unchanged from the previous year, at 17.9 per cent. For the whole of England and Wales the average rose from 17.4 in 1928 to 17.7 in 1929. The early deliveries were phenomenal in this respect, and during the last days of September and the beginning of October returns of 20 per cent. sugar were no unusual occurrence. The highest single return for the costed beet was a truck load at 24.6 per cent. sugar, and the highest that came to the notice of the writer was 25.4 per cent. sugar. It is almost incredible that one-quarter of these roots should be pure sucrose. The lowest sugar content ever observed also occurred during 1929; this was of exactly 10 per cent., and was delivered on the same day from the same field to the same factory as a consignment of 17.0 per cent. sugar. This grower delivered no less than 50 consignments with sugar contents of 20 per cent. or more. If this abnormality is overlooked, the lowest reasonable individual delivery was one of 13.5 per cent. sugar. The highest field average sugar content was 21.0 per cent., while no less than 15 fields gave averages of 20.0 per cent. or more. One fenland field had an average as low as 14.4 per cent., but the washed yield on the same field was no less than 19.4 tons per acre. The next lowest field average was 15.4 per cent., but altogether only 16 fields gave sugar contents below 16.5 per cent. Just three-quarters of the costed fields returned average contents of between 16.5 per cent. and 19.0 per cent. sugar.

(d) *Tops.*

The over-all estimated yield of "tops" in 1929 was 7.3 tons per acre. The unusually dry summer was responsible for this reduction of 16 cwt. per acre on the average for the previous year, and the present figure is no less than 1.6 tons below the average for 1927, which was an unusually wet season. Over the three years the average yield of "tops" is 8.1 tons, which compares with an average yield of roots of 8.7 tons per acre.

4. SOIL CLASSES

In dividing the costed fields into groups according to the nature of the soil, care has been taken to adhere, as far as possible, to the standards which have been adopted in the previous *Reports*. The same fivefold classification has been used, and it is perhaps worthy of note that each field (and not each farm) has been considered individually. Consequently, it can at least be claimed

for the classification that it is a relative one. The five groups are: very light; light to medium; medium to heavy; fen, warp and silt; sewage farms.

Thirty-one of the costed fields were situated on fen, warp or silt land; ten fields were on sewage farms, and exactly 150 fields represent upland soils. Of the upland fields, 23 are described as very light, 91 as light to medium, and 36 as medium to heavy. These numbers, compared with the *data* relating to the 1928 season, indicate a considerable increase on the very light and on the medium to heavy soils. The unprofitable nature of the 1927 crop resulted in a curtailment of production, during the 1928 season, mainly on the heavy and very light soils. There followed the pleasing results of 1928, and the consequent return to production on the less suitable soils. Hence the increased acreage in 1929, which has been further augmented in 1930. But it is perhaps a pertinent question as to how far this increase represents an addition to the economic beet growing area, and how far it is an extension of beet production on land which can only show a profit in a good year.

Table 3 shows the distribution of the costed acreage over the various soil classes in each of the years 1927, 1928 and 1929. It will be seen that, taking the three years together, each class, with the exception of the sewage farms, is represented by more than 1000 acres of beet, and that typical beet growing upland is represented by over 3000 acres.

TABLE 3
SOIL GROUPING OF COSTED AREA

Year.	Light to medium. (acres)	Medium to heavy. (acres)	Fen, warp and silt. (acres)	Very light. (acres)	Sewage. (acres)	All together. (acres)
1927 ..	1076	424	516	221	66	2303
1928 ..	915½	231	438½	347	105	2036½
1929 ..	1068½	423	423	723½	112	2750
All together	3059½	1078	1377½	1291½	283	7089½

On the costed fields the yields obtained from the 1929 crop are, in every soil class, higher even than the satisfactory yields of 1928, but the increase is not uniform. The fenland fields improve upon the good results of 1928 by more than a ton, giving an average yield of no less than 12·2 washed tons per acre in 1929. The medium to heavy soils, with an average washed yield of 9·4 tons, show an increase of half a ton on the previous year. The light to medium soils at 9·0 tons yielded only 2 cwt. above the 1928 figures. The very light soils average 7·5 tons in 1929, or 10 cwt. more than the 1928 crop. The yields on the sewage fields average 8·7 tons, or only 2 cwt. more than the previous year. Over the three seasons, the fen, warp and silt soil-group show an average yield of 12·2 tons unwashed, or 10·6 washed tons per acre. The sewage group give the next best average yield of 8·7 washed tons per acre. Close behind this come the light to medium soils at 8·6 washed tons, and the medium to heavy class with 8·5 washed tons per acre. The very light soils average only 7·3 tons unwashed and 6·3 washed tons per acre.

The above yields, as well as the average sugar content, tare and pounds of sugar per acre for the various soil classes for each year are given in Table 4. It is interesting, although the difference is not statistically significant, to note that over the three years the heavier land returned a slightly better average sugar content than the lighter soils. Thus, the very light soil class has an average sugar content of 17.3 per cent., the light to medium averages 17.6 per cent., and the medium to heavy 17.8 per cent. Over the three years, also, the fen average is 16.3 per cent., while the sewage farms averaged only 15.6 per cent.

TABLE 4
YIELD DATA IN DIFFERENT SOIL GROUPS

Soil Group.	Year.	Unwashed yield. (tons)	Washed yield. (tons)	Sugar content. (%)	Tare. (%)	Sugar (sucrose) per acre. (lb.)
Light to medium	1927	9.430	7.862	16.5	16.3	2914
	1928	9.988	8.904	18.3	10.9	3645
	1929	10.341	9.010	18.1	12.5	3648
	Average	9.920	8.592	17.6	13.2	3402
Medium to heavy	1927	9.261	7.282	16.5	21.5	2719
	1928	10.132	8.853	18.5	12.2	3682
	1929	10.837	9.376	18.5	12.8	3889
	Average	10.077	8.504	17.8	15.5	3430
Fen, warp and silt	1927	10.411	8.670	14.8	16.4	2895
	1928	12.432	11.077	16.9	11.0	4219
	1929	13.618	12.153	17.2	10.4	4656
	Average	12.154	10.633	16.3	12.6	3923
Very light	1927	5.171	4.439	16.5	14.6	1654
	1928	8.115	6.931	17.8	14.1	2759
	1929	8.546	7.459	17.6	12.4	2956
	Average	7.277	6.276	17.3	13.7	2456
Sewage farms	1927	10.855	8.959	14.1	17.2	2832
	1928	9.489	8.581	16.4	9.7	3145
	1929	9.650	8.698	16.4	9.7	3173
	Average	9.998	8.746	15.6	12.2	3050
All together	1927	9.352	7.711	16.1	17.3	2780
	1928	10.185	9.035	17.9	11.4	3624
	1929	10.714	9.386	17.9	12.1	3749
	Average	10.083	8.711	17.3	13.6	3384

On account of the heavy rains experienced in the latter part of the lifting season the average tare in 1929 was rather heavier than in 1928, although it did not nearly approach the excessive figure for 1927. In fact, on the sewage farms the extremely low average of 9.7 per cent. recorded in 1928 was maintained in 1929, and the fenland beet were slightly cleaner in the latter season,

having only 10.4 per cent. tare. There was very little difference between the other three soil classes, which had averages in 1929 of 12.4 per cent. in the very light group, 12.5 per cent. in the light to medium group, and 12.8 per cent. in the medium to heavy group. Over the three seasons the sewage land beet were cleanest with 12.2 per cent. tare. The fen grown beet are very similar, averaging 12.6 per cent. and the light to medium and very light are equally close together with averages of 13.3 per cent. and 13.7 per cent. respectively. As would be expected, the heavier land beet contain the greatest amount of tare, averaging no less than 15.5 per cent. over the three years.

Additional support, if any were required, for the claim that yield is normally more important than sugar content, is provided by expressing the production achieved, on the costed fields in terms of pounds of sugar (sucrose) per acre. In 1929 the fen soil class exceeded by nearly 4 cwt. the average for the previous year and produced more than 2 tons of sugar per acre. The actual figure, 4656 lb., is nearly 7 cwt. more than the average of the medium to heavy soil group, which gave the next best yield of 3889 lb. of sugar per acre. This latter also represents an increase over the 1928 average, but the light to medium soils returned almost exactly the same weight in both years—3648 lb. per acre. The sewage farms at 3173 lb. and the very light soils at 2956 lb. per acre both show small improvements on the 1928 average, so that the over-all result of 3749 lb. per acre is an increase of approximately 1 cwt. per acre.

Over the three years the fen land yield of sugar is highest at 3923 lb. per acre, and the heavier soil group comes second with 3430 lb. per acre. The light to medium class is just a little less (28 lb.) productive of sugar than the latter, while the sewage soils average only 3050 lb. per acre. The very light soils give, over the three years, an average of only 2456 lb. of sugar per acre.

The dry summer of 1929 resulted in a reduction in the yield of "tops" per acre in every soil class, but while the light to medium group suffered a decrease of just 1 ton an acre, the heavier land did not feel the drought to the same extent, and the yield of "tops" is consequently only reduced by half that amount. The fen soils again produced the greatest amount of "tops," yielding just under 10 tons per acre. The sewage farms, and the medium to heavy soil class come next in order of yield with 8.7 and 7.4 tons respectively. The very light land averaged only 5.7 tons per acre, and the light to medium group yielded just one ton more. The average estimated yield in each soil group for each year and for all three years together is given in Table 5.

TABLE 5
AVERAGE ESTIMATED YIELD OF "TOPS" IN EACH SOIL GROUP IN 1927, 1928 AND 1929,
TOGETHER WITH THE THREE YEARS' AVERAGE

Year.	Light to medium. (tons)	Medium to heavy. (tons)	Fen. (tons)	Very light. (tons)	Sewage farm. (tons)	All together. (tons)
1927 ..	9.0	8.3	10.9	4.4	9.0	8.9
1928 ..	7.4	8.0	10.0	7.2	10.0	8.1
1929 ..	6.7	7.4	9.9	5.7	8.7	7.3
Average ..	7.7	7.9	10.3	5.8	9.2	8.1

CHAPTER III.

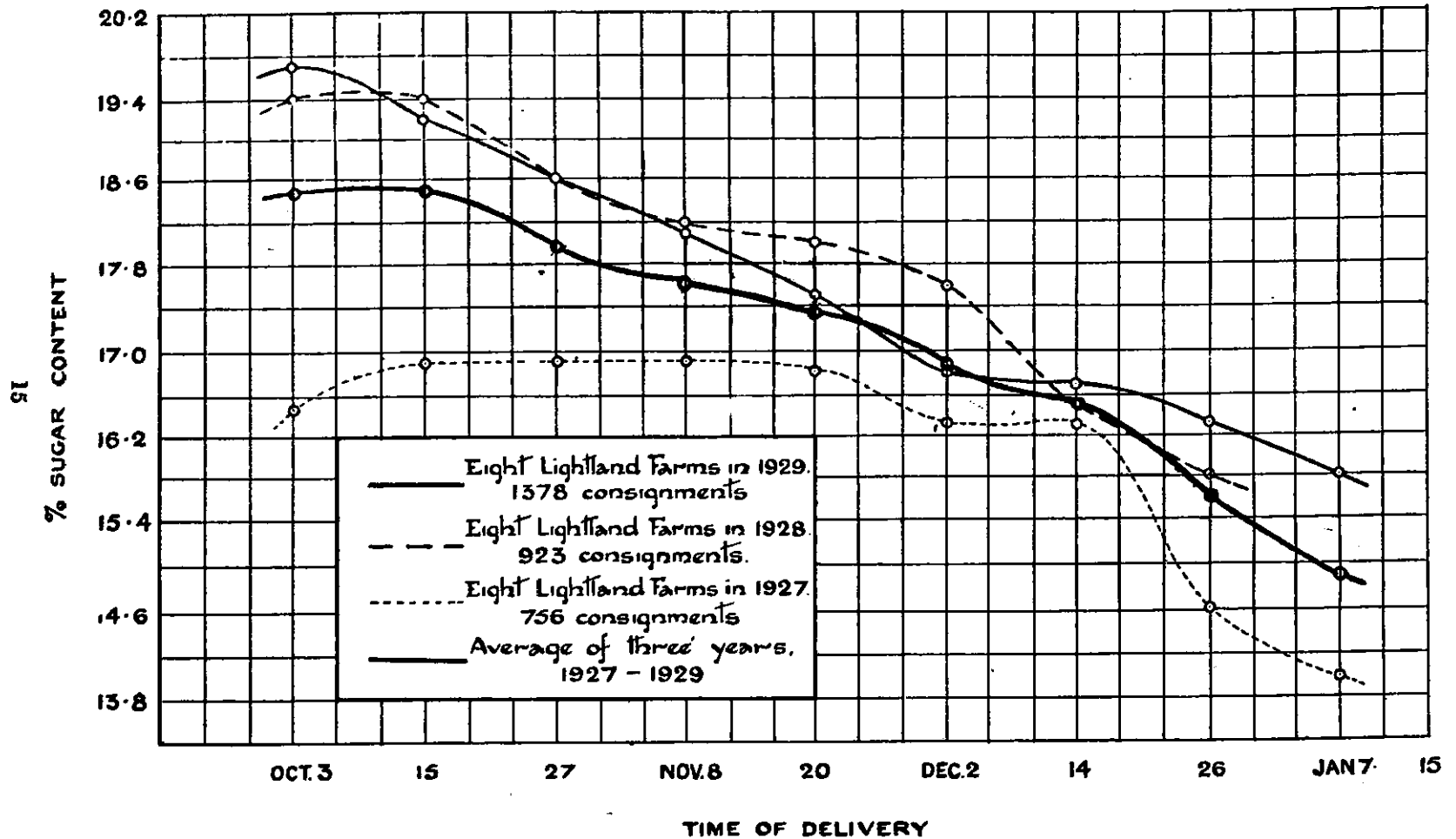
1. INFLUENCE OF TIME OF DELIVERY ON SUGAR CONTENT

It is interesting and instructive to follow the fluctuations in sugar content, and, therefore, in the price per ton of beet, which can be attributed to the variations in the date at which the roots are delivered to the factory. Diagram II on page 15 illustrates these fluctuations during the 1929 lifting season, and makes comparison with similar *data* for the two preceding years. It is unfortunate that under practical conditions it is impossible to obtain reliable figures which would enable the compilation of a similar diagram showing the variation in the weight of roots per acre. There can be little doubt, for instance, that there was a considerable increase in weight during October, 1929, and it seems probable that this would more than compensate for the small loss in sugar content occurring during that month. But whether this was the case in the previous year is less certain, while it seems improbable that, during November, 1929, there was sufficient increase in yield to counteract the continually increasing loss of sugar.

From Diagram II it will be seen that in 1929 the sugar content of beet fell continuously and evenly from the beginning of October until the beginning of December. A close examination of the early deliveries shows that the average sugar content was not quite so high during the last week of September as during the first week in October. This latter week also gave the highest average sugar content in 1928, but whereas in that year the first seven days of the month were dry, in 1929 the heavy rains associated with this period re-started growth and depressed the sugar content almost immediately. During October, 1929, the average sugar content fell by a total of 1.3 per cent. and in the corresponding month of the previous year the fall was 0.9 per cent., while in 1927 there had been a substantial increase. In 1929 the fall continued during November, becoming more pronounced in the last ten days as a result of the cold weather and frosts experienced while the roots were being lifted. Comparing Diagram II with the 1929 temperature variations shown in Diagram III it will be seen that cold weather was experienced about the 15th-20th of November. The roots lifted from the ground in time to suffer from this cold spell would not be delivered to the factories until possibly a week later, and consequently there is a lag of about seven days between the two curves. Detailed examinations of sugar content variations, confined to definite periods, bring out this point better than the general curve. From the beginning to the end of November, 1929, there was an average drop of 1.6 per cent., corresponding to 5s. 4d. in the price per ton of beet. At an average

DIAGRAM II.

Effect of Time of Delivery on Sugar Content in 1927, 1928 and 1929.



yield this represents a fall of 50s. an acre in receipts, and would require an increase of one ton an acre in yield to compensate for the loss of sugar. Even under the exceptional conditions then existing it seems extremely improbable that such a considerable increase could take place so late in the season.

Diagram III reflects the very mild weather experienced during the last days of November and the first two weeks of December, 1929, and the effect of this is seen in the sugar content curve which remains almost level during the first half of the latter month. This is in striking contrast to the cold spell and resultant fall in sugar during the same period of the previous year. Although there was one brief cold spell during the third week of December, 1929, the month, as a whole, was extremely mild, and the average fall of only 0.7 per cent. was much less than that recorded during either of the previous two years. In fact, comparatively warm weather continued during January so that the late deliveries were not penalised to nearly the extent as in the previous two years.

The red curve in Diagram II shows the average variations in sugar content over the three lifting seasons 1927, 1928 and 1929. There is reason to believe that it may be accepted as representing "normal" conditions. From this it is evident that the maximum sugar content may normally be expected to occur during the first two weeks of October, and that from the middle of that month until the middle of December a steady fall at the rate of 1 per cent. a month may be anticipated. At approximately the latter time growers must be prepared for a quicker rate of decrease in sugar content, and during the last month of delivery a fall of some 2 per cent. is indicated. During the three months following the first ten days of October there is normally a total fall of nearly 4 per cent. in sugar content.

During the last three weeks of October the normal fall in sugar content appears to be in the neighbourhood of 0.7 per cent. At present prices this means a reduction of 2s. 4d. per ton, or some 20s. per acre in receipts. An increase in yield of a third of a ton per acre is sufficient to compensate for this, and certainly during the last two years an increase of at least that amount seems to have taken place. It would appear, therefore, that deliveries at the end of October are normally quite as remunerative as earlier consignments. During the month of November sugar contents fall, on an average, by 1 per cent. This suggests, at present prices, a decrease in receipts of something like 30s. an acre, and requires a compensating increase in yield of quite half-a-ton per acre. Such an increase may have taken place during November, 1929, but it is doubtful whether it occurs normally, and it would require the support of a very long and careful investigation before it would be safe to suggest that the optimum time of delivery was usually later than the end of October. The normal fall of 1.5 per cent. during December calls for a further rise of at least $1\frac{1}{2}$ tons an acre in yield, for, in addition to the loss of sugar and the extra cost of handling the increased yield, lifting has usually become more difficult and expensive while the dirt tare has increased substantially. Yields cannot

normally be expected to improve so late in the year, and there can be no doubt that, usually, December deliveries are at a considerable disadvantage. This handicap is further increased where consignments are not dispatched until the beginning of January.

A careful review on these lines of the experiences of the last three seasons suggests that the latter half of October may be expected to be the optimum time of delivery. If delivery can be completed within a month the grower should aim at commencing lifting at the end of the second week of October; if circumstances make six weeks the minimum period of delivery, lifting should be commenced rather earlier, and when consignments must be spread over two months the first should reach the factory at the beginning of October. It can be argued that these dates should vary with the season, but during each of the last three lifting seasons (which varied considerably in climatic conditions) the above periods would have ensured the maximum receipts per acre, and it seems improbable that seasonal variations would alter the optimum period by more than a week. After an unusually dry summer lifting might profitably be delayed several days, and signs of an approaching hard winter should push forward deliveries at the maximum possible rate, but, if the most is to be made of the sugar-beet crop, the above lifting periods should normally be the objective of the grower.

It will be recalled that in the 1928 *Report* (pp. 19-22) evidence was produced to show that, so far as the human factor is concerned, the factory sugar content analyst is inclined to be lenient to the growers; that, in the haste which must accompany the period of maximum deliveries, the chemist mistook, for example, 17.9 per cent. for 18.0 per cent. more often than he thought 18.1 per cent. was 18.0 per cent. An examination of the factory advice notes during 1929 reveals a very similar state of affairs, and when the three years are combined there are 11,488 factory returns on which to base an opinion. This very large sample shows that sugar contents ending in .1, .2, .3, and .4 together occur about as often as would be expected, for although the number of .1's and .2's is just slightly above average there is an equally slight deficiency of .3's and .4's. (In the sample of 11,488 returns it could reasonably be expected that there would be approximately 1149 sugar contents ending in each of the decimal numbers.) It is not surprising to find a small excess of .5's, because $\frac{1}{2}$ is a very convenient fraction, and it seems probable that the greater part of this small excess may be due to a tendency occasionally to mistake .6 for .5, because the .6's are substantially below average. The most remarkable figures, however, are again the deficiencies of .7's, .8's and .9's and the abundance of .0's—i.e. whole numbers. In the whole sample there are 426 more whole numbers than could be expected, and there can be no doubt that this excess is due to the analyst having mistaken .9's, .8's, and even .7's, for whole numbers. The size of the sample makes this conclusion unavoidable, and it would appear that the grower has benefitted accordingly. For the information of those who are particularly interested, the actual figures are given in Table 6.

TABLE 6

FREQUENCY DISTRIBUTION OF SUGAR CONTENT DECIMAL NUMBERS

Decimal digit in % sugar con- tent analyses.	No. of consignments.	% of total.	Decimal digit in % sugar con- tent analyses.	No. of consignments.	% of total.
·0	1574	13·7	·5	1186	10·3
·1	1165	10·2	·6	1072	9·3
·2	1166	10·2	·7	1003	8·7
·3	1134	9·9	·8	1055	9·2
·4	1118	9·7	·9	1015	8·8
			Total	11,488	100·0

2. WEATHER CONDITIONS

The influence of climatic conditions, particularly during the sowing and harvesting periods, has been emphasised again during the 1929 season. No excuse, therefore, is needed for following the practice adopted in the earlier *Reports*, of including a short account and a resumé of the weather records during the season. In these will be found an explanation of many otherwise unaccountable annual variations, and without them much would be incomprehensible. The material has been kindly contributed by W. K. Hubble, M.A., Meteorological Observer to the Department of Agriculture, and the observations are those which have been recorded by him on the University Farm at Cambridge.

April. Persistent northerly winds and a deficiency, amounting to 35·6 hours, of sunshine, made the month generally cold and unsuitable for germination. The mean temperature, at 44°, was 2·3° below normal, and ground frost occurred on three days, the last of these being on the 22nd, when 16° of frost were registered. Although rain fell frequently it was only in small quantities, the heaviest falls of 0·31 in. each, being on the 12th and 29th. The total rainfall for the whole month was slightly below normal.

May. The cold winds and weather continued during the first few days of this month, and although afterwards, the weather turned warm, the mean temperature for the month was no less than 6·2° below normal. Sunshine was 46·5 hours in excess, and the total rainfall was 1·05 in. above average. This was largely due to a severe thunderstorm on the 24th, when 1·7 in. were recorded, and to the continual showers between the 10th and the 14th inclusive, when 0·74 in. fell.

June. This month was remarkable for an abnormal lack of rain. The total fall, 0·81 in., was less than half normal, and three-quarters of this fell during the first week. A few hot days occurred during the middle of the month, but the mean temperature did not quite reach normal. Sunshine was almost average.

July. A single thunderstorm, contributing 0.55 in. of rain, brought the total fall for the month just up to normal, but an excess of sunshine, amounting to 33.2 hours, caused wilting on the hottest days. The mean temperature for the month was almost exactly normal.

August. The deficiency of rain was considerably increased by the dryness of August, when a total of only 0.40 of an inch was recorded. Practically no rain fell after the 6th, but temperature and sunshine were almost normal throughout the whole month. Conditions were ideal for cereal harvesting, but root crops suffered badly from want of moisture.

September. The drought continued during this month, and no rain at all fell until the 21st. The total for the month was only 0.12 in., or 1.49 in. below normal. In addition, the mean temperature for the month was 4.1° above average (a screen maximum of 88° being recorded on the 4th), and there was an excess of sunshine amounting to 39.6 hours. Very light root crops seemed inevitable. The first ground frost occurred on the 26th.

October. The beginning of this month saw the breaking up of the drought, and, in spite of a fairly fine spell in the middle, the total rainfall for the whole month was rather above average at 2.84 in. The mean temperature for the month was practically normal, although several low minima were recorded towards the end of the month. Seven degrees of frost were registered both on the 26th and 28th. Root crops generally commenced to grow again.

November. A large excess of rain, the fall of 4.13 in. being 2.20 in. above normal, which was distributed fairly evenly over the whole month, counteracted substantially the previous deficiencies. Temperature and sunshine were both slightly in excess of normal, but ground frosts occurred on 13 days, the severest of these being on the 12th and 18th when 12° of frost were registered.

December. The beginning of the month was marked by gales from the S.S.E. and S.S.W., and some rain fell every day until the 12th. This was followed by a comparatively fine period in the middle of the month with an unusual amount of sunshine. Over the whole month there was an excess of rain, amounting to 1.23 in., and sunshine was nearly double the normal 40 hours. Hoar frosts occurred on five consecutive days after the 17th, but the mean temperature for the whole month was well above normal.

January, 1930. This month was remarkable for its extraordinary mildness. The maximum temperature ranged from 57° on the 19th to 42° on the 31st, and the grass minimum never fell below 23° Fahrenheit. This latter minimum was registered on the 9th and 21st. Both rainfall and sunshine were just normal, but the soil remained damp on account of the high humidity. A fierce gale, which did much damage, occurred on the night of the 12th, when gusts of over 60 m.p.h. were recorded.

DIAGRAM III.

Mean Daily Temperature as recorded at Cambridge during the
Harvesting Period in 1927, 1928 and 1929.

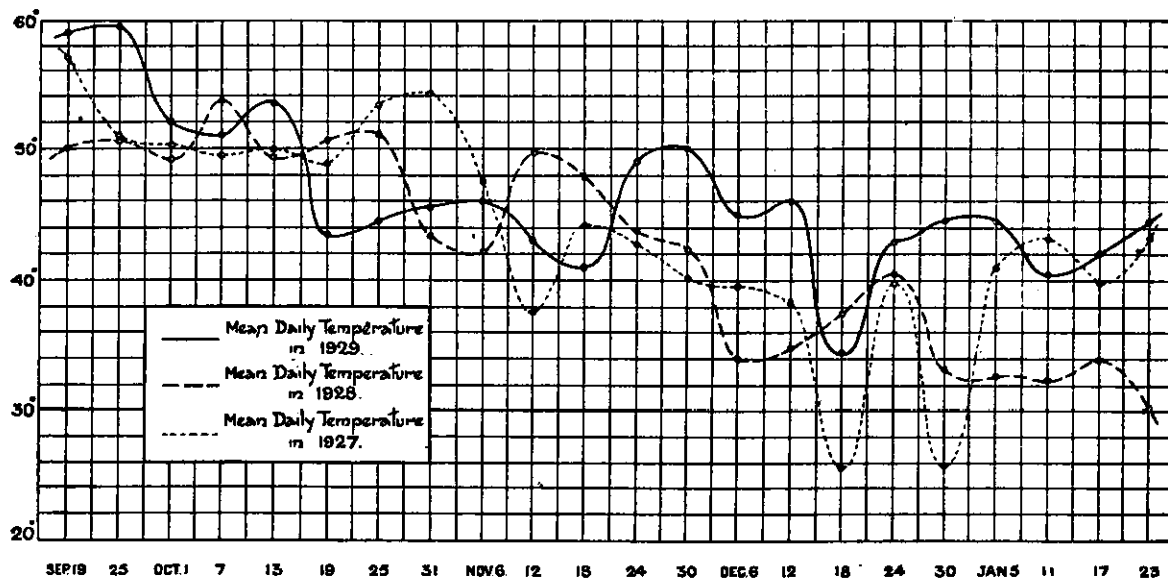


TABLE 7

AIR TEMPERATURES RECORDED AT CAMBRIDGE DURING THE 1929 GROWING AND
HARVESTING PERIOD

Month.	Actual (Deg. Fah.).			Normal (Deg. Fah.).			Deviation (Deg. Fah.).
	Max.°	Min.°	Mean.°	Max.°	Min.°	Mean.°	
April* ..	53.4	35.3	44.4	56.6	36.8	46.7	-2.3
May* ..	62.9	41.7	52.3	68.5	48.5	58.5	-6.2
June ..	66.6	46.8	56.7	68.5	48.5	58.5	-1.8
July ..	72.8	50.7	61.7	71.7	52.0	61.9	-0.2
August ..	71.8	51.1	61.4	70.8	51.4	61.1	+0.3
Sept. ..	71.0	51.0	61.0	66.3	47.4	56.9	+4.1
Oct. ..	57.4	42.3	49.8	57.2	41.5	49.4	+0.4
Nov. ..	51.0	37.3	44.1	49.6	36.5	43.1	+1.0
Dec. ..	48.0	36.0	42.0	44.6	33.2	38.9	+3.1
Jan. (1930) ..	48.3	36.8	42.5	43.3	31.9	37.6	+4.9

TABLE 8

RAINFALL AND SUNSHINE RECORDED AT CAMBRIDGE DURING THE 1929 GROWING
AND HARVESTING PERIOD

Month.	Rainfall (inches).			Sunshine (hours).		
	Actual.	Normal.	Deviation.	Actual.	Normal.	Deviation.
April* ..	1.25	1.36	-0.11	148.3	183.9	-35.6
May* ..	2.81	1.76	+1.05	248.6	202.1	+46.5
June ..	0.81	2.11	-1.30	206.1	201.0	+5.1
July ..	2.19	2.16	+0.03	235.3	202.1	+33.2
August ..	0.40	2.35	-1.95	184.9	187.9	-3.0
Sept. ..	0.12	1.61	-1.49	190.5	150.9	+39.6
Oct. ..	2.84	2.36	+0.48	107.9	103.9	+4.0
Nov. ..	4.13	1.93	+2.20	71.9	62.1	+9.8
Dec. ..	3.16	1.93	+1.23	75.3	40.0	+35.3
Jan. (1930) ..	1.53	1.50	+0.03	53.5	53.0	+0.5

* Data for this month are not available at the University Farm, Cambridge, and the records given here are those made at the Botanical Gardens, Cambridge.

3. HAULAGE AND TRANSPORT

In the majority of cases there are two distinct stages in the conveyance of sugar-beet from field to factory, and it is perhaps necessary to remind readers that for convenience the first of these, viz. loading the roots in the field and carting them to the roadside, rail station or wharf, and unloading, is here termed "Haulage." The second stage, termed "Transport," includes only the carriage of the beet by road, rail, or water from the loading station to the factory. Where rail-transported beet are first carted to the roadside, and then reloaded for conveyance to the rail station, this second stage is included with the first in "Haulage."

The 1929 over-all average road distance of the costed farms to the factories they supplied is 18 miles, or one mile more than the comparable figure in the 1928 *Report*, and three miles less than the 1927 figure. The average distances transported by road and water, both approximately 13 miles, show insignificant increases, while the distance transported by rail has risen by nearly 3 miles, to just under 23 miles. This, however, is still $4\frac{1}{2}$ miles less than the distance which beet were being railed in 1927. The over-all average distance hauled has increased to nearly $1\frac{1}{2}$ miles, on account of the greater distance carted to the rail station, which, in 1929 averaged $2\frac{3}{4}$ miles.

The cost per unwashed ton of beet of haulage and transport by road, rail, and water in 1929 is given in Table 9. The only noticeable changes in these figures, compared with the previous year, are the increases in the cost of haulage where the beet was transported by rail or water, and these are due entirely to the increases in the distances hauled to the rail station or wharf. On this account the over-all cost of haulage has risen by $3\frac{1}{2}d.$ to $3s. 9\frac{1}{2}d.$ per ton, and, as the cost of transport is within a farthing per ton of the 1928 figure, the total over-all cost of conveying the beet from the field to the factory shows an increase of only $4d.$, and averages $8s. 4d.$ per unwashed ton.

TABLE 9
COST PER UNWASHED TON OF HAULAGE AND TRANSPORT BY ROAD, RAIL AND WATER,
IN 1929

	Method of transport.			
	Road.	Rail.	Water.	Over-all.
Haulage (including loading and unloading)	$2/7\frac{1}{2}$	$4/10\frac{1}{2}$	$4/9\frac{1}{2}$	$3/9\frac{1}{2}$
Transport	$5/1\frac{1}{2}$	$4/1\frac{1}{2}$	$3/3$	$4/6\frac{1}{2}$
Total cost from field to factory	$7/8\frac{1}{2}$	$9/0\frac{1}{2}$	$8/0\frac{1}{2}$	$8/4$
Average distance hauled (exclusive of return journey) in miles	0.18	2.78	1.07	1.30
Average distance to factory in miles ..	12.86	22.70	13.00	18.46

Amalgamating the three years' results, and dealing first with those consignments which were transported by road, the average haulage distance to the roadside was 370 yards. It cost $2s. 9d.$ per ton to load the beet, cart them

this distance, and unload them. They were then transported an average of 12 miles by road to the factory at a further cost of 5s. 6d. per ton—making a total cost from field to factory of 8s. 3d. per unwashed ton. It is interesting to notice that this figure has undergone a reduction each year, although the distance has remained unaltered. From 9s. 3d. in 1927 it fell to 8s. in 1928 and 7s. 8d. in 1929. This economy was made in the cost of transport rather than in that of haulage. In the case of rail-carried beet the average distance hauled to the station during the three years 1927–9 was almost exactly 2 miles, and the average cost 4s. 9d. per ton. The subsequent rail carriage cost 4s. 3d. per unwashed ton, and the average distance of these farms from their respective factories was 23 miles. The total cost per unwashed ton from field to factory was therefore 9s. The smaller group of water-borne beet was hauled an average distance to the wharf of nearly three-quarters of a mile at a cost of rather over 4s. 3d. per unwashed ton. The road distance to the factory averaged just over 12 miles, and the cost of water transport was nearly 3s. 3d. per unwashed ton. The total cost of carriage from field to factory in this case was therefore 7s. 6d. per unwashed ton.

To return to the 1929 figures, Table 10 shows the cost of haulage and transport per *ton-mile* of unwashed beet by road, rail and water. It is perhaps advisable to remind readers that these figures are only applicable to the average distances given in Table 9, and that these average distances account for the wide variations in the cost of haulage. The main difference between these and the 1928 figures is the increase in the cost per ton-mile of haulage of the road-transported beet, due to a decrease in the distance hauled. The decrease in the cost per ton-mile of haulage of rail- and water-transported beet is correspondingly due to an increase in the distance hauled. There is a slight reduction in the cost per ton-mile of road transport.

TABLE 10

COST PER UNWASHED TON-MILE OF HAULAGE AND TRANSPORT BY ROAD, RAIL AND WATER, IN 1929

	Method of transport.			
	Road.	Rail.	Water.	Over-all.
Haulage (including loading and unloading)	14/5½	1/9	4/6	2/11
Transport	4½d.	2½d.	3d.	3d.
Total cost per ton-mile from field to factory	7½d.	4½d.	7½d.	5½d.

Over the three years the cost of haulage of road-transported beet has averaged 13s. 3d. per ton-mile. Where beet were rail-transported the distance hauled was nearly ten times further than in the case of road-transported beet, and the cost per ton-mile of haulage has consequently been much less, averaging only 2s. 6d. The cost of haulage of the beet transported by water averages, over the three years, 6s. 6d. per ton-mile.

The ton-mile cost of transport is of more practical interest than that of haulage. Here rail is the most economical, at $2\frac{1}{4}d.$ per ton-mile for a distance of rather over 20 miles. For just half that distance road transport, over the three years, averages $5\frac{1}{2}d.$ per ton-mile. During the three years, however, this figure has declined from slightly over $6d.$ to rather under $5d.$ Water transport for the same distance has remained constant at $3d.$ per ton-mile.

During the three years the over-all average cost of haulage has been $3s. 10d.$ per ton, and the over-all transport charges $4s. 9d.$ per ton, so that the total cost of conveying beet from the field to the factory averages $8s. 7d.$ per *unwashed* ton. This figure represents almost exactly $10s.$ per *washed* ton, and amounts to no less than 25 per cent. of the total net cost of beet delivered at the factory.

CHAPTER IV.

THE original object of this investigation was to elucidate the financial results actually achieved by the practical sugar-beet grower, and, although side-issues of considerable interest have arisen, and are considered in other sections of this *Report*, the present chapter, which contains an analysis of the costs and returns to the grower, must remain of primary importance. For the purpose of seasonal comparisons, the tables are arranged to show the 1927, 1928 and 1929 figures side by side, with the average for the three years together. A comprehensive analysis of the 1927 results was given in *Report* No. 9, and the 1928 figures were explained and compared with those for the previous year in *Report* No. 13. The 1929 results, therefore, remain the principal consideration here.

Before proceeding with the analysis it is possibly advisable to reprint, for the benefit of new readers, the explanations given in the earlier *Reports* of the headings under which the items of cost are grouped:—

“*Preliminary Cultivations*” includes all work done from the harvesting of the previous crop up to the time of, but not including, drilling the beet seed.

“*Seed, Drilling and after Cultivations*,” includes the cost of seed, drilling, chopping-out, singling, hand-hoeing, horse-hoeing, and odd work.

“*Manures*” includes the cost of all manures applied direct to the crop, *plus* the cost of carriage, carting, mixing, and applying.

“*Harvesting*” includes lifting by machine, pulling, topping, lumping and haulage by farm wagon to road-side, railway station, or wharf.

“*Overheads*” includes rent, rates and establishment charges. It should be noted that no allowance has been made for interest on capital, or for remuneration to the farmer as manager.

It must be pointed out, also, that while, in practice the charge for “transport and growers’ representative” appears as a deduction from receipts, it is here more properly shown as an item of cost.

1. OVER-ALL COSTS PER ACRE AND PER TON

The components comprising the cash and net over-all costs per acre are given in Appendix E, from which Table 11 has been extracted for the convenience of readers. Owing to the fact that several farmers discontinued their co-operation before the end of the season the sum of the individual items does not in all cases agree exactly with the totals shown. The compilation of this table has again emphasised the fact that farm to farm costs vary far more in the same season than do season to season costs on the same farm or

group of farms. Many of these farm to farm variations are largely due to differences in the factors of soil and situation, but when these factors are eliminated there still remain divergences which can only be explained by variation in methods of management. Extreme seasonal variations may result in differences of the magnitude of that appearing under the heading of Preliminary Cultivations, where the unusual frosts experienced in the early part of 1929 made the preparation of the seed bed nearly 10s. an acre less expensive than during the previous year.

TABLE 11
OVER-ALL AVERAGE COSTS AND RETURNS PER ACRE

Year	1927			1928			1929					
Number of costs	182			173			191					
Total acreage	2303 acres			2036½ acres			2750 acres					
Unwashed yield per acre ..	9·351 tons			10·185 tons			10·714 tons					
Washed yield per acre ..	7·711 tons			9·035 tons			9·386 tons					
Tare	17·31%			11·35%			12·06%					
Effective sugar content ..	16·1%			17·9%			17·9%					
Sugar per acre	2780 lb.			3624 lb.			3749 lb.					
Lb. sugar per £ labour ..	260			342			390					
Tops per acre	8·9 tons			8·1 tons			7·3 tons					
Costs and returns per acre:—						As a % of total cash cost.				As a % of total cash cost.		
				£	s. d.			£	s. d.			
Preliminary cultivations ..	2	13	5	12·6	2	15	9½	13·1	2	6	1½	11·5
Seed, drilling and after cults. ..	3	15	6	17·9	3	15	8½	17·7	3	12	0	18·0
Total manures	4	13	8	22·2	5	3	8½	24·2	4	12	3½	23·0
Total harvesting	4	19	9½	23·7	4	12	0½	21·6	4	10	11½	22·6
Total overheads	2	14	7	12·9	2	13	7	12·5	2	10	4½	12·6
Farm cash cost	18	16	2½	89·3	19	1	6½	89·1	17	11	9	87·7
Transport and growers' rep. ..	2	5	2	10·7	2	6	10	10·9	2	9	4	12·3
Total cash cost	21	1	4½	100·0	21	8	4½	100·0	20	1	1	100·0
Gross cash receipts	21	6	9½		24	4	8½		25	1	5½	
Cash { Profit	5 5½				2 16 4				5 0 4½			
Loss	—				—				—			
Residual values bt. fwd. ..	17 2½				16 9½				1 0 8½			
Gross cost	21 18 6½				22 5 2½				21 1 9½			
Total credits	4 15 10				5 0 3				4 13 1½			
Net cost	17 2 8½				17 4 11½				16 8 8½			
Net { Profit	4 4 1				6 19 9½				8 12 9½			
Loss	—				—				—			
Distribution of cash profits (+) and cash losses (—) ..	(+)	94	(55%)		(+)	118	(71%)		(+)	142	(74%)	
	(—)	78	(45%)		(—)	49	(29%)		(—)	49	(26%)	
Distribution of net profits (+) and net losses (—) ..	(+)	138	(80%)		(+)	146	(87%)		(+)	178	(93%)	
	(—)	34	(20%)		(—)	21	(13%)		(—)	13	(7%)	
Net cost { Standard deviation ..	£3 12 4				£3 13 2				£3 3 3½			
Standard error of mean	5 6				5 8				4 7			

The cost of "seed, drilling and after cultivations" in 1929 is less by 3s. 8d. per acre than the comparable 1928 figure, and a more detailed analysis shows that chopping-out and hand-hoeing are solely responsible for this decline. It is interesting to record that experience in the handling of a hoe in the sugar beet crop is slowly effecting a much needed economy. In 1927, chopping out and hand-hoeing averaged £2 12s. 8d. per acre. This figure was reduced to £2 10s. 9d. in 1928, and to £2 7s. 8d. in 1929. Expressed in another way, the 1929 figure represents nearly one day's work per acre less than that for 1927. The cost of drilling remains the same for the three years, at 2s. 9d. per acre, and horse-hoeing is unchanged at 12s. 9d. per acre.

The decrease in the cost per acre of manuring is also interesting. The sum expended on artificial manures has decreased each year, from £2 9s. 0d. in 1927 to £1 19s. 6d. in 1929, but, as will be seen from Section 2 of Chapter II, this economy has been wholly effected by a reduction in the amount of the dressing, and in spite of a steady increase in the number of fields receiving the various manures. The over-all cost of the dung applied has also fallen by 4s., to £1 19s. 0d. per acre, but this again is more than accounted for by the decrease in the rate of application. The total decrease between 1929 and 1928 in the cost of manuring amounts to 11s. 5d. per acre, but the 1928 figures represented an increase of 10s. an acre over the 1927 cost. When considered in conjunction with the area under sugar-beet during the respective years, these figures suggest that the growers' expenditure per acre on manures varies inversely with the acreage grown.

The cost of harvesting again exhibits a small reduction, in spite of an increase of more than half a ton in the unwashed yield. A closer analysis shows that the cost of pulling and topping, which in 1928 fell by 6s. an acre, has again fallen by nearly 5s. to £2 2s. 3d. per acre. This is offset by a corresponding increase in the cost of loading and carting, due to an increase of over half a mile in the distance hauled. The cost of ploughing out the beet, where it was done, was 10s. 1d. per acre, but, as previously, where this operation was done, it does not appear to reduce the cost of pulling and topping. Nevertheless, ploughing out continues to increase in popularity, more than 80 per cent. of the fields being so treated in 1929. Climatic and soil conditions, however, must influence considerably the desirability for this operation.

The small reduction in the overhead charges in 1929 reflects the remission of rates on agricultural land and buildings.

The combined effect of all these small economies results in the 1929 farm cash cost per acre being almost exactly 30s. below the 1928 figure, and 24s. 6d. below the 1927 figure. The total cash cost, at £20 1s. 1d. per acre, is substantially less than that of either of the two previous years.

A variety of causes contribute to a small increase in the residual values brought forward from the preceding crops. The substantially heavier manuring, especially with dung, of the 1928 crop, has raised the residual values where beet followed beet. In addition, an increase from 25 per cent. to 30 per cent.

in the number of cases where the preceding crop had received a dressing of dung, and the general encouragement which sugar-beet growing has given to higher farming, have contributed towards raising these residual values from 16s. 10d. to approximately £1 per acre. This addition still leaves, however, the gross cost per acre in 1929 at just 20s. below the average of the two preceding years.

The credit allowances, amounting to £4 13s. 1d. per acre, comprise the following three items:—

- (a) 12s. 2d. per acre for the residual values of cleaning cultivations;
- (b) £1 11s. 3d. per acre for the residual values of manures applied direct to the crop;
- (c) £2 9s. 8d. per acre for the value of tops.

All these items show small declines on the previous year. The decreased manuring and the smaller yield of tops in 1929 provide an explanation for these two reductions. These combined allowances result in the net cost per acre in 1929 being £16 8s. 8d.

From a consideration of the column showing the combined results of the *data* relating to 1927, 1928, and 1929 (given in Table IV of Appendix E), it is evident that a general figure for the per acre cash cost incurred by the grower is approximately £18 10s. 0d., and that when the cost of "transport and growers' representative" is added, the "average" total cash cost is in the neighbourhood of £21 per acre. Net credit allowances for residual values and for the value of "tops" approximate £4, leaving the "average" net cost at nearly £17 per acre.

It is interesting to notice that each year the costs of both manuring and harvesting have amounted in almost equal proportions to 45 per cent. of the total cash cost. The cost of "seed, drilling and after cultivations" adds a further 18 per cent., and the other three items approximate 12 per cent. each.

If the costs *per acre* are converted into the costs *per ton* of washed beet produced, year to year comparisons become more interesting. The Tables in Appendix E make this comparison, and are remarkable for the steady decline which every item exhibits. But, while the decrease between the 1927 and 1928 costs per ton was due entirely to the increased yield of beet, the further reduction shown by the 1929 figures is due mostly to an actual economy in costs per acre. The figures of primary interest in these Tables are the over-all costs for the three years combined. Thus, the average farm cash cost over three seasons approximates 43s. per ton; the total cash cost is 48s. per ton, and the total net cost nearly 40s. per ton. The significance of these figures is considerable, for they are based on nearly 530 separate fields, more than 60,000 tons of beet, and refer to three seasons representing very diverse climatic conditions.

2. OVER-ALL RECEIPTS AND PROFITS PER ACRE AND PER TON

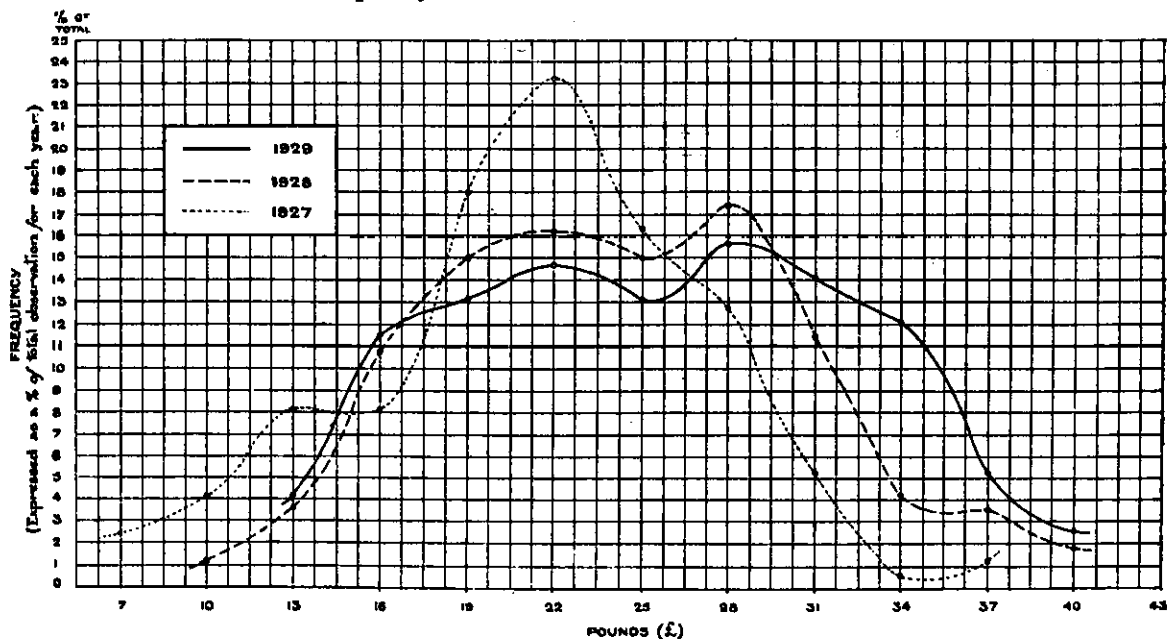
The gross cash receipts per acre in 1929 show an increase of nearly 17s. over the 1928 figure, and average £25 1s. 5½d. Since the sugar content of the

costed sample is similar in both years, this improvement in receipts is solely due to the 7 cwt. increase in the yield of washed beet. As will be seen from Table 11, the gross cash receipts exceed the cash cost by just over £5 per acre, or by 44s. per acre more than in the previous year. The same Table shows that, when consideration is given to the residual values and the value of "tops," the over-all net profit in 1929 is £8 12s. 9d., or 33s. better than in 1928. In the light of these figures, and considering the return which is at present being experienced from other branches of the industry, it is hardly surprising that the record acreage of 1929 is being increased by no less than 40 per cent. in 1930.

Such a result cannot fail to justify a considerable amount of enthusiasm, but, without wishing in any way to detract from the value of the sugar-beet crop, other facts must be added in order to prevent "the man in the street" from drawing unsound conclusions. Firstly, 1929 was undoubtedly an exceptionally good season as far as sugar beet was concerned; much more favourable, in fact, than is likely to occur frequently. Secondly, although there was an "average" cash profit of £5 per acre, no less than a quarter of the growers returned an actual cash loss. Thirdly, interest and management charges have not been deducted before arriving at the profit. Fourthly, the yields obtained on the costed fields are considerably above the average for the country as a whole. Lastly, nearly 85 per cent. of the growers in England and Wales had less than 10 acres of sugar beet, so that the individual's profit was seldom excessive.

DIAGRAM IV.

Frequency Distribution of Gross Cash Receipts.



Over the three years, the cash profit (Table 12) averages £2 14s. 0d. per acre, and the net profit rather less than £6 10s. 0d. Bearing in mind that the costs include no charge for interest on a capital outlay of some £20, nor for managerial remuneration, such returns cannot be considered excessive. The variations in the gross cash receipts and in the cash profit in each of the three years 1927, 1928, and 1929 are illustrated in Diagrams IV and V. In the case of the former Diagram it must be remembered that the nature of the 1927 curve is unsatisfactory despite the higher contract price current in that year.*

DIAGRAM V.
Frequency Distribution of Cash Profits and Losses.

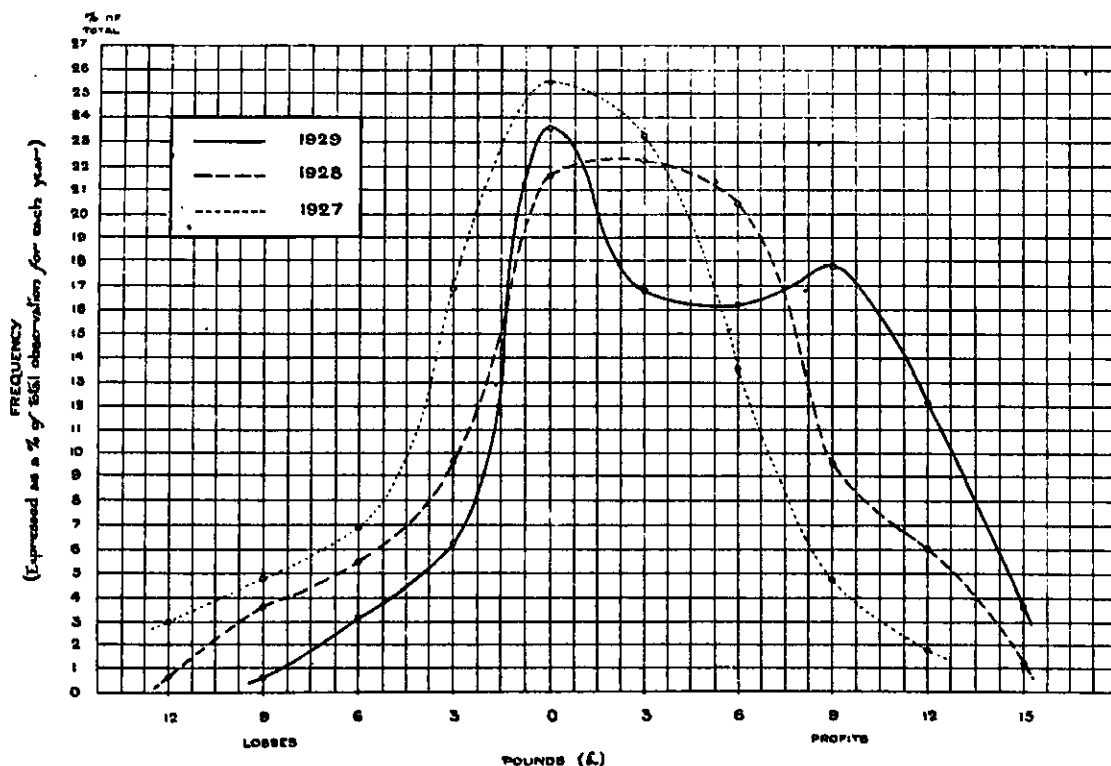


Table VII in Appendix E gives the receipts and profits per washed ton of beet produced in 1929. Since the average sugar content and the contract price per ton are the same as in the previous year, the average receipts per ton are almost unchanged at 53s. 5d. The cash profit per ton is 10s. 8½d., representing an increase of nearly 4s. 6d. on the 1928 figure. On account of somewhat smaller credit allowances in 1929 the net profit, at 18s. 4½d. per ton, is only some 3s. greater than the comparable figure for 1928. Taking the three years together, the cash profit falls just short of 6s. per ton, and the net profit is just under 15s.

* The second period of the subsidy commenced with the 1928 crop.

per ton. If, for the purposes of theoretical comparison, the 1927 contract price is re-adjusted to the same level as that ruling during the two latter years, the combined cash profit is reduced to 3s. 4d. per ton and the combined net profit to 12s. 4d. per ton.

3. RESULTS GROUPED ACCORDING TO SOIL TYPE

The influence of soil type upon costs and returns is illustrated by grouping the costed fields according to their predominant soil characteristics. The same classification has been maintained throughout the three years, and the component costs in each soil group for each of the years 1927, 1928 and 1929, and for all three years together, are given in Tables I, II, III and IV, in Appendix E. The 1927 and 1928 soil group costs have been fully discussed in *Reports* Nos. 9 and 13 respectively, so that attention will now be directed towards the 1929 and the combined results.

The cost of preliminary cultivations in the various soil groups falls, for 1929, into exactly the same order as in 1928, although there is an all-round reduction, varying from 8s. 6d. to 12s. an acre, attributable to the hard weather at the beginning of the year. On the light to medium lands preliminary cultivations are a little more expensive than in the medium to heavy group, possibly because the heavier land farmers were able to take greater advantage of the winter frosts. The cost of "seed, drilling and after cultivations," at £3 13s. 6d. per acre, on the light to medium soils is cheaper by 8s. than on the heavier land. The cost of manuring averages £4 13s. 5d. per acre in the lighter soil group and over £6 an acre on the heavier fields. Such a variation greatly handicaps the medium to heavy group, the total cash cost of which, at £22 6s. 3d. per acre, is £2 7s. 1d. more than that of the lighter class. Owing, however, to the fact that on the lighter soils beet has been preceded by a root crop more often than is the case on the heavier soils, residual values brought forward and charged against the beet are greater in the former than in the latter soil class. Further, as less manure has been applied to beet grown on the lighter soils than to beet grown on the heavier types, the credit allowances are larger in the latter than in the former. These two facts together result in reducing the difference between the soil classes evidenced in the total cash cost, so that the net cost of the light to medium group, at £16 10s. 1d. per acre, is only approximately 23s. less than that of the medium to heavy group. A substantial part of this 23s. is contributed by the difference in the cost of harvesting, which was 10s. 6d. an acre more expensive on the heavier land.

The receipts in the heavier soil group, at £26 1s. 5d. per acre, are some 33s. above those on the lighter soils. Both yield and sugar content contribute to this difference. The results of these variations in costs and receipts are cash profits of roughly £4 10s. 0d. and £3 15s. 0d. per acre in the light to medium and medium to heavy soil groups respectively. When the net profits are considered, the figures are approximately £7 18s. 0d. on the lighter soils and £8 8s. 0d. on the heavier. Considering both the cash and net profits there

appears to have been little to choose between the light and the heavy land results in 1929, and this improvement on the previous years in the achievements on the latter soils would be expected from a consideration of the weather conditions during the whole period.

The component items of the fen land costs each show, with the exception of harvesting, a small reduction on the 1928 figures. An increase of less than 2s. an acre in the cost of harvesting is more than accounted for by the increase of over a ton in the yield per acre. With the exception of "harvesting" and "overheads" the fen land costs are again below those incurred by the light, medium and heavy land farmers. As in the earlier years, the lower cost of manuring on the fen soils more than counterbalances the higher rent and rates. The total cash and net costs, of just over £19 10s. 0d. and £16 per acre respectively, are both approximately 10s. below the comparable figures for the light to medium soils. The excellent yield and comparatively high sugar content on the Fen lands resulted in an average return of over £31 per acre, and in cash and net profits of no less than £11 10s. 0d. and £15 0s. 0d. per acre respectively. These both represent an improvement of more than £4 10s. 0d. an acre on the previous year.

The total cash and net costs for 1929 in the very light soil group average £18 16s. 10d. and £15 13s. 8d. respectively, or approximately £1 more than in the preceding year. This increase is due to considerably heavier manuring and to a rise in the cost of harvesting consequent upon a better yield than in 1928. The other items of cost have decreased, and the totals are still substantially lower than those for the medium and heavier soils. The receipts, at under £20 per acre, are considerably below those in any other soil class, and the profits in 1929 do not show the improvement which is apparent on other types of land. The cash profit was less than £1, and the net profit just over £4 an acre.

Of the five soil groups the sewage farms show the lowest costs in 1929. This group enjoys, of course, considerable advantages in respect to manuring costs. The average cash cost for the sewage farms approximates £17 4s. 0d., and the net cost is as low as £14 6s. 4d. per acre. The sugar content, however, was poor, and the yield disappointing, with the result that the cash profit was less than £4 an acre.

Table IV, in Appendix E, gives the amalgamated results of the three years 1927, 1928 and 1929, classified by soil groups. It will be seen that the sample is a substantial one, both in the number of observations, and in the total acreage concerned, and, since it covers three seasons which individually represent very diverse climatic conditions, these *data* may be accepted as reliable evidence of the "average" costs on the different types of soil. Receipts and profits are, however, subject to far greater variation than costs, and consequently, while the future may be considered in the light of the costs, receipts and profits can only be accepted as evidence of past achievements under certain contract prices. On the other hand, inter-soil class variations in receipts and profits may be regarded as of permanent interest, although the introduction of a different price basis might affect even these.

TABLE 12
AVERAGE COSTS AND RETURNS PER ACRE FOR THREE YEARS, 1927, 1928, AND 1929,
COMBINED AND ARRANGED IN SOIL GROUPS

Soil Groups:—	Light to medium.	Medium to heavy.	Fen, warp and silt.	Very light.	Sewage farms.	Over-all.
Number of costs	264	95	94	50	27	530
Washed yield per acre ..	8.592 tons	8.504 tons	10.633 tons	6.276 tons	8.746 tons	8.711 tons
Costs and returns per acre:—	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Farm cash cost	18 15 5½	20 12 5½	17 16 2½	15 10 8½	15 12 4½	18 9 10
Transport and G.R.	2 7 0½	2 9 4½	2 9 6½	2 1 3½	2 1 7	2 7 1½
Total cash cost	21 2 5½	23 1 9½	20 5 9½	17 12 0½	17 13 11½	20 16 11½
Gross cash receipts	23 13 5	23 17 4½	27 4 7½	16 18 11½	21 10 10½	23 11 0
Cash { Profit	2 10 11½	15 7	6 18 9½	—	3 16 10½	2 14 0½
{ Loss	—	—	—	13 1½	—	—
Residual values bt. fwd. ..	18 6½	15 8½	18 6½	1 3 1½	16 9½	18 3
Gross cost	22 1 0	23 17 6½	21 4 4½	18 15 1½	18 10 9½	21 15 2½
Total credits	4 19 2½	5 10 5½	4 9 10	3 14 5	4 1 8½	4 16 4½
Net cost	17 1 9½	18 7 1	16 14 6½	15 0 8½	14 9 0½	16 18 9½
Net { Profit	6 11 7½	5 10 3½	10 10 1	1 18 2½	7 1 9½	6 12 2½
{ Loss	—	—	—	—	—	—

While a detailed comparison of the soil to soil variations is given in Appendix E, Table 12 provides a synopsis and is included here for convenience. It will be seen that the "average" total cash cost rises from £17 12s. 0d. on the very light soils to £17 14s. 0d. on the sewage farms, £20 on fen, £21 on the light to medium, and £23 per acre on the medium to heavy soils. The net cost is also shown in the same Table to vary from approximately £14 10s. 0d. on the sewage farms to just under £18 10s. 0d. on the medium to heavy soils. The average receipts follow the same order as the total cash cost, but the differences are much larger, varying from under £17 per acre on the very light soils to over £27 on the fen, warp and silt lands. It is interesting to notice that the profit per acre bears no relationship to the cost, and that the medium to heavy soil group has fared better than the very light—a fact which emphasises the connection between yield per acre and profit.

The most noticeable features in Table IV, in Appendix E, are: the heavier cost of manuring on the heavier land; the inexpensive manuring on the fen and sewage soils; the disproportionate cost of harvesting in the heavy soil group; the high rent and rates on the fen soils; and the low rent on the very light soils. The many other points of interest would take too long to expand, and readers are therefore recommended to turn to the Table itself.

In Appendix E are given the component costs per washed ton of beet produced, arranged in soil groups, for each of the years 1927, 1928 and 1929, and for the three years together. The 1929 figures reflect the combined effect of the increased yields and lower per acre costs, and evidence an all-round reduction in comparison with the 1928 figures.

The total cash cost per ton varies from as low as 32s. 2d. on the fen to 50s. 6½d. on the very light soils. The gross cash receipts per ton depend, of course, on the average sugar content, and, on this account, the fens are handicapped when the receipts are expressed per ton of beet. But, on account of the high yields and consequent low tonnage cost achieved in this group, the cash profit on the fen beet (approximately 19s. per ton) is nearly double that on any other soil class, and almost eight times greater than that obtained by the very light soil group. On the other hand, while the *per acre* credit allowances for residual values and tops in the fens are just below average of all soils, when expressed *per ton*, they are considerably lower than those of the other soil groups. Thus, the net profit per ton of 24s. 8½d. on the fen beet does not stand out so much above the over-all average as does the net profit per acre.

TABLE 13

AVERAGE COSTS AND RETURNS PER WASHED TON FOR THREE YEARS 1927, 1928 AND 1929, COMBINED AND ARRANGED IN SOIL GROUPS

Soil Group:—	Light to medium.	Medium to heavy.	Fen, warp and silt.	Very light.	Sewage farms.	Over-all.
Costs and returns per ton:—	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Farm cash cost	2 3 11	2 9 1½	1 14 3½	2 11 7	1 15 9	2 2 10
Transport and G.R.	5 5½	5 10½	4 8	6 8½	4 9	5 5
Total cash cost	2 9 4½	2 15 0	1 18 11½	2 18 3½	2 0 6	2 8 3
Gross cash receipts	2 15 1½	2 16 2½	2 11 3½	2 14 4½	2 9 3	2 14 1½
Cash { Profit.. ..	5 9	1 2½	12 4½	—	8 9	5 10½
Loss	—	—	—	3 10½	—	—
Residual values bt. fwd. ..	2 1½	1 10	1 9½	3 11½	1 11	2 1½
Gross cost	2 11 6½	2 16 10	2 0 9	3 2 3	2 2 5	2 10 4½
Total credits	11 7½	13 0½	8 7½	11 11½	9 4½	11 1½
Net cost	1 19 11½	2 3 9½	1 12 1½	2 10 3½	1 13 0½	1 19 2½
Net { Profit.. ..	15 2½	12 4½	19 2½	4 0½	16 2½	14 11
Loss	—	—	—	—	—	—

Table 13 summarises the *data* given in Appendix E, and shows the average costs per ton for the three years combined. From this Table it would appear that the total cash cost of growing a ton of beet on fen or sewage soils is approximately £2. The light to medium soils and the medium to heavy soils cost, respectively, 10s. and 15s. per ton more, and on very light land the reduced yield increased the cost to nearly £3 per ton. Further, when consideration is given to the residual values and by-products the net cost on fen and sewage soils is 32s. and 33s. per ton, respectively. The comparable figure for the medium upland soils is £2, and for heavier land nearly 44s. per ton, while the average net cost per ton on very light land is 50s. There is a maximum difference, therefore, of nearly 20s. per ton in the average cost of growing beet, which can be attributed to soil conditions alone. For a more detailed insight into the many interesting effects of soil variations on costs and returns, readers should turn to the Table itself, which appears on page 70.

CHAPTER V.

FACTORS AFFECTING COSTS AND RETURNS

IN order to maintain the sequence of analyses, the factors affecting costs and returns have been grouped and arranged in a similar manner to that adopted in the 1927 and 1928 *Reports*. The influence on costs and receipts per acre of such factors as a dressing of dung, deep cultivation, the rate of seeding, the width between rows, etc., which are under the control of the grower, are examined in a way which makes the results comparable with those obtained in the previous years. The analyses have been confined to the light to medium and medium to heavy soil classes, and abnormalities, such as crops on which any form of experimental work had been carried out, or fields which had to be re-drilled on account of insect attacks, have been excluded from consideration.

It is reassuring to find that the conclusions arrived at in the 1927 *Report*, which were supported by the 1928 figures, are still further strengthened by the results emerging from the 1929 investigation. With a full appreciation of the dangers of dogmatism and the unsatisfactory nature of averages, there are, nevertheless, points in the following analyses on which there is ample justification for building very definite conclusions. The similarity of the results of each individual year lends considerable strength to the over-all average.

(a) *The Value of Farm-yard Manure.*

In examining the effect of a dressing of dung on the gross cash receipts in 1929, fields which had been subsoiled were excluded from consideration. The remaining normal fields in the appropriate soil classes are grouped in Table 14, where it will be seen that the cost of manuring the fields which received a dressing of dung exceeded that of the undunged fields by £3 17s. 6d. per acre. The same Table shows that the increase in receipts which can be attributed to the application of farm-yard manure was not quite 14s. an acre, or less than 5 cwt. of beet. Consequently, the direct application of dung to these fields in 1929 put the sugar-beet crop at a disadvantage of little less than £3 5s. 0d. an acre.

TABLE 14
INFLUENCE OF FARMYARD MANURE
Average per acre figures.

	Fields dunged.				Fields not dunged.				Difference.		
	£	s.	d.	No.	£	s.	d.	No.			
Cost of manures ..	8	17	6½	49	3	0	0½	30	3	17	5½
Gross cash receipts ..	24	19	1	49	24	5	2	30	13	11*	

It will be recalled that very similar results were obtained in 1927 and 1928. Over the three years which, for purposes of this comparison, give a combined sample of more than 250 fields, the cost of manuring where farm-yard manure

* Standard error of this difference = £1 9s. 3d.

was applied exceeded that on the undunged fields by £4 6s. 0d. an acre, and the increase in yield attributable to the application of farm-yard manure amounted to only 8 cwt., or £1 per acre at the existing contract prices. On an average, therefore, the immediate result of a dressing of dung to the sugar-beet crop has been a reduction in the *cash* profit of no less than £3 6s. 0d. per acre. But, if half the cost of the dung is carried forward to the succeeding crop, and if allowance is made for the fact that a large proportion of the undunged fields had received some farm-yard manure in the previous year, the difference in *net* profit between the two groups shows an advantage of only 11s. per acre in favour of the undunged fields. It might reasonably be expected that the expenditure on artificial manures would be greater on the undunged than on the dunged fields, but, surprisingly, this is not the case. The dunged and undunged groups have, each year, received equal quantities of artificial manures—a fact which suggests uneconomic manuring.

(b) *The Value of Subsoiling.*

In investigating the effects of subsoiling comparison has been confined to fields which had not been dunged. The results emerging, given in Table 15, are very similar to those obtained in the previous two years. It will be seen that the increase in cost due to subsoiling is 11s. 9d. per acre, and that the receipts in the subsoiled group are some 29s. greater (equivalent to 11 cwt. of beet) than those in the un-subsoiled group. In connection with the apparently low cost of subsoiling it must be remembered that many farmers now use a subsoiling "attachment" on an ordinary plough.

TABLE 15
INFLUENCE OF SUBSOILING
Average per acre figures.

	Subsoiled.				Not subsoiled.				Difference.		
	£	s.	d.	No.	£	s.	d.	No.	£	s.	d.
Cost of preliminary cultivations	3	0	0½	10	2	8	3	30	11	9½	
Gross cash receipts	25	14	1½	10	24	5	2	30	1	8	11½*

If the results of the three years are combined, the increase in cost consequent upon subsoiling averages 12s. 5d. per acre, and the increase in yield attributable to this operation some 15 cwt., or 38s. 6d. per acre. In addition to the direct advantage indicated in these figures, the residual value of subsoiling to the succeeding crops, a value which undoubtedly exists, has to be taken into consideration. It must be pointed out, also, that some fields in the not subsoiled class had been subsoiled in recent years and that this fact would tend to reduce the apparent advantage of subsoiling. There can be little doubt, therefore, of the desirability of this operation. It is interesting to recall that the advantage of subsoiling was most marked during the wet season of 1927.

(c) *The Value of Subsoiling and Farm-yard Manure combined.*

The previous two sections have compared respectively the effect of dung

* Standard error of this difference = £2 1s. 2½d.

when subsoiling was not done, and the value of subsoiling when farm-yard manure was not applied. It remains, therefore, to see the effect of dung and subsoiling in combination. In the light to medium and medium to heavy soil groups 15 fields were both subsoiled and dunged, and 30 neither subsoiled nor dunged. Table 16 makes comparison of the results emerging in these two sub-groups, and gives support to the conclusions arrived at in sections (a) and (b) above.

TABLE 16
INFLUENCE OF FARMYARD MANURE AND SUBSOILING

	Average per acre figures.										
	Subsoiled and dunged.				Neither subsoiled nor dunged.				Difference.		
	£	s.	d.	No.	£	s.	d.	No.	£	s.	d.
Cost of preliminary cultivations and manures	9	18	8½	15	5	8	3½	30	4	10	5
Gross cash receipts ..	27	5	9½	15	24	5	2	30	3	0	7½*

If the above results are amalgamated with the corresponding figures in 1927 and 1928 the difference in cost due to dunging and subsoiling averages £5 12s. 6d. per acre, against which can be set an increase in yield of some 25 cwt., worth, at existing contract prices, £3 8s. 10d. In the light of the previous two sections, this cash deficit of over £2 per acre must be due to the dung and not to the subsoiling.

(d) *Influence of Preceding Crop.*

In 1928 the practice of growing beet after a fallow crop (such as roots) showed, in comparison with beet grown after a straw crop, a saving of 36s. 7d. per acre in the cost of cultivations and manures. The comparable figure for 1929 (as shown in Table 17) is 27s. 4d. The receipts per acre from beet which followed a fallow crop were, however, better than those from beet after a straw crop by a larger margin in 1929 than in 1928. Consequently the total advantage attributable to the preceding fallow crop was slightly greater in 1929, when it amounted to £3 7s. 2d. an acre, than that which was recorded in the previous year.

TABLE 17
INFLUENCE OF PRECEDING CROP

	Average per acre figures.											
	Beet after a fallow crop.				Beet after a straw crop.				Difference.			
	£	s.	d.	No.	£	s.	d.	No.	£	s.	d.	
Cost of preliminary cultivations	2	0	7½	30	2	13	4	56	(—)	12	8½	
Cost of manures ..	4	8	6½	30	4	17	9	56	(—)	9	2½	
Cost of seed, drilling and after-cultivations ..	3	9	9½	30	3	15	3½	56	(—)	5	5½	
Gross cash receipts ..	25	13	0	30	23	13	2	56		1	19 10†	

* Standard error of this difference = £1 19s. 2½d.

† Standard error of this difference = £1 17s. 8d.

Over the three seasons 1927, 1928 and 1929 the difference between the cash cost of beet grown after a fallow crop and beet grown after a straw crop averages £1 6s. 3d. The increase in receipts due to the same cause amounts to £1 15s. 5d. (equivalent to 13 cwt. of beet) in favour of beet after a fallow crop, so that the total average cash advantage is £3 1s. 8d. per acre. This figure is based on the results obtained on nearly 250 separate fields, and, during the three years, has varied by only 5s. 6d. from the average.

It is interesting to notice that just two-thirds, approximately 17s. 6d. per acre, of the saving in the cost of growing sugar beet after a fallow crop (which was, in the majority of cases, also sugar beet) was effected in the cost of preparing the seed-bed. In fact, this sequence of cropping appears to have rendered unnecessary the equivalent of a second ploughing. This seems to indicate that the practice of dilapidating a root crop which has been carted off, on account of the supposed textual damage to the soil, is unsound. The smallness—only 5s. 5d. per acre—of the economy in manuring the second of two root crops also suggests a lack of appreciation of residual values.

In the 1928 *Report* attention was drawn to the frequency with which sugar-beet was grown after sugar-beet on the same land, and it was suggested that, *so long as this practice was not extended sufficiently to invigorate diseases or to become detrimental to the rest of the farm*, it was, perhaps, the most profitable procedure. The analysis in this section makes it clear that, so long as a cash profit is to be expected from sugar-beet, this suggestion stands unrefuted, but the experiences of 1929 have made it necessary to introduce the italics. On six fields in the light to medium soil class the 1929 crop was the third successive time that sugar-beet had been grown, and the average yield of these fields was 7·8 tons, or 1·2 tons below the average for that soil group. Altogether, sugar-beet was being taken for the third time on ten fields, and these gave an average yield of 8·6 tons, which compares unfavourably with the over-all average of 9·4 tons per acre. For this and other reasons there can be little doubt that it is highly undesirable to take *three* successive beet crops.

(e) *Influence of Rate of Seeding.*

It is reassuring to find that, for the third year in succession, an analysis of the costed fields according to the quantity of seed sown supports the pre-conceived opinion that at least 15 lb. per acre should be drilled. Table 18 provides the relevant figures for the 1929 crop.

TABLE 18
INFLUENCE OF RATE OF SEEDING

Rate of seeding.	Less than 12 lb.	12 to 12·9 lb.	13 to 14·9 lb.	Exactly 15 lb.	More than 15 lb.
Number of fields ..	4	6	20	38	27
Average drilling date ..	May 10	Apr. 30	Apr. 26	Apr. 26	Apr. 19
Tons washed yield* ..	8·137	8·356	8·690	9·155	10·314

* Standard deviation of all 95 yields = 2·457 tons.

By amalgamating the comparable results given in the two preceding *Reports* with those shown in the above Table, *data* relating to nearly 300 separate fields are available. In this combined sample the average dates of drilling of all the groups vary by only four days, and therefore cannot disturb the results. The average yields per acre, reading from the "less than 12 lb." to the "more than 15 lb." group are as follows:—7.1 tons, 7.9 tons, 8.3 tons, 9.0 tons, and 9.3 tons. Such a sequence must be considered as reliable evidence of the advisability of heavy seedings. A warning must be given, however, that the heavier seeding rates were more common on those fields on which the rows were drilled comparatively close together, and that this fact tends to exaggerate the advantage of a heavier seeding. But even when full allowance is made for this related factor there still remains indisputable evidence in favour of a *minimum* seeding rate of 15 lb. per acre.

(f) *Influence of Date of Drilling.*

The periods used for the purpose of this comparison in the 1927 *Report* were selected because they divided the sample into four approximately equal sized groups. To maintain comparability the same periods must be adhered to in the present publication, even although drilling dates as a whole are now definitely earlier. As a result of this general movement towards earlier drilling the two periods in Table 19, referring to fields drilled after the 11th May, represent an insignificant number of observations. Nevertheless the 1929 figures again indicate the advantage of early drilling.

TABLE 19
INFLUENCE OF DATE OF DRILLING

Date of drilling.	Before 1st May.	1st to 10th May.	11th to 19th May.	After 19th May.
Number of fields ..	59	24	4	6
Average seeding rate	15.2 lb.	14.9 lb.	14.0 lb.	15.5 lb.
Tons washed yield* ..	9.390	9.321	8.083	8.381

In the above Table it will be noticed that the fields drilled after the 19th May yielded a slightly heavier crop than those drilled between the 11th to the 19th of May inclusive. The reason for this irregularity may be seen in the greater rate of seeding in the former group, which averaged $1\frac{1}{2}$ lb. per acre more than in the latter.

When the three years' results are combined, *data* relating to more than 250 fields are available, thus providing a substantial sample in each group. In this combined analysis the variation in seeding rates between the four groups in no case exceeds $\frac{1}{2}$ lb. per acre, so that the effect of this possibly related factor may be ignored. The yields, commencing with the period "before 1st May," are respectively:—9.2 tons, 8.9 tons, 8.2 tons, and 7.4 tons. There can be no doubt, therefore, that it is advisable to drill the crop in April. It is true that much may depend on the season, but the extreme climatic differences

* Standard deviation of all 93 yields = 2.455 tons.

of the springs of 1927, 1928 and 1929 all failed to produce any justification for delaying sowings until May. In this connection it is pleasing to record that the farmer's own observations are encouraging him in the right direction. In 1927 only 26 per cent. of the costed fields were drilled during April. In 1928 this figure was increased to 34 per cent., and in 1929 it reached 56 per cent. There is, however, still room for further improvement, and it is to be hoped that this tendency will continue.

These figures enable one to state definitely that, in the Eastern Counties, drilling should take place in April, but it is not so obvious whether the earlier or later part of the month is the more desirable. The yields obtained certainly indicate, both for 1928 and 1929, that the middle of the month gave more satisfactory results than the last week, but more than this cannot be deducted from the material available.

(g) *Distance between Drills.*

For the third successive year the *data* collected in the course of this investigation demonstrate that any increase in the size of the individual roots which may result from wider spacing is not sufficient to compensate for the consequent loss in numbers per acre. The 1929 figures, which are given in Table 20 do not show, on account of exceptional results achieved on one farm, the same regular progression apparent in 1927 and 1928; but, nevertheless, the tendency for higher yields to coincide with closer spacing is still very obvious.

TABLE 20
INFLUENCE OF DISTANCE BETWEEN DRILLS

Distances between drills.	19 in. and under.	19½ to 21 in.	22 in. and over.
Number of fields	48	47	17
Sugar content (%)	18.2	18.2	18.7
Washed yield per acre* (tons)	9.456	9.345	8.227

If the three years' *data* are combined, more than 330 separate fields are available for classification into wide, medium and narrow spacing groups. In this amalgamated sample the average sugar content of the three width groups varies by less than 0.1 per cent., while the yields, in the order mentioned above are 9.0 tons, 8.5 tons and 7.9 tons per acre respectively. These figures suggest that an increase of 20 per cent. in the number of plants per acre, which can be achieved by reducing the distance between the drills from 22½ in. to 18 in., is accompanied by an improvement of 15 per cent., or substantially more than a ton an acre, in the yield. The small increase in the cost of intercultivations which results from closer drills is insignificant in comparison with the higher yields obtained. Further, it cannot be claimed that the sole object of sugar-beet growing is to clean the land, and the plea of better fallowing cannot, therefore, be used to support wider spacing. It is frequently stated that soil type must decide the drill width; that, for instance, fenland and sewage farmers

* Standard deviation of all 112 yields = 2.371 tons.

should draw their drills wider than upland farmers. This may be true in the finer adjustments, but it is no excuse for drilling at more than 20 in. between the rows. In support of this statement attention may be drawn to the fact that in each of the three seasons, 1927, 1928 and 1929, those fen and sewage farmers, who drilled their beet at 20 in. or less between the rows obtained a washed yield of approximately one ton per acre more than those who exceeded that width of drill.

(h) *Ridge and Flat Work.*

As in the previous two years, comparison of the result of growing sugar-beet on the ridge and on the flat is handicapped by the small number of available observations of the former system. The results emerging in 1929 are, however, exactly the same as those noted in the two earlier *Reports*. Thus, the extra cost of ridging is more than compensated for by the saving in horse- and hand-hoeing which this system permits, so that the cheaper harvesting on the ridged fields represents roughly the total amount of the economy in labour. The rather lower sugar content and slightly higher yield resulting from ridging in 1929 are not significant, and were not apparent in the earlier years.

TABLE 21
COMPARISON OF RIDGE WITH FLAT WORK

				Average per acre figures.								
				7 Ridge fields.			84 Flat fields.			Difference.		
				£	s.	d.	£	s.	d.	£	s.	d.
Preliminary cultivations	..	..		2	16	8½	2	9	0	(+)	7	8½
Seed, drilling and after cults.	..	..		3	4	0½	3	14	3½	(-)	10	3
Harvesting	..	..		3	3	0½	4	9	11	(-)	1	6 10½
Total labour and seed	..	..		9	3	10	10	13	2½	(-)	1	9 4½
Washed yield (tons)	..	..		9.172			8.997			(+)	0.175	
Tare	..	..		11.61%			12.59%			(-)	0.98%	
Sugar content	..	..		17.5%			18.2%			(-)	0.7%	
Gross cash receipts	..	..		23	19	2½	24	9	0	(-)	9	9½

Over the three years the greater cost of preliminary cultivations on the ridged fields averages approximately 6s. per acre, but hoeing has cost less by more than 7s. and harvesting has been nearly 18s. per acre cheaper. Ridging, therefore, appears to have reduced costs by rather less than £1 per acre. On the other hand, the receipts per acre average nearly 11s. less than from beet grown on the flat, so that the cash advantage of ridging in these cases was 9s. per acre. Considering the size of the sample, this result is by no means significant and the only deduction which can be made is that if soil, climatic, or other conditions, make it desirable to grow sugar-beet on the ridge, this mode of cultivation can be adopted without fear of loss on that account.

(i) *Influence of Nitrogenous Manuring.*

Sections (a) and (c) of this chapter point conclusively to a surprisingly small increase in yield as a consequence of a dressing of dung. This unexpected

result stimulated further analysis with the object of determining what effect was achieved in practice by the application of manures generally. For this purpose every manure, mineral and organic, was considered only as supplying a certain number of pounds of available nitrogen, potash or phosphate, and the dressing which each field received was converted into pounds per acre of these manurial constituents. The field yields in the light to medium and medium to heavy soil classes were then arranged in the ascending order of the number of pounds per acre of nitrogen which had been applied. This was done for each of the years 1927, 1928 and 1929, but, since the annual results were very similar, the analysis given here (Table 22) is the simple average of the three years' figures.

TABLE 22
INFLUENCE OF NITROGENOUS MANURING

lb. of Nitrogen (N.) per acre.	No. of fields.	Average washed yield per acre in tons.	Average sugar content (%).
100 and over	21	10.470	17.6
90 but under 100	12	9.614	17.6
80 " " 90	24	9.453	17.6
70 " " 80	29	9.141	17.9
60 " " 70	38	8.649	17.7
50 " " 60	52	8.823	17.8
40 " " 50	36	8.689	17.5
30 " " 40	39	8.214	17.9
20 " " 30	18	7.337	17.8
10 " " 20	14	7.185	18.2
less than 10	20	7.177	17.5

The above Table shows a remarkable connection between the amount of nitrogen applied and the yield of sugar beet per acre. The range is from 7 tons per acre of washed beet, on the fields receiving no nitrogenous manure, to 10.5 tons per acre on those receiving the equivalent of over 100 lb. of nitrogen per acre. The result is all the more striking because it is based on actual farming, as opposed to experimental, conditions, and its significance cannot be doubted since it rests upon a sample of over 300 fields and more than 3500 acres of sugar-beet. It is often objected that nitrogenous manuring depresses the sugar content, but the right-hand column of the same Table shows that within the range of farm practice this is not necessarily the case.

The warning must be given, however, that heavy dressings of nitrogenous manures are frequently accompanied by heavy dressings of phosphate and/or potash. Indeed, a close examination of the *data* shows that dressings of phosphate and potash both tend to increase as the weight of nitrogen per acre rises. Subsequent analyses (see sections (j) and (k) of this chapter) show that this tendency would exaggerate the effects of nitrogen as it appears in Table 22, and the figures therein given must be considered, therefore, as being influenced by possibly related factors.

There is every reason, however, to believe that, over the three years 1927, 1928 and 1929, a dressing of, say, 60 lb. per acre of nitrogen increased the yield of sugar-beet by at least 1 ton without depressing the sugar content of the roots. The money value of 1 ton of beet at the average sugar content and prices then obtained was £2 13s. 0d. Therefore, there was a cash return of over 10d. per lb. of nitrogen applied. The cost of nitrogen in the form of sulphate of ammonia, plus the cost of carting and applying, averages under 6d. per lb., and a comparable figure for nitrate of soda is just 7½d. per lb. In other words, the application of sulphate of ammonia to the sugar-beet crop in the three years 1927, 1928 and 1929, increased the receipts by nearly twice the cost of the dressing.

There is, of course, a limit to the size of the dressing which will yield such a return. The number of fields which were very heavily dressed was not sufficient to allow of any precise indication as to the actual point at which the increase began to decline. Certainly the proportional increase is maintained up to 100 lb. per acre, but if the 21 fields which received at least that amount are subdivided into the two groups:—(a) “100 lb. but under 110 lb. N” and (b) “110 lb. N or more,” the yield in the latter is no larger than that in the former, while the sugar content appears to have been depressed by the more excessive dressing. It is suggested, therefore, that the economic limit may be in the neighbourhood of 100 lb. of nitrogen per acre—the equivalent of nearly 4½ cwt. of sulphate of ammonia—a figure which is reached by only 7 per cent. of growers.

An analysis, on similar lines, of the fenland yields does not give such significant results, because the available sample is small and unevenly distributed; but even here definite indications are given that a substantial increase in yield is obtained from the application of nitrogenous manures.

(j) *Influence of Phosphatic Manuring.*

The relationship between the amount of phosphate applied and the yield obtained is not nearly so marked as is the case with nitrogenous manures. Table 23 gives the results of an analysis of this factor on nearly 300 fields on light to medium and medium to heavy soils in 1927, 1928 and 1929.

TABLE 23
INFLUENCE OF PHOSPHATIC MANURING

lb. of Phosphoric acid (P ₂ O ₅) per acre.	No. of fields.	Average washed yield per acre in tons.	Average sugar content (%).
100 and over	23	9.243	17.7
80 but under 100	42	9.082	17.8
60 „ „ 80	77	8.865	17.8
40 „ „ 60	77	8.371	17.4
20 „ „ 40	55	7.715	17.9
less than 20	33	8.223	17.7

If the groupings adopted in the above Table are widened the effect of phosphatic manuring is seen more clearly. Thus, those 63 fields which received less than 30 lb. per acre of P_2O_5 gave an average yield of 7.9 tons; the 143 fields receiving between 30 lb. and 70 lb. per acre gave an average yield of 8.6 tons; while the 101 fields dressed with more than 70 lb. per acre yielded 9.1 tons per acre. At the same time phosphatic manuring does not appear to have had any significant effect on sugar content.

From an examination of the figures given in Table 23 it appears that, during the three years concerned, the application of some 70 lb. per acre of phosphoric acid could be expected to increase the yield of beet by at least half-a-ton. The return per lb. of phosphoric acid applied was therefore $4\frac{1}{2}d.$ The cost of phosphoric acid in the form of superphosphate, plus the cost of carting and applying, does not exceed $3d.$ per lb., so that there was, during these years, a cash balance of $1\frac{1}{2}d.$ per lb. of P_2O_5 applied—or £2 5s. 0d. per ton of superphosphate. Further, it must be remembered that, in addition to paying off the cost of the dressing and leaving a cash balance of 45s. per ton, the fertility of the soil had been increased by the application of a manure which has a substantial residual value.

(k) *Influence of Potassic Manuring.*

It is generally believed that root crops in particular benefit from potassic manuring, and that this, as much as any other manure, influences the sugar content of beet. It is also widely accepted that heavy land responds less than lighter soils to dressings of potash. On this account the present section is confined to fields on the light to medium soil class, in order to illustrate the effects of potassic manuring on those soils where it is believed to be economic. Again, it must be emphasised, however, that the results of this analysis, given in Table 24, are influenced by related factors, and caution must therefore be observed in drawing conclusions.

TABLE 24
INFLUENCE OF POTASSIC MANURING

lb. of Potash (K_2O) per acre.	No. of fields.	Average washed yield per acre in tons.	Average sugar content (%).
120 and over	30	7.865	17.5
100 but under 120	20	9.702	17.4
80 " " 100	34	9.414	17.8
60 " " 80	33	8.792	17.7
40 " " 60	43	8.928	17.5
20 " " 40	29	8.085	18.0
less than 20	17	8.177	17.3

The considerable drop in the average yield of the group which received "120 lb. and over" of K_2O per acre calls for some explanation. These figures refer to the amalgamated results for the three seasons 1927, 1928 and 1929, but the same effect is evidenced when each year is considered individually.

Indeed, the cause-effect relationship is so consistent throughout the three years that the point is worth considering, and a more detailed analysis of the heavily manured fields is given in Table 25. Here would appear to be definite evidence that the application of more than 100 lb. per acre of potash—say 6½ cwt. of kainit, or approximately 2 cwt. of muriate of potash—is not only uneconomic, but actually injurious. A quotation from the standard work on

TABLE 25
INFLUENCE OF EXCESSIVE POTASSIC MANURING

lb. of Potash (K ₂ O) per acre.	Washed yield in tons per acre.			3 Years together.
	1927.	1928.	1929.	
120 and over	6.284	7.480	9.831	7.865
110 but under 120	8.347	8.776	8.526	8.550
100 " " 110	9.187	12.004	10.957	10.716

manures and manuring* provides some explanation of this apparent effect, and emphasizes the necessity for the judicious application of potash manures:—

"A clue to this apparent depressing effect of potash is provided by the appearance of the soil on certain of the experimental plots at Rothamsted, as on the Barn field, where considerable amounts of potash salts are applied every year. The behaviour of the soil, which lies extremely wet and sticky after rain, and dries with a hard glazed surface, shows that the clay particles must have become thoroughly deflocculated. . . . The destruction of tilth of the soil brought about in this way may easily give rise to an irregular stand, and so account for an inferior plant and a reduced yield on the plots receiving potash salts; . . ."

In addition to the explanation provided by this quotation it may also be that excessive potassic manuring disturbs the internal metabolism of the plant.

Contrary to expectation, Table 24 shows no apparent connection between potassic manuring and sugar content. So great is the influence of other factors, particularly weather conditions and the time of harvesting, that any effect which manuring may have appears to be completely obliterated.

A consideration of Table 24 suggests that during the years 1927, 1928 and 1929 the application of 95 lb. per acre of potash—say 1½ cwt. of muriate of potash or 6 cwt. of kainit—could be expected to increase the yield per acre by at least one ton of beet. Converted into money, this means that 1 lb. of potash increased the receipts by 6½d. But potash can be purchased and applied at a cost of from 2½d. to 3d. per lb., and half this cost may logically be carried forward to the succeeding crop as residual value. If used with care, therefore, potash is quite as profitable when applied to the sugar-beet crop as nitrogen or phosphate, but unlike these other manures an excessive dressing is more nearly within the reach of normal farm practice. In fact, the point at which returns commence to diminish on account of over-manuring with potash appears to have been reached by no less than 20 per cent. of the light to medium land growers in 1927–29.

* "*Fertilisers and Manures*," by Sir A. D. Hall.

CHAPTER VI.

1. THE SEASONAL DISTRIBUTION OF LABOUR ON SUGAR-BEET

THE labour requirement of sugar-beet is a subject which, both from the socio-logical and political standpoints, has given rise to controversy in every country where this crop is known. From the producer's point of view the subject has, however, received less attention, and the object of the present section is to investigate the effect which the introduction of sugar-beet exerts on the labour organisation and management of the farm. This farm management aspect of the subject is of considerable importance to the grower, and the following paragraphs may help towards an understanding of the problems involved.*

The "average" amount of labour required for the production of 10 acres of sugar-beet on a medium soil is approximately 2100 man hours and 1100 horse hours. These figures include all farm work upon the crop except the labour employed in the carting and application of manures. The following Table compares the total labour requirements of 10 acres of sugar-beet with those of a similar acreage of other farm crops. The money cost of 2100 man hours

TABLE 26
LABOUR REQUIREMENTS PER 10 ACRES OF CROP, EXCLUDING
THE LABOUR ON MANURING AND THRESHING

Crop.			Man hours.	Horse hours.
Sugar beet	..	..	2095	1111
Mangolds	..	..	1964	1438
Potatoes	..	..	1802	1357
Winter beans	..	..	608	554
Spring oats	..	..	435	493
Spring barley	..	..	410	495
Wheat	..	..	342	396
Winter oats	..	..	309	359
Hay-making	..	..	194	101

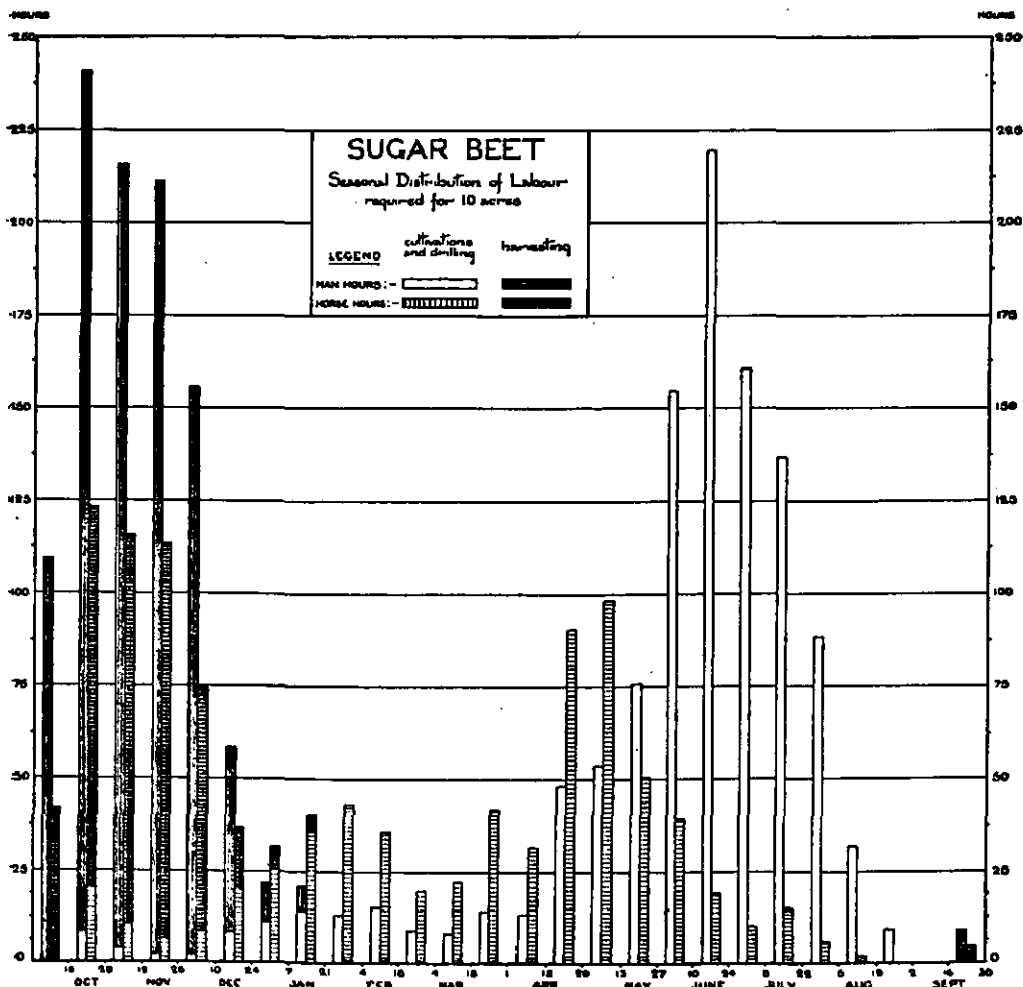
is approximately £70, and 1100 horse hours cost about £30, so that, exclusive of manuring, the cost of labour on sugar-beet amounts to some £10 per acre; a figure which justifies a careful consideration of the subject. A dressing of dung at the rate of 12 loads per acre would add approximately 250 man hours and 150 horse hours to the above totals, and, if normal dressings of artificials are also applied, a further 30 man hours and 15 horse hours must be included. If these are added, the total requirements become 2370 man hours and 1265 horse hours.

* For a fuller discussion of the subject see: Farm Economics Branch, *Report No. 14*, "The Seasonal Distribution of Farm Labour Requirements." (W. Heffer & Sons Ltd., 2s. net.)

It is, however, the seasonal distribution of this labour which is of most interest to the farm manager, for it is vitally important that the "rush" periods should be foreseen, and the necessary arrangements made to cope efficiently with the demands occasioned by the crop. This is more evident on those farms where the proportion of sugar-beet to other farm crops is comparatively large. Diagram VI illustrates graphically the seasonal distribution of labour on 10 acres of beet. It must not, of course, be supposed that the work on any single 10 acres of sugar-beet is represented here. The diagram is based on the average of a number of fields, and is therefore applicable to the general, and not to the particular case. It represents the requirements of a locality rather than of a single field, and is sufficiently demonstrative to need no further explanation.

DIAGRAM VI.

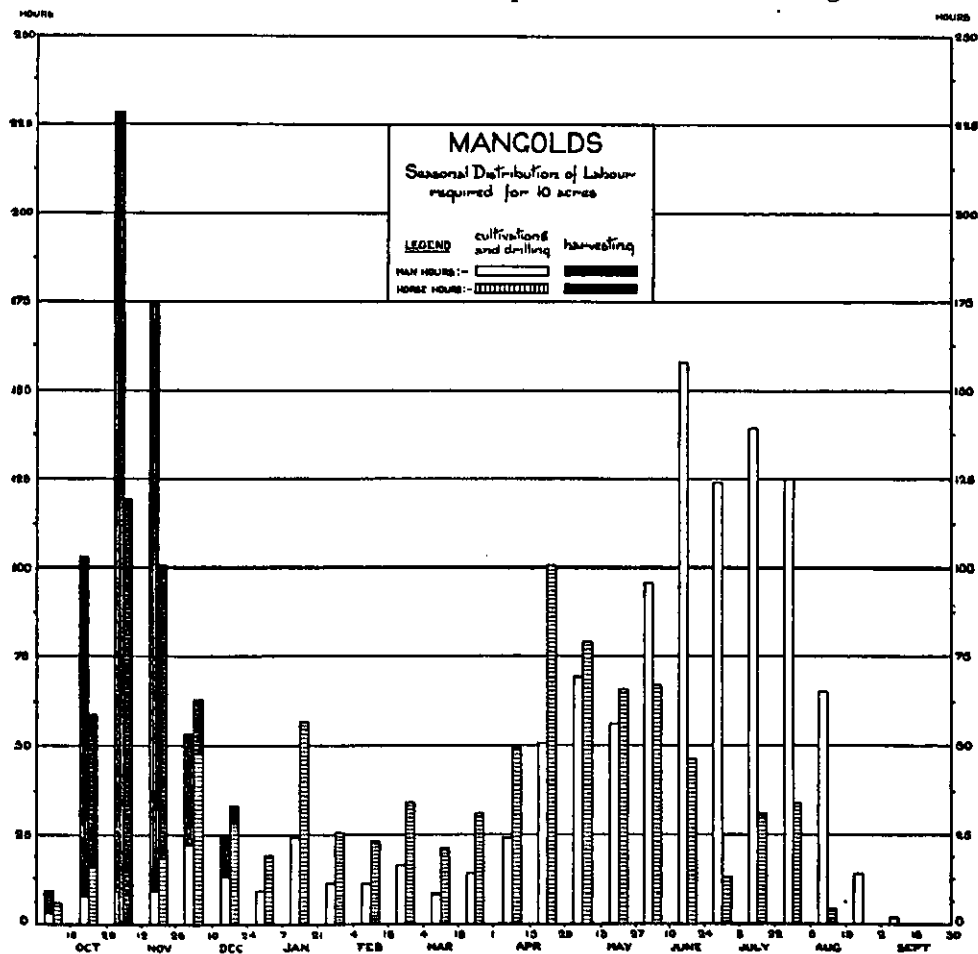
Seasonal Distribution of Labour required for 10 Acres of Sugar Beet.



The crop most closely allied to sugar-beet, and therefore most likely to compete for labour with sugar-beet, is undoubtedly mangolds. Diagram VII, which shows the seasonal distribution of the labour required to grow 10 acres of mangolds, illustrates this similarity. In comparing Diagram VII with Diagram VI, it must be appreciated that labour employed in carting mangolds

DIAGRAM VII.

Seasonal Distribution of Labour required for 10 Acres of Mangolds.



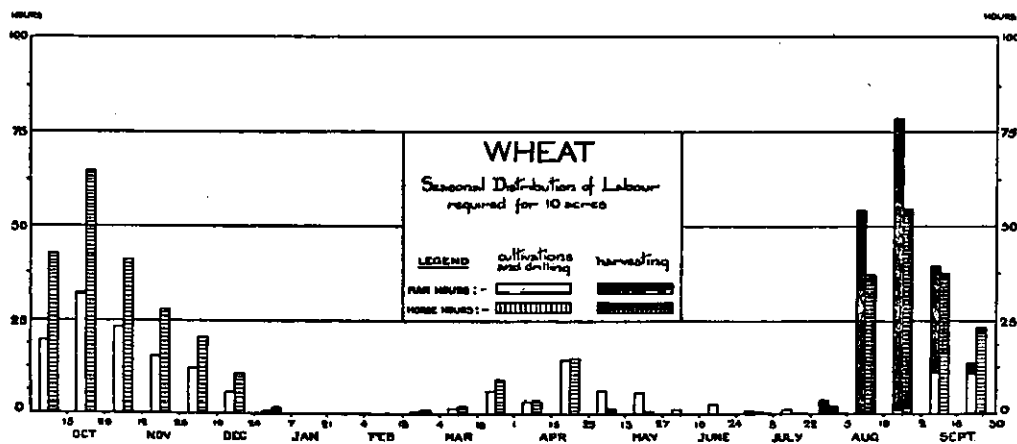
from clamp to yard after the end of December has not been included. An addition of some 350 man hours per ten acres and a similar number of horse hours should be made to the mangold chart on this account, representing (on the assumption that the carting is distributed evenly between the beginning of January and the end of April) a further 40 man hours and 40 horse hours to

the fortnightly totals shown for this period. This addition to mangolds does not, however, affect the comparison since it comes at a time when sugar-beet makes little demand upon the labour supply. Apart from this, it will be seen that the requirements of both sugar-beet and mangolds coincide very closely, both in volume and time.

Of the other farm enterprises which are likely to compete with sugar-beet for labour, potatoes and autumn-sown crops are the most common. Thus, the planting of main crop potatoes falls at approximately the same period as the drilling of beet, but this crop is mostly harvested before the lifting of sugar-beet becomes general. The preliminary cultivations and drilling of wheat, winter oats and beans occur when the sugar-beet lifting season is at its height, but these demand more horse than manual labour, and their harvest is accomplished at a time when sugar-beet needs no attention. Diagram VIII illustrates the seasonal labour requirements of 10 acres of wheat. This shows how small is the

DIAGRAM VIII.

Seasonal Distribution of Labour required for 10 Acres of Wheat.



demand in comparison with sugar-beet and mangolds, and it is evident that other fallow crops are the main competitors with sugar-beet for the available labour of the farm. Where sugar-beet is grown in excess of the normal fallow shift the difficulty occasioned may be overcome by the introduction of casual labour, but this arrangement is seldom satisfactory to the farmer, and is a doubtful advantage to the community. The difficulty may, however, be entirely avoided, without reducing the area of sugar-beet, by keeping the fallow shift constant and *substituting* sugar-beet for part of the normal root acreage. That this latter practice is the more economical was pointed out in the 1928 *Report*, and it is being demonstrated in practice by a large number of growers. It is, therefore, in the more general appreciation of this system that the solution of the labour problem in sugar-beet growing will be found.

2. QUANTITATIVE REQUIREMENTS.

It is the practice in this country to express farming costs of production in terms of money values. Such figures have several disadvantages, and it is often desirable to know the productive requirements in terms of materials and labour. Such a basis of expression possesses the advantage that, so long as production practices remain unchanged, the effect of variations in the prices of the components of the total cost may be easily estimated. It is convenient, therefore, to have available costs expressed, as far as possible, in this form, and Table 27 gives the relative *data* for the 1929 crop on light to medium soils. This method of expressing costs is less satisfactory in the case of sugar-beet than with those crops in the production of which piece-work is less extensive.

TABLE 27

QUANTITATIVE REQUIREMENTS PER ACRE ON LIGHT TO MEDIUM SOIL IN 1929

				Average per acre figures.			
				Man hours.	Horse hours.	Other items.	Money value. £ s. d.
Preliminary cultivations	..			26	54		2 9 7
Drilling and after-cultivations..				83	10		3 5 0
Applying manures	..	..		11	9		13 1
Harvesting	..	..	..	91	40		4 7 10
Seed	..	..	..			15 lb.	8 6
Manures	..	..	..			80 lb. N.	2 3 4
						61 lb. P ₂ O ₅	13 9
						102 lb. K ₂ O	1 3 4
Transport and G.R.	..	..					2 7 2
Overheads	..	..	..				2 7 6
Totals	..	..		211	113		19 19 1

3. THREE YEARS' ACHIEVEMENTS.

An interesting comparison is made in Table 28, which shows the costs and receipts on those 44 farms for which information has been obtained continuously for the three years 1927, 1928 and 1929. It is impossible, of course, to differentiate conclusively between the result of experience in the production of the crop and the effects of variations in climatic conditions. Further, in comparing the annual results, the variations in yield must also be taken into consideration, for these have exerted more effect on the profit than have economies in the absolute costs of production.

TABLE 28

COSTS AND RETURNS PER ACRE ON 44 FARMS COSTED FOR THREE CONSECUTIVE YEARS

Year.	1927.	1928.	1929.
Number of farms	44	44	44
Number of fields	93	77	96
Per cent. of arable under sugar-beet ..	10.4	12.4	15.0
Amount of dried pulp purchased (tons) ..	7.4	16.4	20.6
Washed yield per acre (tons)	7.896	8.767	9.374
Tare %	17.60	10.69	11.69
Effective sugar content (%)	16.1	17.8	17.9
<i>Costs and returns per acre.</i>			
Total labour and seed	£ 11 0 3	£ 10 11 8	£ 9 12 2½
Total manures	4 14 2½	4 17 5½	4 6 8½
Total overheads	2 14 0	2 12 8½	2 11 10½
Farm cash cost	18 8 5½	18 1 9½	16 10 9½
Transport and Grower's Rep.	2 4 3½	2 1 9	2 5 7
Total cash cost	20 12 9½	20 3 6½	18 16 4½
Gross cash receipts	21 16 11½	23 5 6½	24 17 10½
Cash profit	1 4 2	3 2 0	6 1 6½
Residual values bt. fwd.	1 5 9½	1 2 2½	1 12 5½
Gross cost	21 18 6½	21 5 9½	20 8 10½
Total credits	4 17 5½	4 14 7½	4 11 9½
Net cost	17 1 1	16 11 1¾	15 17 0¾
Net profit	4 15 10½	6 14 5	9 0 10

4. CONCLUSION

This investigation is being brought to a close at a time when everyone interested in the production of home-grown sugar is speculating on the effect which the second reduction in the rate of the subsidy (which comes into operation with the 1931 crop) will have upon the price per ton of roots paid by the factories to the growers. It will be recalled that the Sugar-Beet (Subsidy) Act of 1924 provided for the payment from the National Exchequer to the Beet Sugar Factories of a sum of 19s. 6d. per cwt. of white sugar (and *pro-rata* for molasses) manufactured during that year and until the completion of the 1927 season. During the same period the normal contract price, as agreed between the factories and the growers, was 54s. per ton of washed roots having a sugar percentage of 15.5 per cent., with an addition or deduction of 3d. per ton for every 0.1 per cent. difference in sugar content. For the three seasons 1928-30 the subsidy rate was reduced to 13s. per cwt. of white sugar, and the agreed contract price of roots was brought down to 46s. per ton at 15.5 per cent. sugar, with a deduction of 3.6d. for every 0.1 per cent. below that figure and an

addition of the same amount for every increase up to 16.5 per cent. sugar, while, above 16.5 per cent. sugar the premium was at the rate of 4d. for every 0.1 per cent. For the three seasons 1931-33 the subsidy rate is to be reduced to 6s. 6d. per cwt. of sugar, and the factories and the growers are faced with the necessity of readjusting the contract price of roots.

The former occasion when the reduction in the subsidy called for a revision of the contract price of roots unfortunately occurred while the growers were experiencing the most unsatisfactory season which the industry has had to withstand since the passing of the 1924 Act. The result was that the 1928 acreage of sugar-beet represented a reduction of 21 per cent. below the 1927 total. There have since followed two more satisfactory seasons, bringing with them an atmosphere of optimism, and annual increases of 31 per cent. and nearly 40 per cent. in the acreage grown. The good years and the increased acreage have been as profitable to the factories as to the growers and the question of a reduction in the contract price of roots should be approached by both parties in a more healthy spirit than was possible in 1927. There can be no doubt, however, that the attitude of both interests will be largely influenced by the results of the 1930 crop, and while it is, as yet, too early in the season to hazard a forecast of the growers' measure of success, the factories' position is almost assured by the greatly extended acreage.

It is hoped that this *Report* and its two predecessors will assist in clarifying the economic position of sugar-beet production from the point of view of the grower. Such an insight into existing conditions should be of assistance to those who will be responsible for fixing the new contract prices. The first suggestion is a warning to those who would press for a substantial reduction of the existing price, that they must not base their opinions too much upon the recent very considerable extension of the acreage under sugar-beet. It is an open question as to how far this increase is the normal reaction following two highly favourable seasons; how far it is due to the depression in corn and potato prices; and how far it is a last grab at a dwindling subsidy. There can be no doubt that a large proportion of the increased acreage is on marginal land, of both heavy and very light soils, which could not produce profitable crops of beet at a substantially reduced price. To those who threaten curtailment of acreage, however, it must be urged that maximum production is essential to economic factory operation, and only by the latter can the grower hope to obtain the best price for his beet.

In the preceding chapters there are given ample reasons for believing that, over a number of years, growers can deliver roots to the factories at a total cost of approximately 48s. per ton, and that, when consideration is given to the residual values of the crop and the value of the tops, the net cost is somewhere in the neighbourhood of 40s. per ton. (These figures are possibly below the true average for the Eastern Counties, for the sample on which they are based may represent farmers who are more efficient and enterprising than the normal.) During the last five years the sugar content of the beet

grown in England and Wales has averaged 17·0 per cent., and assuming that the *data* given in this *Report* are representative, it would appear that the minimum price at which such beet could be grown, without leaving either interest or profit to the grower, is 40s. per ton. To the industrialist it may seem absurd to suggest that sugar-beet would be grown without the inducement of profit, but agriculture follows laws of its own. Nevertheless, 40s. per ton of beet of 17·0 per cent. sugar is surely the minimum price that could be accepted, and such a figure would undoubtedly reduce considerably the present area under beet. Further, unless improvements in the efficiency of beet production are effected, this minimum figure cannot be regarded as a safe one on which to establish a permanent industry. Lastly, without sympathetic political interference, the industry must look forward to the complete withdrawal of State assistance in three years' time, and it is then, and not now, that the minimum contract price for roots should be reached.

On the present scale of payment for sugar content, 40s. per ton of beet of 17·0 per cent. sugar is equivalent to 35s. 4d. per ton at 15·5 per cent. sugar, but a careful study of the results emerging from this investigation suggests that perhaps the present bonus basis is not the best that could be devised. Table IV in Appendix E shows that during the three years 1927-29 fenland growers have made an average cash profit of nearly £7 per acre, while the best of the upland soil classes have averaged only £2 10s. 0d. per acre. There can be no doubt that the special circumstances surrounding fen farming justify a claim to a higher profit than can be demanded by the majority of upland farmers, but these figures seem disproportionate. Fen farmers certainly contribute a very substantial proportion of the beet grown, but the majority of factories must still look for the greater part of their supplies of beet from upland growers, and a more even distribution of receipts would encourage the latter and larger class. This could be obtained by increasing the bonus on sugar, and a scale which rose by 6d. per ton for every 0·1 per cent. increase in sugar content might, in the long run, be fully justified. The fenland grower, on account of the high yielding qualities of his soil, would still be at a considerable advantage, but the gap would not be so wide and the majority of producers would benefit. It may be objected that 0·1 per cent. of sugar per ton of roots is not worth 6d., but this argument would be overruled if such a scale were to assist in maintaining the acreage under sugar-beet.

The circumstances surrounding the economics of sugar production by the factories are less clear than those relating to beet production by the growers. In compliance with the 1924 (Subsidy) Act, through which they receive Government assistance, the factories publish their balance sheets each year, and the information thus made available is slightly amplified at the annual general meetings of each company. But these statements tell little of the internal economy of manufacture, and their sparseness caused the Financial Editor of *The Times* recently to complain that "it would be more satisfactory if the companies showed more clearly how the results are arrived at, and to what

extent higher efficiency may have contributed to the profits." Substantial profit distribution and increased allocations to reserves have been generally recorded, and are the main facts upon which opinions, in the absence of further information, must be based. These are, however, at best rough and unsatisfactory indications, and only make it possible to say, for instance, that the two largest factories have, during the last two years, recorded a net profit of some £5 5s. 0d. per acre of beet worked. Undoubtedly the factories could withstand a substantial reduction in this figure and probably, also, depreciation allowances are not at a minimum, but sufficient material is not available to enable any accurate calculation to be made. But whatever the immediate developments, the ultimate objective of both the growers and the factories is identical. They are inter-dependent upon each other, and it is as much in the interests of the factory to offer a price which will maintain the acreage of beet at a maximum, as it is in the interests of the farmer to maintain production at a level which will make possible economic factory operation, for only thus can the maximum contract price be obtained.

APPENDIX A.

GENERAL ECONOMIC DATA, 1929.

Farm Number.	General Description of Soil.	Total Acreage.	% Arable.	Rent and Rates per Acre.	Density per 100 Acres*		Number of Tractors†	Total Beet Grown expressed as a % of Total Arable.					1929 Beet Crop actually Costed.		Factories Supplied.	Approximate Road Distance (Miles) to Factory.
					Labour.	Horses.		1925	1926	1927	1928	1929	Number of Fields.	Acres.		
502	Sandy loam ..	689	86	24/0½	3-4	2-7	1	13-8	16-1	18-7	16-4	15-1	5	90½	Bury ..	2.
504	Light loam ..	465	86	21/4	3-0	1-7	1	7-5	16-0	32-5	28-5	22-1	3	52	Bury ..	4½.
505	Light mixed ..	236	58	22/9	2-5	2-5	—	—	3-7	4-4	5-9	7-3	2	10	Bury ..	30.
507	Very light ..	602	88	11/5½	4-0	3-3	1	5-3	8-7	11-7	23-3	24-9	6	131½	Bury, Ely and Ipswich.	4, 40, 25.
507A	Clay loam ..	120	100	15/2	3-3	3-3	—	—	—	—	—	12-5	1	15	Bury ..	6.
508	Strong loam ..	1015	75	31/5½	4-5	3-4	—	2-1	5-2	7-8	10-5	13-2	2	35	Bury ..	11.
510	Gravel loam ..	280	54	23/6½	3-6	2-9	—	5-3	11-3	18-0	18-7	22-0	3	33	Bury and Ipswich	23, 23.
520	Sand and warp ..	242	66	46/8½	3-5	3-7	1	3-8	3-8	3-8	1-4	2-5	1	4	Brigg ..	12.
523	Fen ..	600	88	33/-	3-0	2-8	3	3-4	3-4	8-8	5-9	15-2	4	53	Bardney and Brigg	4, 25.
524	Medium loam ..	350	80	28/6½	2-6	2-3	—	3-2	3-2	5-0	2-1	3-4	1	9½	Bardney ..	6.
526	Mixed loam ..	144	79	36/2	3-5	4-9	—	8-8	10-5	14-0	14-9	15-8	3	18	Cantley ..	14.
536	Strong loam ..	150	87	27/10½	5-3	3-3	1	7-5	7-5	9-6	11-5	55-4	3	17½	Ipswich and Cantley.	25, 35.
539	Gravel loam ..	178	64	33/7½	5-8	2-8	1	—	1-8	2-6	6-1	9-2	1	10½	Peterborough ..	29.
542	Loam on clay ..	380	68	32/10½	5-8	2-6	1	4-6	6-9	6-9	9-6	7-3	2	19	Cantley ..	21.
543	Fen ..	1411	96	48/6	5-7	5-0	3	11-8	11-8	12-5	15-4	11-0	1	15	Ely ..	8.
544	Gravel loam ..	500	60	26/7½	2-0	1-8	1	2-7	6-0	6-0	6-0	11-5	2	34½	Peterborough and Spalding.	13, 16.
551	Sewage farm on sand	300	83	27/1½	4-0	3-3	—	6-0	9-2	13-8	18-8	21-6	5	54	Kelham, Colwick and Bardney.	11, 25, 30.
553	Very mixed ..	800	75	25/8½	2-0	1-9	—	—	2-3	2-3	1-7	1-6	4	9½	Bardney and Kelham.	6, 20.
554	Gravel ..	73	96	23/6½	4-1	4-1	—	2-9	5-7	8-6	8-6	8-2	1	6	Bardney ..	6.
556	Gravel loam ..	70	69	33/6½	4-0	4-3	—	—	7-3	16-7	31-3	20-8	1	4	Kelham and Bardney.	20, 5.
557	Sandy loam and clay	400	65	20/10	5-0	3-7	1	2-2	4-1	5-5	6-8	9-6	2	26	Cantley ..	16.
560	Black fen ..	144	100	47/11	4-2	4-2	1	—	3-5	3-8	13-9	13-9	1	12	Peterborough ..	4.
562	Medium to heavy	95	68	43/5½	3-2	4-2	1	—	3-1	6-2	3-1	3-1	1	2	Peterborough ..	8.
566	Fen ..	44	77	71/7½	4-6	4-6	—	5-9	17-6	26-5	35-3	41-2	1	8	Peterborough and Spalding.	8, 11.
567	Limestone ..	1353	19	21/3½	0-9	1-0	—	—	2-2	4-4	2-2	5-5	1	14	Peterborough ..	8.
568	Medium fen ..	196	87	70/8½	5-1	4-6	—	8-8	8-8	8-8	20-0	30-6	4	52	Ely, Peterborough and Spalding.	24, 22, 24.
578	Light loam ..	200	80	33/0½	4-0	4-0	—	3-1	5-0	6-3	6-3	6-3	1	10	Cantley ..	15.
583	Sewage farm on sand	541	55	29/5	3-1	2-2	1	5-1	5-1	11-5	19-5	19-5	5	68	Cantley ..	14.
584	Light loam on chalk	750	95	22/1½	4-8	5-1	—	2-8	5-6	3-4	5-6	3-9	1	23	Bury ..	3½.
586	Light loam ..	1179	21	13/4½	1-8	0-7	—	7-3	—	4-9	7-3	7-8	1	19	Bury ..	14.
589	Silt loam ..	400	90	35/6	6-2	4-0	1	2-8	6-9	8-3	2-8	6-9	1	15	King's Lynn	17.
590	Skirt ..	50	76	34/0½	2-0	4-0	—	—	5-3	5-3	15-8	31-6	2	12	Bury ..	20.
591	Very light ..	999½	22	13/7½	1-0	1-0	1	8-2	13-6	22-7	13-6	9-1	4	20	Ipswich ..	18.
592	Gravel loam ..	137	62	32/7½	2-9	2-9	—	9-4	9-4	12-9	5-9	5-9	1	5	Ipswich ..	23.
593	Light to loam ..	1487	55	26/5	3-7	3-0	1	5-9	9-9	11-0	5-6	6-3	2	24½	Ipswich ..	10.
594	Light ..	230	87	23/2½	4-8	3-9	—	8-0	8-0	11-5	13-0	12-5	2	25	Ipswich ..	6.
596	Light loam ..	800	50	23/3	3-5	1-9	—	6-8	7-5	11-3	25-0	9-5	1	7	Ipswich ..	9.
598	Skirt ..	54	70	49/1½	3-7	5-6	—	7-9	15-8	18-4	15-8	15-8	1	6	Ely ..	13.
600	Clay loam ..	168	84	31/0½	5-4	4-2	1	4-2	7-0	6-5	10-2	9-9	1	6½	Ipswich ..	5.
605	Chalk loam and clay	215	81	34/3½	6-0	3-7	—	9-7	12-0	12-0	14-3	17-7	3	31	Ely and Bury	18, 14.
606	Fen ..	260	90	33/0½	5-0	6-2	—	17-0	30-0	23-8	13-4	26-2	4	61½	Peterborough ..	18.
608	Mixed heavy ..	260	86	19/3½	4-6	3-5	1	1-8	4-5	6-4	2-9	7-1	3	16	Bury ..	14.
609	Black fen ..	760	79	52/10½	4-7	5-5	1	4-2	10-0	15-0	41-7	63-3	1	8	Ely ..	15.
611½	Very mixed ..	426	60	30/9	4-8	3-3	1	1-2	3-1	4-8	5-0	5-8	2	14½	Ely ..	21.
612	Light loam ..	236	98	31/10½	3-4	2-1	2	1-3	3-0	3-0	3-0	3-0	1	7	Bury and Felsted	50, 45.
614	Light to Chalk ..	362	75	14/0½	3-0	2-2	1	2-1	5-2	6-9	5-2	4-2	1	11½	Bury, Felsted, Ely and Wistington.	35, 23, 30, 70.
615	Mixed loam ..	84	64	28/1½	3-0	6-0	—	—	22-7	33-0	31-1	40-6	3	21½	Bury and Ely	15, 12.
616	Heavy ..	46	93	36/6½	4-4	4-4	—	7-0	11-6	11-6	11-6	11-6	1	5	Ipswich ..	13.
618	Light to strong ..	72	76	30/-	4-2	7-0	—	—	7-3	8-2	8-2	10-0	1	5½	Bury ..	8.
621	Medium loam ..	112	64	21/5½	4-0	2-7	—	6-1	6-1	18-4	15-3	9-7	1	7	Cantley ..	16.
622	Mixed clay to sandy loam.	130	88	33/5½	6-7	4-3	—	—	—	3-7	5-6	6-7	1	6	Cantley ..	17.
623	Sandy loam ..	204	74	36/4½	3-4	3-9	—	—	—	4-7	1-3	2-7	1	4	Cantley ..	16.
624	Sandy loam to strong	73	82	52/10½	4-1	4-1	—	—	—	6-7	12-5	10-8	2	6½	Brigg and Selby	8, 35.
627	Loam ..	44	100	52/4½	—	—	—	—	—	—	44-4	50-0	1	2½	Bury ..	17.
628	Sandy loam ..	230	74	23/10½	4-4	3-0	1	8-8	23-5	35-3	35-3	31-2	5	53	Ipswich ..	20.
629	Sand ..	1600	88	6/5½	1-9	1-6	3	—	—	7-2	15-0	22-6	1	317	King's Lynn	20.
629A	Light mixed ..	626	80	6/5½	2-1	1-9	1	—	—	—	—	19-9	1	100	King's Lynn	21.

* Excludes casual labour. † Excludes tractors hired. ‡ Experimental farm.
§ Includes 7500 acres heath, for which only a nominal rent is paid.

Appendix A.

GENERAL ECONOMIC DATA, 1929—continued

Farm Number.	General Description of Soil.	Total Acreage.	% Arable.	Rent and Rates per Acre.	Density per 100 Acres*		Number of Tractors.†	Total Beet grown expressed as a % of Total Arable.					1929 Beet Crop actually Costed.		Factories Supplied.	Approximate Road Distance (Miles) to Factory.
					Labour.	Horses.							Number of Fields.	Acres.		
								1925	1926	1927	1928	1929				
680	Fen and skirt ..	812	84	61/9½	4.8	6.4	1	4.6	6.1	9.2	9.9	17.2	1	32	Ely and Wislington	17.6.
681	Light fen to medium loam.	350	36	28/8	1.8	2.7	—	24.0	24.0	24.0	58.4	67.5	1	16	Wislington	1.
682	Heavy fen ..	450	94	62/7½	5.8	3.6	1	13.1	13.1	13.1	11.8	9.4	1	40	Spalding ..	10½.
683	Light loam ..	250	69	27/8½	6.4	2.0	1	—	6.6	9.1	7.6	11.6	1	20	Cantley ..	5.
684	Mixed sand ..	720	61	21/8	2.9	2.5	—	4.5	9.1	6.8	6.8	6.8	2	30	King's Lynn	16.
686	Sandy loam ..	390	82	36/11½	3.6	8.1	—	—	—	1.9	3.1	3.9	2	10½	Cantley ..	18.
688	Fen ..	280	91	57/2½	2.5	2.9	—	—	—	4.7	8.0	11.0	1	28	Bardney ..	20.
689	Mixed loam ..	250	73	24/7	3.6	3.2	1	—	20.0	22.0	19.7	23.4	4	41	Cantley ..	20.
640	Fen ..	200	61	42/11½	5.0	4.6	1	32.5	40.7	48.8	50.4	48.0	5	59	Ely and Bury	9, 19.
641	Light to strong ..	601	68	19/11½	4.4	3.2	—	1.5	5.9	13.2	13.1	13.2	1	12½	Bury and Cantley	20, 20.
642	Sand to clay loam ..	300	50	23/4	0.0	3.3	1	8.0	20.0	23.8	18.0	21.0	4	81½	Ipwich and Bury	13, 35.
648	Clay loam ..	212	81	22/10½	3.8	3.8	—	5.8	11.6	11.6	12.8	16.3	4	28	Ipwich and Bury	20, 20.
644	Sandy loam ..	150	75	34/10	5.8	4.0	—	—	17.7	16.8	24.6	4	22½	Ipwich ..	6.	
645	Gravel loam to strong.	407	63	22/10	2.2	1.7	—	—	14.1	15.6	14.1	13.9	3	35½	Bury and Ely	7, 20.
647	Medium loam ..	53	79	42/10½	7.5	5.7	—	—	7.1	11.9	9.5	15.5	1	6½	Cantley ..	13.
648	Sand and clay loam	110	56	52/1½	5.5	4.6	—	5.5	17.1	24.7	9.6	14.9	2	9½	Cantley ..	7.
650	Mixed on chalk ..	50	80	42/10½	6.0	6.0	—	20.0	30.0	12.5	12.5	12.5	1	2½	Ely ..	38.
651	Medium loam ..	790	73	20/3	4.7	3.4	1	—	1.4	2.9	4.5	4.3	3	25	Cantley ..	17.
652	Medium ..	47	92	41/8½	4.8	6.4	—	9.3	18.6	18.6	14.0	13.9	1	6	Cantley ..	15.
653	Heavy loam ..	740	86	31/6½	4.0	2.7	2	—	0.1	1.4	2.3	3.9	2	25	Ely ..	40.
654	Skirt ..	21	81	60/6½	4.8	9.5	—	17.7	23.5	47.1	35.3	39.4	1	5	Wislington and Ely	9, 30.
655	Clay silt ..	80	60	69/-	3.3	3.3	—	—	11.1	11.1	16.7	19.4	1	3½	King's Lynn	7.
656	Loam ..	220	59	23/10½	2.3	2.7	—	9.2	9.2	9.2	9.2	9.2	1	12	Felsted ..	32.
660	Light to mixed loam	110	55	24/4	2.7	1.8	—	—	—	—	5.0	16.7	1	10	Ipwich ..	12.
661	Light on chalk ..	700	94	13/7½	3.4	2.6	1	—	—	—	—	2.3	1	15	King's Lynn	11.
662	Fen ..	250	100	51/3½	4.6	6.0	—	—	4.1	10.0	12.0	20.0	1	15	Ely and Wislington	10, 20.
663	Gravel loam ..	320	78	19/3½	2.7	3.1	1	—	—	2.8	8.0	14.4	2	36	Cantley ..	15.
664	Mixed on chalk and gravel.	1200	80	22/4	3.2	2.8	2	10.4	18.7	31.2	20.8	22.6	8	217	King's Lynn and Bury.	14, 30.
666	Light to medium loam.	387	72	20/3½	3.4	3.1	1	2.0	4.7	9.4	9.7	11.2	1	31	Bury ..	3½.
667	Very light mixed ..	804	56	11/8½	3.2	2.0	—	4.4	8.9	13.3	17.6	18.1	6	81½	Bury, Cantley and Ely.	16, 40, 25.
668	Mixed loam ..	193	61	20/2½	2.6	2.1	1	—	7.6	5.9	6.4	6.8	1	8	Felsted ..	20.
669	Very mixed ..	444	71	17/1½	2.0	1.8	1	0.3	2.8	3.5	6.3	7.2	1	23	Ely and Peterborough.	18, 18.
670	Clay loam ..	287	72	26/5½	4.2	3.5	1	5.8	8.0	8.7	11.1	13.0	1	27	Cantley, Ipwich and Bury.	40, 22, 22.
671	Very light ..	142	92	32/10	2.6	2.1	1	2.7	5.3	6.9	14.1	21.0	1	27½	Bury and Ely	3, 35.
672	Light to medium ..	395	73	30/8	3.3	2.0	2	1.7	2.4	7.3	11.8	12.1	1	35	Ely ..	18.
673	Medium to heavy ..	489	83	22/-	3.6	3.1	1	—	2.5	9.9	9.9	9.9	1	40	Bury and Wislington.	20, 40.
674	Light ..	385	89	30/9	3.2	3.5	—	—	2.0	2.8	3.6	6.3	1	16	Cantley ..	30.
675	Medium to heavy ..	410	56	16/10	2.3	2.4	1	2.2	3.5	3.5	7.8	7.8	1	13	Cantley ..	13.
Totals and averages		36,761½	74.3	32/11½	3.8	3.4	55	4.5	8.1	11.2	13.0	15.7	191	2760		17.9

* Excludes casual labour.

† Excludes tractors hired.

APPENDIX B.

FIELD DATA, 1929.

Farm Number.	Field Number.	Soil Class.	Acres.	Preceding Crop.	Variety of Seed.	Seed lb. per acre.	Mean Date of Drilling.	Ridge or Flat.	Distance (ins.) between		Succeeding Crop.
									Drills.	Plants	
502	1	L.-M.	8½	Rye ..	K.W. ..	13	May 10	Flat	21	9	Barley.
	2	L.-M.	25	Barley ..	K.W. ..	14	May 1	Flat	21	9	Barley.
	3	L.-M.	10	Barley ..	K.W. ..	15	May 7	Flat	21	9	Barley.
	4	L.-M.	42	Barley and Oats	Kuhn, Marsters	16½	April 21	Flat	21	9	Barley.
504	5	L.-M.	5	Brussel Sprouts	K.W. ..	12	May 12	Flat	21	9	Barley.
	6	V.L.	21	Oats ..	Kuhn ..	12	?	Flat	16	10	Roots.
	7	L.-M.	16	Sugar Beet ..	K.W. "Z."	12	May 3	Flat	16	10	Barley.
	8	L.-M.	15	Wheat ..	Dippe ..	12	April 26	Flat	16	10	Barley.
505	9	L.-M.	4	Barley ..	K.W. ..	16	April 23	Flat	21	10	Barley.
	10	L.-M.	6	Barley ..	K.W. ..	16	April 20	Flat	21	10	Barley.
507	11	L.-M.	10½	Rye ..	K.W. ..	23	May 21	Flat	19	9	Sugar Beet.
	12	L.-M.	23½	Sugar Beet ..	K.W., Kuhn "P."	14	April 16	Flat	19	9	Oats.
	13	L.-M.	22	Sugar Beet ..	K.W. ..	14	May 15	Flat	19	9	Barley.
	14	L.-M.	15½	Sugar Beet ..	K.W. ..	16	May 9	Flat	19	9	Oats.
	15	L.-M.	32	Oats and S. Beet.	Strube "Z."	22	May 27	Flat	19	9	Oats and S. Beet.
	16	L.-M.	28	Rye and S. Beet	K.W. ..	15	April 19	Flat	19	9	Sugar Beet.
507A	17	M.-H.	15	Barley ..	K.W. ..	15	May 5	Flat	19	9	Sugar Beet.
508	18	M.-H.	20	Barley ..	K.W. ..	16	April 22	Flat	22½	9	Barley.
	19	M.-H.	15	Wheat ..	Kuhn ..	16	April 18	Flat	22½	9	Barley.
510	20	M.-H.	9	Wheat ..	Mixed ..	18	April 12	Flat	18-22	8	Barley.
	21	L.-M.	6	Oats ..	K.W., Marsters	17	May 23	Flat	18-22	8	Oats.
	22	L.-M.	18	Barley and S. Beet.	K.W., Schreiber "S.S."	17	April 29	Flat	18-22	8	Barley.
520	23	F.	4	Wheat ..	Kuhn ..	15	May 5	Ridge	21	10	Potatoes.
523	24	F.	24	Oats ..	Kuhn "P."	21	May 10	Flat	21½	9	Wheat.
	25	F.	8	Wheat and Oats	Mixed ..	20	May 24	Flat	21½	9	Sugar Beet.
	26	F.	9	Wheat ..	Mixed ..	20	May 24	Flat	21½	9	Oats.
	27	F.	12	Potatoes ..	Schreiber	17	June	Flat	21½	9	Wheat.
	28	L.-M.	9½	Sainfoin ..	K.W., Rimpao	16	May 9	Flat	18	10	Oats.
524	29	L.-M.	7½	Sugar Beet ..	Kuhn, Dippe	18	April 19	Flat	20	9	Barley.
526	30	L.-M.	2½	Sugar Beet ..	K.W. ..	18	April 26	Flat	20	9	Barley.
	31	L.-M.	3½	Sugar Beet ..	Schreiber	18	May 3	Flat	20	9	Barley.
528	32	L.-M.	6½	Wheat ..	Kuhn ..	14	April 11	Flat	18	10	Sugar Beet.
	33	L.-M.	6½	Oats ..	Kuhn ..	14	April 24	Flat	18	10	Barley.
	34	M.-H.	4½	Barley ..	K.W. ..	14	April 26	Flat	18	10	Barley.
	35	L.-M.	10½	Potatoes and Cabbage.	K.W. "N." and "E."	14	April 14	Flat	21	10	Brussel Sprouts.
542	36	M.-H.	5	Barley ..	Kuhn ..	15	April 19	Flat	20	9	Barley.
	37	L.-M.	14	Barley ..	K.W. ..	15	May 5	Flat	20	9	Barley.
543	38	F.	16	Wheat ..	Kuhn ..	13	?	Flat	19½	9	Sugar Beet.
544	39	L.-M.	30	Barley ..	Kuhn, Marsters	16	May 2	Flat	21	8	Barley.
	40	L.-M.	4½	Swedes ..	Kuhn ..	16	May 16	Flat	21	8	Barley.
551	41	S.	15	Wheat ..	K.W. ..	12	May 17	Ridge	23	8	Oats.
	42	S.	9	Roots ..	K.W. ..	12	May 3	Ridge	23	8	Sugar Beet.
	43	S.	9	S. Beet and Wheat.	Mixed ..	12	May 8	Ridge	23	8	Sugar Beet.
	44	S.	12	S. Beet and Sewage treatment.	K.W. ..	12	May 15	Ridge	23	8	Sugar Beet.
	45	S.	9	Barley ..	K.W. ..	13	May 17	Ridge	23	8	Oats.
	46	L.-M.	3	Sugar Beet ..	K.W. "E."	15	April 23	Ridge	24	10	Barley.
	47	V.L.	2	Sugar Beet ..	K.W. "E."	15	April 9	Ridge	24	10	Barley.
	48	L.-M.	2½	Wheat ..	K.W. "E."	15	April 15	Ridge	24	10	Barley.
	49	V.L.	2	Wheat ..	K.W. "E."	15	April 11	Ridge	24	10	Mangolds.
554	50	L.-M.	6	Sugar Beet ..	K.W., Johnsons	15	May 8	Ridge	19	10	Roots.
556	51	L.-M.	4	Rye ..	Kuhn ..	13	June 4	Ridge	27	8	Barley.
557	52	L.-M.	21	Barley ..	Kuhn ..	15	April 24	Flat	19	9	Barley.
	53	M.-H.	5	Wheat ..	Johnsons	15	May 17	Flat	19	9	Roots.
					"Perfection."						
560	54	F.	12	Barley ..	K.W. "Z."	13	April 18	Flat	20	10	Wheat.
562	55	M.-H.	2	Barley ..	K.W. ..	14	May 4	Flat	22	9	Barley.
566	56	F.	8	Wheat ..	Kuhn ..	15	April 18	Flat	19	10	Sugar Beet.
567	57	L.-M.	14	Wheat ..	?	15	April 20	Flat	22	9	Wheat.
568	58	F.	8	Potatoes ..	Kuhn ..	13	April 16	Flat	19½	10	Oats.
	59	F.	16	Wheat ..	Kuhn ..	13	April 26	Flat	19½	10	Potatoes.
	60	F.	7	Potatoes ..	Garroux	13	May 7	Flat	19½	10	Wheat.
	61	F.	21	Wheat ..	Garroux	13	May 3	Flat	19½	10	Potatoes.
578	62	L.-M.	10	Oats ..	Kuhn, Marsters	18	April 25	Flat	18	9	Barley.
583	63	S.	12	Oats ..	Kuhn ..	15	April 14	Flat	18	9	Oats.
	64	S.	8½	Oats ..	Kuhn ..	15	May 7	Flat	18	9	Oats.

* Part failed and was re-drilled. † Spacing drill used.
V.L. = Very light. L.-M. = Light to medium. M.-H. = Medium to heavy. F. = Fen, Silt and Warp. S. = Sewage.
"K.W." indicates *Klein Wanzleben*. "Mixed" indicates that more than two varieties were drilled.

Appendix B.

FIELD DATA—continued

Farm Number.	Field Number.	Soil Class.	Acres.	Preceding Crop.	Variety of Seed.	Seed lb. per acre.	Mean Date of Drilling.	Ridge or Flat.	Distance (ins.) between		Succeeding Crop.
									Drills.	Plants	
	65	S.	17	Rye Grass ..	Dippe ..	15	April 29	Flat	18	9	Sugar Beet.
	66	S.	9½	Oats ..	Hillcrag ..	15	May 26	Flat	18	9	Oats.
	67	S.	11	Sugar Beet ..	Kuhn ..	15	May 14	Flat	18	9	Silage.
584	68	L.-M.	28	Barley ..	Mixed ..	15	April 16	Flat	24	8	Barley.
588	69	V.L.	19	Oats ..	Kuhn ..	14	May 14	Flat	20	9	Oats.
					K.W."Z."						
589	70	F.	15	Oats ..	Marsters ..	14	April 12	Flat	18	8	Potatoes.
590	71	F.	8	S. Beet and Wheat.	K.W. ..	14	May 8	Flat	19	10	Sugar Beet.
	72	F.	4	Rye and Bare Fallow.	K.W."N."	14	April 23	Flat	19	10	Sugar Beet.
591	73	L.-M.	6	Sugar Beet ..	Dippe, Marsters	12	April 24	Flat	18	9	Barley.
	74	V.L.	5	Roots ..	Dippe, Marsters	12	May 4	Flat	18	9	Sugar Beet.
	75	L.-M.	5	Rye ..	Dippe, Marsters	12	?	Flat	18	9	Barley.
	76	L.-M.	4	Kale ..	Dippe, Marsters	12	May 11	Flat	18	9	Barley.
592	77	L.-M.	5	Linsed ..	Kuhn ..	12	April 24	Flat	24	9	Barley.
593	78	V.L.	10½	Barley ..	Johnsons ..	12	April 21	Ridge	18½	9	?
	79	L.-M.	14	Oats ..	Johnsons ..	11	May 11	Ridge	18½	9	?
594	80	L.-M.	15	Wheat ..	K.W."N."	15	?	Flat	18	8	Sugar Beet.
	81	M.-H.	10	Wheat ..	Johnsons ..	15	?	Flat	18	8	Oats.
					"Perfection."						
596	82	L.-M.	7	Roots ..	K.W."N."	*28	May 24	Flat	19	10	Barley.
					Kuhn "P."						
598	83	M.-H.	6	Barley ..	Johnsons "P."	12	April 18	Flat	19	8	Wheat.
600	84	M.-H.	6½	Barley ..	K.W. ..	14	May 4	Flat	22	10	Barley.
603	85	L.-M.	10	Beans and Oats	Kuhn "P."	15	April 12	Flat	23	8	Barley.
	86	L.-M.	16	Barley ..	Kuhn "P."	15	April 28	Flat	28	8	Barley.
	87	L.-M.	5	Oats ..	Kuhn "P."	15	April 12	Flat	23	8	Wheat.
606	88	F.	14½	Potatoes ..	Marsters ..	15	May 7	Flat	20	10	Sugar Beet.
	89	F.	21½	Potatoes and S. Beet.	Marsters ..	15	April 13	Flat	30	10	Wheat.
	90	F.	15	Sugar Beet ..	Marsters ..	15	April 23	Flat	20	10	Potatoes.
	91	F.	10½	Wheat ..	Marsters ..	15	April 24	Flat	20	10	Potatoes.
608	92	M.-H.	8	Wheat ..	?	16	?	Flat	21	9	Barley.
	93	M.-H.	8	Cabbage ..	?	16	?	Flat	21	9	Barley.
609	94	F.	8	Rape ..	Marsters ..	12	?	Flat	30	13	Sugar Beet.
611	95	L.-M.	7½	Barley ..	K.W. ..	15	April 19	Flat	18	9	Barley.
	96	L.-M.	7	Wheat ..	K.W. ..	16	May 1	Flat	18	9	Barley.
612	97	L.-M.	7	Oats ..	Kuhn ..	18	April 19	Flat	22	9	Barley.
614	98	L.-M.	11½	Barley ..	K.W., Kuhn ..	13	April 16	Flat	21	10	Barley.
615	99	L.-M.	5	Sugar Beet ..	?	13	April 10	Flat	30	10	Barley.
	100	L.-M.	7	Wheat ..	?	14	May 4	Flat	30	10	Wheat.
	101	L.-M.	9½	Wheat and Barley.	?	14	April 25	Flat	30	10	Barley.
616	102	M.-H.	5	Oats ..	Kuhn, K.W."N."	15	April 21	Flat	18	10	Barley.
618	103	M.-H.	5½	Oats ..	Dippe ..	16	April 3	Flat	24-32	10	Wheat.
631	104	L.-M.	7	Wheat, Oats and Peas.	Dippe, Hillcrag.	14	May 1	Flat	19	9	Sugar Beet.
633	105	L.-M.	6	Oats ..	Dippe ..	15	?	Flat	21	9	Barley.
635	106	L.-M.	4	Wheat ..	Dippe ..	15	April 26	Flat	21	9	Barley.
634	107	L.-M.	4	Potatoes ..	Kuhn "P."	19	May 7	Ridge	20	10	Sugar Beet.
	108	L.-M.	3½	Barley ..	Kuhn "P."	17	April 27	Ridge	20	10	Wheat.
627	109	L.-M.	2½	Sugar Beet ..	K.W., Dippe ..	15	April 18	Flat	23	10	Sugar Beet.
638	110	V.L.	13	Sugar Beet ..	Marsters, Kuhn	12	April 13	Flat	20½	9	Oats.
	111	L.-M.	10	Roots and Turnips.	Marsters, Kuhn	11	April 27	Flat	20½	9	Sugar Beet.
	112	V.L.	10	Sugar Beet ..	Marsters, Kuhn	12	May 16	Flat	20½	9	Oats.
	113	V.L.	17	Sugar Beet ..	Marsters, Kuhn	12	?	Flat	20½	9	Sugar Beet.
	114	L.-M.	3	Oats ..	Marsters, Kuhn	11	June 7	Flat	20½	9	Barley.
639	115	V.L.	317	Roots and Corn	K.W., Kuhn ..	15	?	Flat	24	9	Roots and Barley.
639A	116	V.L.	100	Barley and Rye	K.W., Kuhn ..	15	?	Flat	24	9	?
630	117	F.	32	Wheat ..	Mixed ..	16	April 24	Flat	19½	10	Sugar Beet.
631	118	L.-M.	16	Sugar Beet ..	Kuhn ..	14	May 17	Flat	18	10	Barley.
632	119	F.	40	Wheat ..	Brauno, Sharpes "Z.Z."	28	April 17	Flat	17	9	Potatoes.
633	120	M.-H.	30	Barley ..	Mixed ..	20	April 23	Flat	20	9	Barley.
634	121	V.L.	25	Oats ..	Kuhn ..	15	?	Flat	21	9	Barley.
	122	L.-M.	5	Wheat ..	Kuhn ..	15	May 30	Flat	21	9	Barley.
636	123	L.-M.	4	Sugar Beet ..	Kuhn ..	16	April 19	Flat	30	9	Wheat.
	124	L.-M.	6½	Barley ..	K.W. ..	16	April 25	Flat	20	9	Barley.
638	125	F.	28	Potatoes, Wheat and Beans.	Mixed ..	18	April 20	Flat	19½	9	Wheat and S. Beet.
639	126	L.-M.	11½	Barley ..	K.W., Kuhn ..	15	April 20	Flat	18	9	Barley.
	127	M.-H.	11	Oats ..	K.W., Kuhn ..	15	May 1	Flat	18	9	Barley.
	128	L.-M.	6½	Wheat ..	K.W., Kuhn ..	15	May 3	Flat	18	9	Barley.

* Part failed and was re-drilled.

V.L. = Very light. L.-M. = Light to medium. M.-H. = Medium to heavy. F. = Fen, Silt and Warp. S. = Sewage.

"K.W." indicates Klein Wansleben. "Mixed" indicates that more than two varieties were drilled.

Appendix B.

FIELD DATA—continued

Farm Number.	Field Number.	Soil Class.	Acres.	Preceding Crop.	Variety of Seed.	Seed lb. per acre.	Mean Date of Drilling.	Ridge or Flat.	Distance (ins.) between		Succeeding Crop.
									Drills.	Plants	
640	129	L.-M.	13	Roots ..	K.W., Kuhn ..	15	May 10	Flat	18	9	Barley.
	130	F.	18	Potatoes and S. Beet.	Mixed ..	15	May 3	Flat	20	10	Sugar Beet.
	131	F.	8	Barley ..	Sharps ..	15	May 1	Flat	20	10	Sugar Beet.
	132	F.	13	Oats ..	Kuhn ..	15	April 17	Flat	20	10	Barley.
	133	F.	7	Barley ..	Kuhn ..	15	April 18	Flat	20	10	Wheat.
641	134	F.	13	Wheat ..	Kuhn ..	16	April 17	Flat	20	10	Wheat and Oats.
	135	L.-M.	12½	Oats ..	K.W. ..	16	May 3	Flat	20	9	Barley.
	136	L.-M.	14	Roots ..	Kuhn "P." ..	20	April 26	Flat	21	9	Barley.
	137	L.-M.	6	Roots ..	Dippe ..	15	May 29	Flat	21	9	Barley.
	138	L.-M.	9	Roots ..	Kuhn "P." ..	16	May 18	Flat	21	9	?
643	139	L.-M.	2½	Roots ..	Dippe ..	16	May 29	Flat	21	9	?
	140	M.-H.	8	Barley ..	Mixed ..	15	April 10	Flat	18	10	Barley.
	141	M.-H.	6	Sugar Beet	K.W. ..	15	April 19	Flat	18	10	Barley.
	142	M.-H.	6	Barley ..	Mixed ..	15	May 1	Flat	18	10	Barley.
	143	M.-H.	8	Barley ..	Kuhn ..	15	May 13	Flat	18	10	Barley.
644	144	L.-M.	3	Sugar Beet	Marsters ..	15	April	Flat	19	9	Barley.
	145	M.-H.	5	Sugar Beet	Marsters ..	15	April	Flat	19	9	Barley.
	146	L.-M.	5½	Barley ..	Dippe ..	15	May	Flat	19	9	Sugar Beet.
	147	L.-M.	9	Sugar Beet	Marsters ..	15	May 10	Flat	19	9	Barley.
	148	M.-H.	8½	Wheat ..	K.W. ..	15	April 22	Flat	20½	9	Barley.
645	149	L.-M.	16½	Barley ..	K.W. ..	15	May	Flat	20½	9	Barley.
	150	L.-M.	10½	Barley ..	K.W. ..	15	May 2	Flat	20½	9	Barley.
	151	L.-M.	6½	Oats ..	Kuhn "P." ..	18	April 27	Flat	18	8	Barley.
	152	M.-H.	5	Roots ..	Dippe ..	15	April 9	Flat	18	8	Tares and Oats.
	153	L.-M.	4½	Barley ..	Marsters ..	15	May 2	Flat	18	8	Barley.
650	154	L.-M.	2½	Potatoes	Kuhn ..	16	May 9	Flat	19	8	Wheat.
	155	M.-H.	12	Sugar Beet	Hilleshog ..	14	April 5	Flat	18	10	Sugar Beet.
	156	M.-H.	8	Sugar Beet	Hilleshog ..	14	April 4	Flat	18	10	Sugar Beet.
	157	M.-H.	5	Sugar Beet	Hilleshog ..	14	April 20	Flat	18	10	Sugar Beet.
	158	L.-M.	6	Wheat ..	K.W., Kuhn ..	15	April 23	Flat	21	9	Barley.
652	159	M.-H.	13	Barley ..	Hilleshog ..	16	April 21	Flat	21	9	Oats.
	160	M.-H.	12	Oats ..	Marsters and Hilleshog.	20	April 29	Flat	18	9	Sugar Beet.
	161	F.	5	Wheat and Strawberries.	Marsters ..	12	April 30	Flat	21	9	Wheat.
	162	F.	3½	Cabbage ..	Kuhn ..	13	May 22	Flat	22	10	Potatoes.
	163	L.-M.	12	Barley ..	Mixed ..	10	April 25	Flat	22	9	Barley.
660	164	L.-M.	10	Wheat and Peas	Mixed ..	25	April 24	Flat	20	10	Barley.
	165	V.L.	15	Barley ..	Kuhn ..	15	April 29	Flat	20	9	Barley.
	166	F.	15	Oats ..	Kuhn "P." ..	17	April 26	Flat	21	8	Barley.
	167	V.L.	17	Oats ..	Marsters, Kuhn "P."	18	April 22	Flat	19	9	Barley.
	168	L.-M.	19	Oats ..	Mixed ..	17	May 18	Flat	19	9	Barley.
664	169	M.-H.	48	Barley ..	K.W. ..	15	April 22	Flat	21	8-9	Barley.
	170	L.-M.	25	Barley ..	Kuhn ..	15	April 5	Flat	21	8-9	Barley.
	171	L.-M.	50	Barley and Oats	K.W. ..	15	April 10	Flat	21	8-9	Barley.
	172	V.L.	24	Wheat ..	Kuhn ..	15	April 7	Flat	21	8-9	Barley.
	173	V.L.	17	Barley ..	K.W. ..	15	April 19	Flat	21	8-9	Barley.
672	174	M.-H.	7	Barley ..	K.W. ..	15	April 23	Flat	21	8-9	Roots.
	175	L.-M.	40	Barley ..	K.W. ..	15	May 2	Flat	21	8-9	Barley.
	176	L.-M.	5	Pasture ..	K.W. ..	15	May 20	Flat	21	8-9	Sugar Beet.
	177	L.-M.	31	Tares and Oats	K.W., Kuhn "P."	15	?	Flat	18	6	Barley.
	178	V.L.	25	Barley ..	K.W., Kuhn ..	18	May 3	Flat	20	10-11	Barley.
667	179	V.L.	6	Sugar Beet	K.W., Kuhn ..	23	April 10	Flat	20	10-11	Sugar Beet.
	180	V.L.	6	Barley ..	K.W., Kuhn ..	13	April 12	Flat	20	10-11	Barley.
	181	V.L.	8½	Barley ..	K.W., Kuhn ..	13	April 19	Flat	20	10-11	Sugar Beet.
	182	V.L.	10	Rye and Tares	K.W., Kuhn ..	13	May 10	Flat	20	10-11	Barley.
	183	V.L.	26	Tares and Leys	K.W., Kuhn ..	13	May 10	Flat	20	10-11	Barley.
668	184	M.-H.	8	Tares and S. Beet.	?	15	May 6	Flat	19	9	?
	185	M.-H.	23	S. Beet, Fallow and Wheat.	K.W. "E." ..	18	April 29	Flat	19½	8	?
	186	M.-H.	27	Wheat and Barley.	Mixed ..	10	May 1	Flat	21	10	?
	187	V.L.	27½	Corn and Fallow.	Mixed ..	16½	April 19	Flat	18	9	?
	188	L.-M.	35	Wheat ..	K.W., Kuhn ..	17	April 26	Flat	21	9	?
673	189	M.-H.	40	Wheat and Barley.	K.W., Kuhn ..	16	May 7	Flat	21	9	Barley.
	190	L.-M.	16	Barley ..	?	13	April 26	Flat	21	9	?
	191	M.-H.	18	Barley ..	K.W. "N.", Kuhn "P."	15	May 3	Flat	19	9	Barley.

V.L. = Very light. L.-M. = Light to medium. M.-H. = Medium to heavy. F. = Fen, Silt and Warp. S. = Sewage.
 "K.W." indicates *Klein Wansleben*. "Mixed" indicates that more than two varieties were drilled.

APPENDIX C. YIELD DATA, 1929.

Field Number	Yield in Tons per Acre.		% Pure.	Effective % Sugar Content.	lb. Sugar (Sucrose) per Acre.	lb. Sugar (Sucrose) per £ labour.	Haulage Miles.	Method of Transport.	Estimated Tons.	Tops per Acre.	
	Unwashed.	Washed.								Method of Disposal.	Value. £ s. d.
1	9-022	7-886	12-56	18-1	3197	509			6	Part carted and part ploughed in	2 5 0
2	9-022	7-886	12-56	18-1	3197	369			6	Part carted and part ploughed in	2 5 0
3	9-022	7-886	12-56	18-1	3197	344			6	Part carted and part ploughed in	2 5 0
4	9-022	7-886	12-56	18-1	3197	400			6	Part carted and part ploughed in	2 5 0
5	9-022	7-886	12-56	18-1	3197	510			6	Part carted and part ploughed in	2 5 0
6	5-726	5-311	7-24	19-7	2344	282			4	Folded	1 10 0
7	10-994	9-479	13-78	17-7	3758	555			7	Folded	2 12 6
8	9-169	7-282	20-60	18-0	2936	347			5½	Folded	2 1 3
9	12-603	10-103	19-84	17-8	4028	297			7	Carted off	2 12 6
10	11-790	9-994	15-28	18-0	4030	300			7	Carted off	2 12 6
11	8-611	7-083	17-01	17-4	2733	315			5	Part carted and part ploughed in	1 13 6
12	4-640	4-314	7-03	20-6	1991	220			3	Folded	1 2 6
13	7-555	6-860	9-11	19-2	2953	359			5	Part carted and part ploughed in	1 12 6
14	6-783	5-858	13-64	18-0	2362	260			4	Folded	1 10 0
16	11-791	9-397	20-30	10-7	3515	366			6	Part carted and part ploughed in	1 19 0
16	6-733	6-100	8-07	20-6	2850	334			4	Folded	1 10 0
17	11-127	8-636	22-89	17-8	3443	329			8	Ploughed in	2 4 0
18	14-446	11-918	17-50	17-8	4752	481			12	Carted off	4 10 0
19	11-880	10-928	8-04	21-0	5141	604			10	Carted off	3 15 0
20	18-054	10-049	11-11	18-2	6543	388			12	Part folded, part carted and part ploughed in	4 10 0
21	14-348	12-792	10-85	17-6	5043	295			10	Part folded, part carted and part ploughed in	3 15 0
22	13-037	11-620	10-87	19-1	4972	375			9	Part folded, part carted and part ploughed in	3 7 6
23	12-958	11-116	14-19	17-6	4352	364			15	Carted off	4 17 6
24	10-275	9-751	5-10	17-4	3801	487			10	Part carted and part folded	3 5 0
25	10-558	9-770	7-40	17-6	3852	398			10	Part carted and part folded	3 5 0
26	11-826	10-080	9-64	16-9	4045	489			10½	Part carted and part folded	3 8 3
27	11-465	10-493	8-72	20-6	4842	761			10½	Part carted and part folded	3 8 3
28	13-374	12-293	8-80	16-9	4642	527			8	Folded	3 0 0
29	14-343	12-608	13-13	18-5	5225	565			9	Carted off	3 7 6
30	10-300	9-395	8-79	20-1	4230	477			7	Carted off	2 12 6
31	12-898	11-206	13-12	17-9	4498	537			8	Carted off	3 0 0
32	11-638	11-042	4-94	18-7	4626	460			10	Part carted and part folded	3 15 0
33	11-544	10-885	5-71	20-1	4801	439			9	Part carted and part folded	3 7 6
34	8-603	7-086	10-66	17-7	3047	201			7	Part carted and part folded	2 12 6
35	8-444	7-446	8-20	19-4	3366	319			5½	Carted off	2 1 3
36	7-167	6-828	4-74	19-6	2998	302			6	Carted off	2 5 0
37	14-492	12-566	13-29	18-7	5264	347			10	Carted off	3 15 0
38	12-742	12-257	3-81	15-8	4338	411			12	Ploughed in	2 14 0
39	5-148	4-770	7-34	30-9	2233	270			2½	Folded	18 9
40	5-148	4-770	7-34	30-9	2233	264			2½	Folded	18 9
41	10-700	9-112	15-32	17-9	3654	510			9	Part carted and part folded	2 18 6
42	6-877	6-261	8-96	16-6	2328	364			6	Part carted and part folded	1 19 0
43	9-304	7-845	13-17	17-5	3075	410			8	Part carted and part folded	2 12 0
44	9-466	8-161	13-78	17-6	3217	460			8	Part carted and part folded	2 12 0
45	6-877	6-261	8-96	16-6	2328	353			6	Part carted and part folded	1 19 0
46	9-633	8-062	6-90	18-3	3674	533			8	Folded	3 0 0
47	10-887	9-812	9-87	17-1	3758	525			8	Folded	3 0 0
48	10-375	9-100	12-29	17-7	3608	477			8	Folded	3 0 0
49	9-294	8-662	6-79	17-7	3494	367			8	Folded	3 0 0
50	9-010	8-423	6-52	17-8	3358	458			6	Carted off	2 5 0
51	8-100	7-306	11-03	16-5	2603	340			6	Carted off	2 5 0
52	11-710	9-799	16-31	17-0	3731	382			7	Carted off	2 12 6
53	11-710	9-799	10-31	17-0	3731	344			7	Carted off	2 12 6
54	14-902	13-006	9-06	18-2	5547	676			11	Folded	3 11 6
55	6-450	5-919	8-24	19-5	2585	286			4	Folded	1 10 0
56	12-487	11-742	8-97	17-8	4682	484			10	Ploughed in	2 5 0
57	4-138	3-897	5-83	20-8	1903	265			5	Folded	1 17 6
58	14-066	12-173	13-45	17-1	4663	486			10	Carted off	3 5 0
59	14-066	12-173	13-45	17-1	4663	419			10	Carted off	3 5 0
60	14-066	12-173	13-45	17-1	4668	425			10	Carted off	3 5 0
61	14-066	12-173	13-45	17-1	4663	475			10	Carted off	3 5 0
62	13-476	12-082	10-33	18-9	5115	494			7	Ploughed in	1 18 6
63	11-200	10-383	7-29	15-5	3005	366			10½	Part carted and part ploughed in	2 17 9
64	11-529	10-090	7-28	16-5	3712	322			11	Part carted and part ploughed in	3 0 6
65	12-000	11-126	7-29	15-5	3863	341			11	Part carted and part ploughed in	3 0 6
66	8-947	8-296	7-28	15-5	2880	221			9	Part carted and part ploughed in	2 9 6
67	9-545	8-849	7-29	15-5	3072	297			9	Part carted and part ploughed in	2 9 6

* Weighted average of individual consignments.

† From field to roadside, wharf or rail station.

‡ From roadside, wharf or rail station to factory: where more than one destination data are given in same order as factories in Appendix A.

Appendix C.

YIELD DATA, 1929—continued

Field Number	Yield in Tons per Acre.		% Tare.	Effective % Sugar Content.	lb. Sugar (Su-crose) per Acre.	lb. Sugar (Su-crose) per lb. labour.	Haul- age, Miles.	Method of Trans- port.	Esti- mated Tons.	Tops per Acre.	
	Un- washed.	Washed.								Method of Disposal.	Value. \$ s. d.
68	12-045	10-104	16-12	18-6	4210	458	1	Road	8	Folded	3 0 0
69	5-966	4-924	17-47	18-4	1809	207	1	Road	3	Folded	1 2 6
70	20-363	16-992	16-56	17-2	6547	713	1	Road	12	Ploughed in	2 14 0
71	5-947	4-959	16-61	16-6	1844	214	3	Rail	4	Ploughed in	18 0
72	10-375	8-697	16-17	17-3	3370	346	6		6	Ploughed in	1 7 0
73	7-590	6-534	13-91	17-1	2503	265	6		6	Folded	2 5 0
74	7-590	6-534	13-91	17-1	2503	267	3 1/2	Rail	6	Folded	2 5 0
75	7-590	6-534	13-91	17-1	2503	331	6		6	Folded	2 5 0
76	7-590	6-534	13-91	17-1	2503	327	6		6	Folded	2 5 0
77	6-355	5-733	10-38	18-4	2359	276	1	Road	7	Folded	2 12 6
78	7-577	6-935	8-48	20-0	3107	356	1	Road	4 1/2	Part carted and part ploughed in	1 9 3
79	8-776	7-859	10-45	18-7	3292	349	1		6	Part carted and part ploughed in	1 19 0
80	12-808	10-972	14-34	18-0	4424	694	1	Road	8	Carted off	3 0 0
81	7-731	6-995	9-52	19-2	3008	408	1		6	Carted off	2 5 0
82	14-755	12-134	17-77	16-9	4593	405	1	Rail	8	Folded	3 0 0
83	9-762	7-981	18-25	17-1	3057	302	1	Rail	5	Ploughed in	1 7 6
84	11-885	10-238	13-85	17-4	3990	366	1	Road	7	Part carted and part ploughed in	2 5 6
85	10-204	8-565	16-08	16-1	3089	241	6		6	Ploughed in	1 13 0
86	8-071	6-898	13-29	17-9	2306	236	1	Road	5	Ploughed in	1 7 6
87	6-532	6-187	5-28	20-7	2869	235	5		5	Ploughed in	1 7 6
88	14-888	13-243	11-05	16-9	5013	470	10		10	Part folded and part ploughed in	2 15 0
89	14-888	13-243	11-05	16-9	5013	580	10	Rail	10	Part folded and part ploughed in	2 15 0
90	14-888	13-243	11-05	16-9	5013	507	10		10	Part folded and part ploughed in	2 15 0
91	14-888	13-243	11-05	16-9	5013	574	10		10	Part folded and part ploughed in	2 15 0
92	10-559	9-281	12-10	19-9	4137	432	1	Road	8	Part carted and part folded	3 0 0
93	15-438	11-961	22-52	17-6	4716	533	1		10	Part carted and part folded	3 15 0
94	23-873	19-370	18-87	14-4	6248	681	2 1/2	Water	15	Folded	4 17 6
95	12-156	10-266	15-55	17-6	4047	298	2 1/2	Rail	5	Folded	1 17 6
96	13-279	11-120	16-26	16-6	4135	285	7		7	Folded	2 12 6
97	8-696	7-452	14-31	18-1	3021	317	2	Rail	5	Folded	1 17 6
98	7-904	7-335	7-20	18-5	3040	302	2	Rail	5	Folded	1 17 6
99	10-737	8-845	17-63	17-0	3368	396	6		6	Ploughed in	1 13 0
100	14-188	12-120	15-28	16-6	4507	318	1	Road	8	Ploughed in	2 4 0
101	5-991	5-375	10-28	17-9	2155	211	4		4	Ploughed in	1 2 0
102	9-060	7-767	14-27	18-5	3219	277	1	Road	8	Part carted and part ploughed in	2 12 0
103	6-886	6-632	3-70	20-8	3090	288	1 1/2	Rail	8	Ploughed in	2 4 0
104	9-748	8-334	14-51	16-7	3118	298	1 1/2	Road	7	Carted off	2 12 6
105	11-473	10-029	12-58	18-6	4178	373	1 1/2	Rail	8	Ploughed in	2 4 0
106	10-203	9-863	3-34	20-6	4599	301	1	Water	9	Carted off	3 7 6
107	15-081	12-325	18-23	17-3	4776	549	1	Road	8	Carted off	3 0 0
108	12-253	10-330	15-71	16-1	3725	343	1		9	Carted off	3 7 6
109	11-933	11-478	3-89	19-5	5014	498	1 1/2	Road	8	Ploughed in	2 4 0
110	8-986	8-035	10-59	18-6	3348	400	8		8	Part carted and part ploughed in	2 12 0
111	11-425	9-385	17-88	17-4	3658	410	9		9	Part carted and part ploughed in	2 18 6
112	10-748	7-945	26-08	16-9	3008	372	1	Road	8	Part carted and part ploughed in	2 12 0
113	10-748	7-945	26-08	16-9	3008	309	8		8	Part carted and part ploughed in	2 12 0
114	8-288	6-750	18-55	16-8	2540	247	7		7	Part carted and part ploughed in	2 5 6
115	5-502	4-897	12-42	16-6	1830	286	1	Road	4	Part folded and part ploughed in	1 8 0
116	5-592	4-897	12-42	16-6	1830	291	1 1/2	Road	4	Part folded and part ploughed in	1 6 0
117	13-104	12-388	5-46	16-9	4690	431	1 1/2	Rail	9	Part folded and part ploughed in	2 18 6
118	13-296	11-205	15-73	18-8	4719	468	1 1/2	Water	7	Part carted and part folded	2 12 6
119	11-939	11-089	7-12	18-8	4670	388	1	Road	12	Ploughed in	2 14 0
120	12-602	11-404	9-50	18-7	4777	448	3	Rail	8	Carted off	3 0 0
121	7-986	7-080	11-34	16-7	2648	274	1	Road	5	Folded	1 17 6
122	7-986	7-080	11-34	16-7	2648	259	5		5	Ploughed in	1 7 6
123	13-462	11-627	13-63	18-0	4688	436	1	Rail	8	Part carted and part ploughed in	2 12 0
124	13-462	11-627	13-63	18-0	4688	436	8		8	Part carted and part ploughed in	2 12 0
125	15-281	14-406	5-73	18-5	5970	584	1	Road	10	Folded	3 5 0
126	8-130	7-514	7-58	18-6	3131	293	6		6	Carted off	2 5 0
127	6-988	6-242	10-67	16-5	2307	297	1	Road	6	Carted off	2 5 0
128	7-339	6-389	13-95	15-9	2276	304	2	Water	6	Carted off	2 5 0
129	11-812	10-226	13-42	16-2	3940	511	8		8	Carted off	3 0 0
130	17-719	14-776	16-61	15-4	5097	563	10		10	Part folded and part ploughed in	2 15 0
131	11-487	10-670	7-11	17-7	4230	580	8		8	Part folded and part ploughed in	2 4 0
132	15-208	12-691	16-55	16-8	4776	593	1	Road	9	Part folded and part ploughed in	2 9 6
133	9-321	9-007	3-37	17-7	3571	468	7		7	Part folded and part ploughed in	1 18 6
134	9-693	9-060	6-54	17-1	3470	472	7		7	Part folded and part ploughed in	1 18 6
135	9-338	8-432	9-65	20-1	3796	248	1	Road	6	Carted off	3 5 0
136							3	Rail	7		
137	12-433	10-581	14-90	17-8	4210	431	1	Road	7	Part carted and part folded	2 12 6
138	12-433	10-581	14-90	17-8	4210	430	1	Rail	7	Part carted and part folded	2 12 6
139	12-433	10-581	14-90	17-8	4210	439	1		7	Part carted and part folded	2 12 6

* Weighed average of individual consignments.

† From field to roadside, wharf or rail station.

‡ From roadside, wharf or rail station to factory: where more than one destination data are given in same order as factories in Appendix A.

Appendix C.

YIELD DATA, 1929—continued

Field Number	Yield in Tons per Acre.		% Tare.	Effective % * Sugar Content.	lb. Sugar (Su-crose) per Acre.	lb. Sugar (Su-crose) per £ labour.	† Haul- age. Miles.	‡ Method of Trans- port.	Tops per Acre.		
	Un- washed.	Washed.							Esti- mated Tons.	Method of Disposal.	Value. \$ s. d.
140	10-739	9-791	8-83	20-2	4430	340			8	Part carted and part folded	3 0 0
141	14-862	12-933	12-98	19-0	5504	470	1	Rail	10	Part carted and part folded	3 15 0
142	8-488	7-725	8-98	19-6	3392	319			7	Part carted and part folded	2 12 6
143	8-216	6-597	19-70	18-1	2675	250			5	Part carted and part folded	1 17 6
144	11-329	9-600	16-36	17-9	3849	416			6	Carted off	2 5 0
145	11-517	10-238	11-11	19-3	4426	419	‡	Road	8	Carted off	3 0 0
146	10-589	9-355	11-65	18-9	3961	360			6	Carted off	2 5 0
147	15-879	12-893	17-77	17-4	5025	469			10	Carted off	3 15 0
148	6-110	5-706	6-63	19-3	2454	302	5	Rail	5	Folded	1 17 6
149	9-105	7-848	19-30	17-6	2897	276	1 1/2	Road	6	Folded	2 5 0
150	6-261	5-565	11-10	18-8	2344	286			4	Folded	1 10 0
151	13-027	11-165	7-16	19-2	4802	443	‡	Road	7	Carted off	2 12 6
152	9-723	9-270	4-05	19-6	4070	395	‡	Road	7	Carted off	2 12 6
153	9-723	9-270	4-05	19-6	4070	395			7	Carted off	2 12 6
154	10-915	10-390	4-81	18-0	4189	372	‡	Rail	6	Ploughed in	1 13 0
155	10-786	10-064	6-70	19-1	4306	354			6	Part carted and part folded	2 5 0
156	15-436	13-473	12-71	18-4	5855	430	‡	Rail	8	Part carted and part folded	3 0 0
157	14-420	11-402	20-93	17-8	4546	394			7	Part carted and part folded	2 12 6
158	11-135	10-262	7-84	18-5	4253	399	‡	Rail	9	Carted off	3 7 6
159	10-645	9-317	12-48	17-9	3736	301	3	Rail	7	Folded	2 12 6
160	10-645	9-317	12-48	17-9	3736	304			7	Carted off	2 12 6
161	13-722	13-058	4-84	18-6	5440	517	‡	Water Road	8	Ploughed in	1 16 0
162	18-482	16-600	10-18	16-5	6135	650	1	Rail	10	Ploughed in	2 5 0
163	9-686	8-554	11-70	18-8	3602	433	‡	Road	5	Carted off	1 17 6
164	5-884	4-923	16-34	17-7	1952	239			4	Folded	1 10 0
165	8-806	7-338	16-67	16-5	2713	337	‡	Road	4	Folded	1 10 0
166	12-813	11-880	7-28	15-4	4098	431	‡	Rail	10	Part folded and part ploughed in	2 15 0
167	6-015	5-475	8-98	18-2	2232	227	3 1/2	Rail	4	Carted off	1 10 0
168	8-090	6-403	20-86	16-8	2410	235			5	Carted off	1 17 6
169	13-281	10-738	19-23	17-3	4157	444			8	Part carted and part folded	3 0 0
170	12-830	11-317	11-70	19-0	4817	555			8	Part carted and part folded	3 0 0
171	12-390	10-708	13-67	16-8	4030	453			8	Part carted and part folded	3 0 0
172	9-839	8-756	11-01	18-8	3687	482	9	Rail	7	Part carted and part folded	2 12 6
173	10-163	8-905	12-38	17-9	3571	438			7	Part carted and part folded	2 12 6
174	17-525	14-034	19-64	17-1	5395	697			10	Part carted and part folded	3 15 0
175	14-108	11-714	16-96	16-7	4382	439			8	Part carted and part folded	3 0 0
176	13-733	11-898	17-01	16-7	4264	392			8	Part carted and part folded	3 0 0
177	9-982	8-465	15-19	18-0	3413	282	‡	Rail Road	7 1/2	Folded	2 16 3
178	8-799	8-188	6-94	17-7	3246	318			6	Folded	2 5 0
179	9-058	8-329	8-05	18-5	3452	408	‡	Road	6	Ploughed in	1 15 0
180	11-473	9-733	14-91	17-6	3833	410	1 1/2	Rail	7 1/2	Ploughed in	2 1 3
181	9-659	8-929	7-55	17-7	3540	276	1 1/2	Rail	7	Folded	2 12 6
182	8-376	7-157	14-55	16-4	3629	233			5 1/2	Folded	2 1 3
183	7-960	6-778	14-35	16-3	2475	198			5	Folded	1 17 6
184	7-848	6-491	17-30	18-9	2748	256	‡	Road	6	Part carted and part ploughed in	2 2 0
185	7-041	6-175	12-32	18-2	2517	303	‡	Rail Road	5	Folded	1 17 6
186	13-811	12-653	8-38	19-0	5385	399	1	Rail	10	Carted off	3 15 0
187	9-727	9-000	7-48	19-9	4012	571	‡	Road	5	Part folded, part carted and part ploughed in.	1 11 2
188	11-792	9-901	16-04	18-7	4147	379	2 1/2	Rail	7	Ploughed in	1 18 6
189	10-770	8-083	24-94	18-4	3331	294	‡	Rail	7	Folded	2 12 6
190	8-706	8-029	7-77	18-7	3363	307	2 1/2	Rail	6	Ploughed in	1 13 0
191	7-907	7-237	8-60	17-4	2817	261	5 1/2	Rail	6	Part carted and part folded	2 5 0

* Weighted average of individual consignments.

† From field to roadside, wharf or rail station.

‡ From roadside, wharf or rail station to factory: where more than one destination data are given in same order as factories in Appendix A.

APPENDIX D.

Organic Manures and the Manurial Equivalents of Artificials per Acre applied direct to the 1927 Sugar Beet Crop.

Field Num- ber.	Dung. Loads	Fish Guts. Cwt.	Nitro- gen. lb.	Phos- phoric Acid. lb.	Pot- ash. lb.	Lime. Cwt.	Field Num- ber.	Dung. Loads	Fish Guts. Cwt.	Nitro- gen. lb.	Phos- phoric Acid. lb.	Pot- ash. lb.	Lime. Cwt.	Field Num- ber.	Dung. Loads	Fish Guts. Cwt.	Nitro- gen. lb.	Phos- phoric Acid. lb.	Pot- ash. lb.	Lt Oz
1	—	—	24	67	79	—	66	—	—	63	74	62	—	133	—	—	—	—	—	—
2	—	—	40	47	56	—	67	4-8	—	19	31	32	—	134	—	—	—	—	63	—
3	—	—	57	52	58	—	68	—	—	35	71	65	—	135	—	—	—	—	63	—
4	10-9	—	41	47	56	—	69	4-0	—	90	61	40	—	136	1-0	—	—	—	63	—
5	11-2	—	60	50	59	—	70	15-6	—	47	63	—	—	137	0-4*	8	11	—	63	—
6	—	—	40	46	58	—	71	16-0	—	21	42	38	—	139	—	—	—	—	—	—
7	—	—	23	86	56	—	72	12-0	—	—	—	—	—	140	10-0	—	27	54	50	—
8	—	—	—	—	—	—	73	11-0	—	15	60	16	—	141	—	—	—	—	—	—
9	—	—	—	—	—	—	74	—	—	15	76	5	—	142	—	—	—	—	—	—
10	—	—	22	44	39	—	75	—	—	—	78	78	—	143	10-4	—	23	47	—	—
12	—	—	40	87	112	—	76	—	—	65	79	78	—	144	—	—	—	—	85	—
13	5-0	—	—	78	52	—	77	8-0	—	14	28	25	—	146	—	—	25	33	187	—
14	0-1	33½	16	—	—	—	78	9-6	—	17	49	123	—	147	—	—	36	43	219	—
15	11-2	—	16	—	78	—	82	—	—	19	89	36	—	148	—	—	24	49	45	—
16	—	37	18	—	82	—	83	10-0	—	46	60	22	—	149	10-0	—	89	67	12	—
17	18-1	—	48	98	89	—	84	—	—	21	20	13	—	150	5-0	—	—	—	44	—
18	14-0	—	59	98	89	—	85	—	—	59	78	224	—	151	—	—	41	43	44	—
21	10-0	—	21	47	50	—	86	—	—	58	63	112	—	152	—	—	—	—	—	—
22	—	—	30	38	54	—	87	5-0	—	24	63	39	—	153	—	—	—	—	—	—
23	—	—	61	90	134	—	88	—	—	15	27	29	—	154	—	—	75	98	89	—
24	5-7	—	55	81	61	—	89	12-0	—	2	141	52	—	155	6-7	—	24	45	103	—
25	2-2	—	80	102	95	—	90	10-8	—	24	49	45	37½	156	15-7	10½	16	—	—	—
26	12-0	—	70	49	45	—	91	10-0	—	44	31	107	20	158	—	—	13	26	30	—
27	—	—	70	49	45	—	92	8-8	—	46	94	94	20	159	5-9	—	21	46	140	—
28	—	27½	55	71	65	—	93	—	—	23	35	40	—	160	14-0	—	30	65	80	—
29	—	—	48	31	47	—	94	12-7	—	29	59	54	3½	161	—	—	40	28	142	—
30	—	—	55	32	49	—	95	10-0	—	11	21	19	—	162	12-0	—	50	69	125	—
31	10-0	—	64	12	23	4½	96	—	—	—	—	—	—	163	—	—	35	51	129	—
32	11-7	—	15	29	27	—	97	8-0	5	26	15	30	—	164	—	—	115	47	—	—
33	—	—	23	56	—	—	98	—	—	35	63	112	—	165	—	—	78	47	52	—
34	18-6	—	66	22	20	—	99	—	—	19	39	36	—	167	—	—	86	36	49	—
35	10-0	—	66	113	103	23½	100	—	—	50	115	—	—	168	17-1	—	69	32	53	—
36	12-0	—	56	78	72	—	101	—	—	50	115	—	—	169	13-7	—	—	—	—	—
37	9-6	—	51	55	90	—	102	12-0	—	50	115	—	—	171	6-8	—	—	—	—	—
38	—	—	7	13	14	—	104	—	—	69	120	—	—	173	4-3	—	59	—	101	—
39	7-4	—	21	73	43	—	105	—	—	—	63	—	—	173	—	—	33	63	28	—
40	12-0	—	43	59	54	—	106	—	—	11	23	20	—	174	—	—	75	60	—	—
41	7-0	—	35	65	65	—	107	—	—	19	39	98	—	175	—	—	47	29	91	—
42	—	—	32	59	64	—	109	—	—	22	45	112	—	176	—	—	49	28	92	—
43	—	—	47	88	81	—	110	—	—	19	39	99	—	178	—	—	5	31	82	—
44	—	—	82	164	162	20	111	—	—	19	42	98	—	179	—	—	4	30	81	—
45	10-0	—	27	47	51	—	112	—	—	19	39	98	—	180	—	—	4	31	80	—
46	—	—	28	56	51	—	113	—	—	19	42	98	—	181	8-0*	—	15	62	65	—
47	—	—	41	83	76	—	114	—	—	19	39	123	—	182	8-0	—	28	62	61	—
48	—	—	48	69	61	—	115	—	—	19	39	98	—	184	—	—	73	110	112	—
49	9-0	2	26	—	—	—	116	14-0	—	31	78	—	—	185	—	—	4	110	112	—
50	8-0	1½	23	—	—	—	117	—	—	31	79	—	—	186	—	—	4	110	112	—
51	—	—	47	51	117	—	118	—	—	31	79	—	—	187	—	—	4	110	112	—
52	—	—	7	—	—	—	119	10-0	—	31	78	—	—	188	12-0	—	35	—	78	—
53	7-0	—	29	59	54	—	120	—	—	31	79	—	—	189	12-0	—	25	—	94	—
55	10-0	—	—	—	33	—	121	4-8	—	31	79	20	—	190	—	—	12	60	21	—
56	10-9	—	16	—	45	—	122	—	—	31	79	—	—	191	—	—	—	69	—	—
57	3-6	—	41	—	86	—	123	7-0	—	35	88	—	—	192	—	—	80	172	35	—
58	14-0	—	35	56	56	—	124	—	—	30	75	—	—	193	—	—	71	82	75	—
59	—	—	44	34	77	—	125	9-4*	—	29	60	—	—	194	—	—	81	132	85	—
60	10-0	—	23	47	43	—	126	—	—	—	89	—	—	195	—	—	52	166	90	—
61	10-0	—	59	68	65	—	127	—	—	45	91	84	—	196	14-7	—	35	51	47	—
62	—	—	61	77	80	—	129	6-0	20	52	35	94	—	197	10-0	—	10	20	18	—
63	5-3	—	43	89	46	—	130	12-5	—	46	31	—	—	198	8-0	—	10	20	18	—
64	—	—	87	94	81	—	131	—	—	58	63	56	—	199	—	—	46	—	—	—
65	—	—	85	90	65	—	132	10-0	—	54	35	88	—	—	—	—	—	—	—	—

* Treated with sewage.

Appendix D—continued.

Organic Manures and the Manurial Equivalents of Artificials per Acre applied direct to the 1928 Sugar Beet Crop.

Field Number.	Dung. Loads	Fish Guts. Owt.	Nitrogen. lb.	Phosphoric Acid. lb.	Potash. lb.	Lime. Cwt.	Field Number.	Dung. Loads	Fish Guts. Owt.	Nitrogen. lb.	Phosphoric Acid. lb.	Potash. lb.	Lime. Cwt.	Field Number.	Dung. Loads	Fish Guts. Owt.	Nitrogen. lb.	Phosphoric Acid. lb.	Potash. lb.	Lime. Cwt.
1	—	—	37	48	51	—	62	14-0	—	31	101	—	—	120	16-0	—	—	79	—	—
2	—	—	40	48	56	—	63	—	—	—	63	—	—	121	—	—	39	49	45	10
3	—	—	38	44	52	—	64	11-0	—	5	34	79	—	122	—	—	45	49	45	10
4	—	—	40	46	55	—	65	9-0	—	5	25	79	—	123	—	—	39	49	45	10
5	—	—	40	47	56	—	66	2-5	—	4	34	79	—	124	—	—	39	49	45	10
6	—	—	23	68	84	—	67	13-0	—	50	65	60	—	125	—	—	39	49	45	10
7	11-7	—	23	—	—	—	68	12-0	—	50	65	69	—	126	—	—	24	49	45	—
8	—	—	23	91	33	—	69	?	?	?	?	?	?	127	—	4	64	—	—	—
9	—	—	52	69	140	—	70	8-0	11	—	105	—	—	128	8-0	—	—	94	—	—
10	—	—	24	49	45	—	71	7-8	—	42	34	31	—	129	8-0	—	—	33	—	—
11	10-0	—	10	20	19	—	72	—	—	—	—	—	—	130	—	—	—	89	67	—
12	—	25	22	45	48	—	73	10-0	—	45	39	36	—	131	—	—	—	89	67	—
13	—	—	—	—	—	—	74	10-0	—	44	36	32	—	132	8-0	—	15	10	2	—
14	9-2	—	—	—	—	—	75	—	—	—	—	—	—	133	—	—	57	76	74	10
15	7-4	13½	—	—	—	—	76	—	—	—	—	—	—	134	20-0	—	58	76	45	—
16	8-1	—	3	5	58	—	77	8-7	—	20	41	—	—	135	17-0	—	74	129	80	—
17	—	—	68	68	63	—	78	—	—	25	50	124	—	136	—	—	59	81	50	—
18	12-0	—	52	68	63	—	79	12-0	—	15	—	—	—	137	13-0	—	24	—	63	—
19	6-0	—	61	50	107	—	80	7-3	—	—	—	—	—	138	12-0	—	16	—	—	—
20	16-7	—	37	31	67	15	81	14-0	—	24	49	45	—	139	7-6	—	41	23	67	—
21	—	—	36	31	47	—	82	12-0	—	—	—	—	—	140	5-3	—	—	28	23½	—
22	—	—	37	31	47	—	83	15-9	—	19	39	146	—	141	10-0	—	—	63	—	—
23	—	—	36	31	47	—	84	3-6	21½	8	29	168	—	142	10-0	—	68	126	78	—
24	—	—	37	59	45	20½	85	—	—	8	17	121	—	143	7-0	—	62	34	52	—
25	—	—	61	88	80	23½	86	6-0	—	65	77	104	—	144	4-2	10	22	—	45	—
26	—	—	68	63	108	—	87	10-0	—	80	—	63	—	145	—	—	—	—	—	—
27	12-0	—	55	76	70	10	88	10-7	—	7	45	28	—	146	9-2	—	46	44	39	—
28	6-0	—	18	57	45	—	89	10-9	—	8	17	15	—	147	10-0	—	46	44	39	—
29	—	—	48	98	89	—	90	11-0	—	46	31	31	—	148	10-0	—	37	33	34	—
30	—	—	50	61	68	12½	91	—	—	72	50	—	—	149	—	—	—	73	—	—
31	—	—	43	87	131	4½	92	—	—	72	56	—	12½	150	10-0	—	—	114	—	—
32	10-0	—	68	78	72	—	93	19-0	—	31	28	32	—	151	12-5	—	40	33	24	—
33	—	—	23	60	—	—	94	—	—	24	49	45	—	152	—	—	49	51	78	—
34	10-0	—	23	63	—	—	95A	—	—	40	31	56	—	153	—	—	52	62	—	—
35	—	—	69	72	112	—	96B	12-0	—	40	31	56	—	154	—	—	66	98	89	—
36	10-0	—	58	52	47	—	97	16-0	—	40	50	96	—	155	12-5	—	55	82	75	—
37	—	—	55	65	60	—	98	16-0	—	33	47	84	—	156	—	—	46	78	20	—
38	16-0	—	108	42	38	11½	99	16-0	—	35	47	84	—	157	—	—	23	63	78	—
39	—	—	28	47	—	—	100	—	—	16	33	82	—	158	15-0	—	16	34	75	—
40	—	—	13	71	—	—	101	—	—	16	33	68	—	159	—	—	27	51	55	—
41	—	—	—	—	—	—	102	12-0	—	—	—	—	—	160	15-0	—	17	20	29	—
42	19-0	—	67	75	44	—	103	12-6	—	47	59	54	—	161	—	35	—	—	—	—
43	—	—	12	—	—	—	104	7-5	—	—	—	94	—	162	1-7	—	—	78	17	—
44	—	—	12	—	—	—	105	6-0	—	18	36	34	—	163	14-9	14½	14	28	26	—
45	—	—	10	—	—	—	106	—	—	12	34	140	—	164	15-0	13½	11	26	22	—
46	—	—	10	—	—	—	107	—	—	39	31	36	—	165	14-5	14½	14	29	107	—
47	—	—	12	—	—	—	108	—	—	52	48	94	—	166	15-5	15	13	26	98	—
48	—	—	52	—	—	—	109	10-0	—	21	31	28	—	167	15-0	—	69	94	168	—
49	—	—	63	65	60	—	110	12-0	—	24	49	45	—	168	—	—	67	—	—	—
50	—	—	72	98	90	—	111	—	—	82	71	101	—	169	18-8	—	46	31	78	—
51	8-0	—	39	78	72	—	112	—	—	66	54	90	—	170	18-8	—	36	31	78	—
52	—	—	36	79	66	20	113	?	?	?	?	?	?	171	—	—	23	31	—	—
53	9-7	—	43	63	112	25	114	?	?	?	?	?	?	172	8-0	—	47	35	30	—
54	—	—	30	12	30	—	115	?	?	?	?	?	?	173	8-0	—	57	52	48	—
55	10-8	—	12	24	22	—	116	?	?	?	?	?	?	174	—	—	38	56	51	—
56	10-0	—	10	19	18	—	117	?	?	?	?	?	?	175	—	—	—	—	—	—
57	10-0	—	—	—	—	—	118	11-8	—	19	44	81	21	176	—	—	13	23	27	—
58	15-0	—	24	49	45	—	119	—	—	—	94	84	—	—	—	—	—	—	—	—

* Treated with sewage.

Appendix D—continued.

Organic Manures and the Manurial Equivalents of Artificials per Acre applied direct to the 1929 Sugar Beet Crop.

Field Number.	Dung. Loads	Fish Guts. Cwt.	Nitro-gen. lb.	Phos-phoric Acid. lb.	Pot-ash. lb.	Lime. Cwt.	Field Number.	Dung. Loads	Fish Guts. Cwt.	Nitro-gen. lb.	Phos-phoric Acid. lb.	Pot-ash. lb.	Lime. Cwt.	Field Number.	Dung. Loads	Fish Guts. Cwt.	Nitro-gen. lb.	Phos-phoric Acid. lb.	Pot-ash. lb.	Lime. Cwt.
1	—	—	33	—	—	—	65	—	—	—	—	—	—	129	10	—	—	—	—	—
2	—	—	39	45	—	—	66	10-6	19	—	—	—	—	130	—	—	—	63	—	—
3	—	—	40	47	—	—	67	10	17½	—	—	—	—	131	8	—	—	75	—	—
4	5-7	—	32	49	—	—	68	9-8	—	23	47	—	—	132	8	—	—	63	—	—
5	—	—	40	47	—	—	69	11-4	—	17	33	113	—	133	—	—	—	69	—	—
6	—	—	19	118	78	—	70	10	—	48	98	89	—	134	4-9	—	—	72	—	—
7	12-4	—	—	—	—	—	71	—	—	2	25	63	—	135	9-6	—	—	72	33	30
8	—	—	45	52	48	—	72	10	—	—	—	—	—	136	—	—	—	54	47	78
9	6-5	—	17	—	—	—	73	14	—	35	39	78	—	137	—	—	—	48	47	75
10	20	—	20	—	—	—	74	—	—	35	—	—	—	138	—	—	—	35	59	116
11	11-2	—	16	33	30	8½	75	—	—	17	—	—	—	139	16	—	8	50	90	—
12	—	—	15	31	36	10½	76	14	—	—	—	—	—	140	13-2	—	—	36	147	67
13	—	—	19	39	45	9	77	12	—	—	—	—	—	141	—	—	—	46	—	—
14	—	—	46	55	50	9½	78	14-9	—	—	61	—	—	142	13-3	—	—	24	49	45
15	3-5	—	23	46	42	10½	79	8-6	—	—	69	—	—	143	—	—	—	17	—	—
16	6-3	—	24	48	49	—	80	8-8*	—	34	69	63	—	144	—	—	—	31	63	116
17	4-7	—	44	49	45	—	81	8-8	—	34	69	63	—	145	—	—	—	37	63	67
18	10	—	51	69	63	—	82	—	—	60	47	—	—	146	10-9	—	—	25	46	88
19	12	—	41	68	63	—	83	—	—	8	101	26	—	147	12	—	—	46	45	63
20	12-4	—	67	64	75	—	84	—	—	34	116	62	—	148	10	—	—	33	44	59
21	—	—	57	59	80	—	85	5	—	17	35	35	—	149	10	—	—	72	—	—
22	—	—	51	52	67	6½	86	1-9	—	29	69	54	—	150	10	—	—	72	—	—
23	—	—	23	47	—	—	87	2-4	—	11	21	24	—	151	5-4	30	18	15	14	—
24	—	—	20	40	129	—	88	5-2	—	—	—	—	—	152	10	—	—	14	94	—
25	12	—	78	78	—	—	89	4-2	—	8	43	38	—	153	10-1	—	—	16	78	—
26	—	—	70	124	—	—	90	—	—	14	74	66	—	154	—	—	—	53	47	84
27	—	—	26	47	—	—	91	—	—	14	85	66	—	155	—	—	—	46	31	78
28	10-5	—	66	103	94	—	92	12	—	55	47	84	—	156	12	—	—	46	31	78
29	5-1	—	20	39	36	—	93	—	—	56	47	84	—	157	9-6	—	—	46	31	78
30	8	—	19	39	36	—	94	—	—	12	25	22	—	158	3-3	—	—	—	—	—
31	—	20	45	—	—	—	95	13	—	36	31	31	—	159	12	—	—	51	54	50
32	—	—	58	47	130	—	96	5	—	35	31	31	—	160	10	—	—	46	49	45
33	—	—	69	47	84	—	97	7	—	40	54	90	—	161	4-2	—	—	19	39	36
34	—	—	50	47	84	—	98	12	—	24	50	58	—	162	—	—	—	41	50	75
35	2	—	83	37	34	9½	99	—	—	7	14	48	—	163	—	—	—	14	32	28
36	10-4	—	19	39	36	—	100	12	—	5	10	12	—	164	—	—	—	21	7	9
37	10	—	15	29	27	—	101	—	—	7	13	45	—	165	—	—	—	58	38	47
38	—	—	—	—	—	—	102	10	—	37	39	30	—	166	9-1	—	—	—	34	9
39	6-6	—	—	61	60	—	103	—	—	56	25	30	—	167	—	36	28	124	—	—
40	—	—	—	—	—	—	104	—	—	42	49	45	—	168	—	—	—	22	57	9
41	—	—	17	—	—	—	105	10	—	—	—	—	—	169	4-7	—	—	38	52	70
42	—	—	17	—	—	—	106	10	—	23	24	42	—	170	13-4	—	—	60	63	84
43	—	—	17	—	—	—	107	—	—	45	62	140	—	171	8-4	—	—	64	83	84
44	—	—	17	—	—	—	108	—	—	84	81	224	16	172	15-6	—	—	65	63	84
45	12	—	17	—	16	—	109	9-3	—	—	—	70	—	173	9	—	—	57	52	70
46	—	—	50	65	80	—	110	—	—	66	49	45	—	174	25-7	—	—	74	52	70
47	—	—	56	78	72	—	111	—	—	42	49	45	—	175	—	—	—	57	52	70
48	—	—	60	78	72	—	112	—	—	42	49	45	—	176	—	—	—	57	52	70
49	—	—	66	98	89	—	113	—	—	42	49	45	—	177	—	—	—	54	—	—
50	8-8	—	—	89	105	—	114	—	—	42	49	45	—	178	12	—	—	62	31	110
51	11-2	—	89	31	112	—	115	—	9½	61	6	7	—	179	—	25	—	57	31	110
52	—	—	23	45	63	—	116	—	—	69	—	—	—	180	12	—	—	62	31	110
53	12	—	23	16	—	—	117	1-9	—	—	61	—	—	181	12	—	—	61	31	111
54	10	—	10	20	18	—	118	14	—	69	54	67	—	182	—	—	—	40	31	110
55	12	—	—	—	—	—	119	—	—	—	—	—	24	183	—	—	—	63	32	110
56	6-2	—	18	37	34	—	120	12	—	55	48	48	—	184	10	—	—	55	—	—
57	12	—	36	23	94	—	121	10	—	40	63	63	—	185	6-6	—	—	8	—	—
58	—	—	21	45	51	—	122	12	—	48	75	75	—	186	9-6	—	—	49	57	59
59	—	—	22	46	52	—	123	—	7½	33	30	65	—	187	2-9	—	—	35	79	64
60	—	—	22	46	51	—	124	10	—	33	30	96	—	188	—	—	—	62	42	144
61	—	—	22	40	51	—	125	—	—	—	31	—	—	189	—	—	—	36	57	68
62	10	—	46	—	130	—	126	10	—	—	—	—	—	190	10	—	—	35	31	47
63	10	—	—	—	—	—	127	10	—	—	—	—	—	191	9-2	—	—	19	38	35
64	—	—	—	—	—	—	128	—	—	4	8	9	—	—	—	—	—	—	—	—

* Treated with sewage.

APPENDIX E.

TABLE I.

Average Yields, Costs and Returns per Acre in 1927 arranged in Soil Groups.

(The yield, cost and return figures shown below are simple averages of the per acre results obtained in each field. As the cost data from some of the fields are incomplete, the number of items concerned with each individual cost average is shown.)

Soil group:—	Light to medium.		Medium to heavy.		Fen, warp and silt.		Very light.		Sewage farms.		Over-all.	
Total acreage	1076		424		516		221		66		2308	
Average size of field	12.5 acres		10.3 acres		13.6 acres		18.4 acres		13.2 acres		13.6 acres	
Unwashed yield per acre	9.430 tons		9.261 tons		10.411 tons		5.171 tons		10.855 tons		9.351 tons	
Washed yield per acre	7.862 tons		7.282 tons		8.670 tons		4.439 tons		8.959 tons		7.711 tons	
Tare	16.33%		21.50%		16.41%		14.62%		17.15%		17.31%	
Effective sugar content	16.5%		16.5%		14.8%		16.5%		14.1%		16.1%	
Sugar per acre	2914 lb.		2719 lb.		2895 lb.		1654 lb.		2832 lb.		2780 lb.	
Lb. sugar per £ labour	276		224		270		191		282		260	
Tons per acre	9.0 tons		8.3 tons		10.9 tons		4.4 tons		9.0 tons		8.9 tons	
Costs and returns:—	Per acre.		Per acre.		Per acre.		Per acre.		Per acre.		Per acre.	
	£ s. d.	No.	£ s. d.	No.	£ s. d.	No.	£ s. d.	No.	£ s. d.	No.	£ s. d.	No.
Preliminary cultivations	2 14 2½	86	3 1 1½	41	2 6 11	38	2 0 1½	12	2 12 0½	5	2 18 5	182
Seed, drilling and after-cultivations ..	3 13 9½	84	3 19 0½	39	3 16 4½	38	3 14 7½	12	3 11 10	5	3 15 6	178
Total manures	5 9 11½	86	5 3 4½	41	2 19 11½	38	3 10 5½	12	2 5 8½	5	4 13 8	182
Total harvesting	4 17 6	83	5 15 7½	35	5 1 3½	37	3 9 4½	12	4 9 5½	5	4 19 9½	172
Total overheads	2 10 4½	86	2 9 10½	41	3 15 2½	38	1 17 0½	12	2 11 4½	5	2 14 7	182
Farm cash cost	£19 4 5½	83	£20 10 9½	35	£18 1 2½	37	£14 11 7½	12	£15 10 5½	5	£18 16 2½	172
Transport and growers' representative ..	2 5 11	83	2 12 0½	35	2 0 9½	37	1 13 5	12	2 5 2½	5	2 6 2	172
Total cash cost	£21 10 4½	83	£23 2 10	35	£20 2 0½	37	£16 5 0½	12	£17 16 8	5	£21 1 4½	172
Gross cash receipts	22 3 3½	83	20 14 0½	35	22 15 0	37	12 12 3½	12	22 12 7	5	21 6 9½	172
Cash {Profit	12 11	87	—	—	2 12 11½	37	—	—	4 16 11	5	5 8½	172
Loss	—	—	2 8 9½	35	—	—	3 12 9½	12	—	—	—	—
Residual value bt. fwd.	16 0½	83	13 6½	35	1 0 4	37	1 6 3	12	18 0	5	17 2½	172
Gross cost	£22 6 5	83	£23 16 4½	35	£21 2 4½	37	£17 11 8½	12	£18 13 8	5	£21 18 6½	172
Total credits	5 4 4	83	4 19 5	35	4 8 6	37	2 15 3½	12	4 1 3	5	4 16 10	172
Net cost	£17 2 1	83	£18 16 11½	35	£16 18 10½	37	£14 16 0½	12	£14 12 6	5	£17 2 8½	172
Net {Profit	£5 1 2½	83	£1 17 1½	35	£6 1 1½	37	—	—	£8 0 1	5	£4 4 1	172
Loss	—	—	—	—	—	—	£2 3 9	12	—	—	—	—
Distribution of cash profits (+) and cash losses (—)	+48 (58%) -35 (42%)		+12 (34%) -23 (66%)		+28 (78%) -9 (24%)		+3 (17%) -10 (83%)		+4 (80%) -1 (20%)		+34 (55%) -78 (46%)	
Distribution of net profits (+) and net losses (—)	+72 (87%) -11 (13%)		+23 (66%) -12 (34%)		+36 (97%) -1 (3%)		+3 (25%) -9 (75%)		+4 (80%) -1 (20%)		+138 (80%) -34 (20%)	
Net Cost	£3 10 10		£3 7 1		£3 6 7		£3 13 6		£2 12 2		£3 12 4	
Standard deviation	7 9		11 4		10 11		1 1 2		1 3 3		5 6	
Standard error of mean												

Appendix E—continued.

TABLE II.

Average Yields, Costs and Returns per Acre in 1928 arranged in Soil Groups.

(The yield, cost and return figures shown below are simple averages of the per acre results obtained in each field. As the cost data from some of the fields are incomplete, the number of items concerned with each individual cost average is shown.)

Soil group:—	Light to medium.		Medium to heavy.		Pen, warp and silt.		Very light.		Sewage farms.		Over-all.	
Total acreage	915.25		231		438.25		347		105		2036.5	
Average size of field	10.2 acres		9.2 acres		14.1 acres		23.1 acres		8.8 acres		11.8 acres	
Unwashed yield per acre	9.988 tons		10.132 tons		12.432 tons		8.115 tons		9.489 tons		10.185 tons	
Washed yield per acre	8.904 tons		8.853 tons		11.077 tons		6.931 tons		8.681 tons		9.035 tons	
Tare	10.98%		12.22%		11.03%		14.08%		9.65%		11.35%	
Effective sugar content	18.3%		18.5%		16.9%		17.8%		16.4%		17.9%	
Sugar per acre	3645 lb.		3682 lb.		4219 lb.		2759 lb.		3145 lb.		3624 lb.	
Lb. sugar per £ labour	346		324		387		293		318		343	
Tops per acre	7.4 tons		8.0 tons		10.0 tons		7.2 tons		10.0 tons		8.1 tons	
Costs and returns:—	Per acre.		Per acre.		Per acre.		Per acre.		Per acre.		Per acre.	
	£ s. d.	No.	£ s. d.	No.	£ s. d.	No.	£ s. d.	No.	£ s. d.	No.	£ s. d.	No.
Preliminary cultivations	2 18 2½	90	2 15 6½	25	2 10 3½	31	2 11 5½	15	2 17 8½	12	2 15 9½	172
Seed, drilling and after-cultivations	3 16 6	90	3 17 0½	24	3 16 0½	31	3 10 4½	15	3 11 7	12	3 15 8½	167
Total manures	5 12 8½	90	7 6 4	24	3 9 5½	26	3 13 9½	15	3 2 4½	12	5 3 8½	167
Total harvesting	4 12 0½	90	5 1 7½	24	4 18 11½	26	3 13 9	15	4 0 6½	12	4 12 0½	167
Total overheads	2 10 5	90	2 10 4½	24	3 15 10½	26	2 1 10½	15	2 9 11½	12	2 13 7	167
Farm cash cost	£19 9 11½	90	£21 11 5½	24	£18 14 5½	26	£15 11 3	15	£16 2 1½	12	£10 1 6½	167
Transport and growers' representative	2 7 11½	90	2 4 9½	24	2 10 0½	26	2 2 11½	15	2 0 2½	12	2 6 10	167
Total cash cost	£21 17 11	90	£23 16 3½	24	£21 4 6	26	£17 14 2½	15	£18 2 4½	12	£21 8 4½	167
Gross cash receipts	24 8 8½	90	24 16 7½	24	27 17 6½	26	18 9 1½	15	20 17 7	12	24 4 8½	167
Cash { Profit	2 10 9½	90	1 0 4½	24	6 13 0½	26	14 11½	15	2 15 2½	12	2 16 4	167
Loss	—	—	—	—	—	—	—	—	—	—	—	—
Residual values bt. fwd.	16 9	90	16 0½	24	17 3½	26	1 2 8½	15	11 0	12	16 9½	167
Gross cost	£22 14 8	90	£24 12 4	24	£22 1 9½	26	£18 16 5½	15	£18 13 4½	12	£22 5 2½	167
Total credits	5 1 5	90	6 1 5½	24	4 12 11½	26	4 3 11½	15	4 5 0½	12	5 0 3	167
Net cost	£17 13 3	90	£18 10 10½	24	£17 8 9½	26	£14 12 6	15	£14 8 4½	12	£17 4 11½	167
Net { Profit	£6 15 5½	90	£6 5 9	24	£10 8 9	26	£3 16 7½	15	£6 9 2½	12	£6 19 9½	167
Loss	—	—	—	—	—	—	—	—	—	—	—	—
Distribution of cash profits (+) and cash losses (—)	+62 (88%) -28 (31%)		+14 (58%) -10 (42%)		+25 (96%) -1 (4%)		+8 (53%) -7 (47%)		+9 (75%) -3 (25%)		+118 (71%) -49 (29%)	
Distribution of net profits (+) and net losses (—)	+76 (84%) -14 (16%)		+21 (88%) -8 (12%)		+25 (96%) -1 (4%)		+13 (87%) -2 (13%)		+11 (92%) -1 (8%)		+146 (87%) -21 (13%)	
NET COST.												
Standard deviation	£3 14 4		£3 5 4		£3 10 5		£3 1 2		£2 9 3		£3 13 2	
Standard error of mean	7 10		13 4		13 10		10 8		14 3		5 8	

TABLE III.

Average Yields, Costs and Returns per Acre in 1929 arranged in Soil Groups.

(The yield, cost and return figures shown below are simple averages of the per acre results obtained in each field.)

Soil group:—*	Light to medium.		Medium to heavy.		Pen, warp and silt.		Very light.		Sewage farms.		Over-all.	
Total acreage*	1068.5		423		423		723.5		112		2750	
Average size of field	11.7 acres		11.8 acres		13.6 acres		31.6 acres		11.2 acres		14.4 acres	
Unwashed yield per acre†	10.341 tons		10.837 tons		13.618 tons		8.546 tons		9.650 tons		10.714 tons	
Washed yield per acre†	9.010 tons		9.376 tons		12.163 tons		7.459 tons		8.698 tons		9.386 tons	
Tar†	12.51%		12.83%		10.36%		12.44%		9.68%		12.06%	
Effective sugar content†	18.1%		18.5%		17.2%		17.6%		16.4%		17.9%	
Sugar per acre†	8648 lb.		8869 lb.		4656 lb.		2956 lb.		3178 lb.		3740 lb.	
Lb. sugar per £ labour†	376		371		501		341		364		390	
Tons per acre†	6.7 tons		7.4 tons		9.9 tons		5.7 tons		8.7 tons		7.8 tons	
Costs and returns:—												
	Per acre		Per acre.		Per acre.		Per acre.		Per acre.		Per acre.	
	£ s. d.	No.	£ s. d.	No.	£ s. d.	No.	£ s. d.	No.	£ s. d.	No.	£ s. d.	No.
Preliminary cultivations	2 9 7½	91	2 6 11	36	1 19 8½	31	2 0 8½	23	2 6 3½	10	2 6 1½	191
Seed, drilling and after-cultivations	3 13 6½	91	4 1 4½	36	3 4 2½	31	3 6 9½	23	3 0 6½	10	3 12 0	191
Total manures	4 13 5½	91	0 1 3½	36	2 15 10½	31	5 2 4½	23	3 6 8½	10	4 12 3½	191
Total harvesting	4 7 10½	91	4 18 3	36	5 0 9	31	4 1 5½	23	4 3 10½	10	4 10 11½	191
Total overheads	2 7 6½	91	2 7 2½	36	3 12 7	31	1 17 11½	23	2 8 3	10	2 10 4½	191
Farm cash cost	£17 11 11½	91	19 15 0½	36	£16 12 11½	31	£16 9 3½	23	£15 4 7½	10	£17 11 9	191
Transport and growers' representative	2 7 2½	91	2 11 2½	36	2 17 10½	31	2 7 6½	23	1 19 3	10	2 9 4	191
Total cash cost	£19 19 2	91	£22 6 3	36	£19 10 10½	31	£18 16 10½	23	£17 8 10½	10	£20 1 1	191
Gross cash receipts	24 8 3	91	26 1 4½	36	31 1 2½	31	19 15 5½	23	21 2 5½	10	25 1 5½	191
Cash {Profit	4 9 1	91	3 15 1½	36	11 10 4½	31	18 6½	23	3 18 7	10	5 0 4½	191
Loss	—	—	—	—	—	—	—	—	—	—	—	—
Residual values bt. fwd.	1 2 9½	91	17 7½	36	18 0½	31	1 0 9½	23	1 1 5½	10	1 0 8½	191
Gross cost	£21 1 11½	91	£23 8 10½	36	£20 8 10½	31	£19 17 8½	23	£18 5 4	10	£21 1 9½	191
Total credits	4 11 10½	91	5 10 6½	36	4 8 0	31	4 4 0	23	3 19 0	10	4 13 1½	191
Net cost	£16 10 0½	91	£17 13 5½	36	£16 0 10½	31	£15 13 8½	23	£14 6 4	10	£16 8 8½	191
Net {Profit	£7 18 2½	91	£8 7 11½	36	£15 0 4	31	£4 1 9	23	£6 16 1½	10	£8 12 9½	191
Loss	—	—	—	—	—	—	—	—	—	—	—	—
Distribution of cash profits (+) and cash losses (—)	+67 (74%) -24 (26%)		+20 (72%) -10 (28%)		+30 (97%) -1 (3%)		+12 (52%) -11 (48%)		+7 (70%) -8 (30%)		+142 (74%) -49 (26%)	
Distribution of net profits (+) and net losses (—)	+83 (91%) -8 (9%)		+35 (97%) -1 (3%)		+30 (97%) -1 (3%)		+21 (91%) -2 (9%)		+9 (90%) -1 (10%)		+178 (93%) -13 (7%)	
Net Cost	£3 4 7		£3 14 5½		£3 8 8½		£2 9 2½		£2 12 2½		£3 3 3½	
Standard deviation	6 9½		9 1		12 3		10 3		16 6		4 7	
Standard error of mean	—		—		—		—		—		—	

* See Appendix B. † Simple averages of per acre results given in Appendix O.

TABLE IV.

Average Yields, Costs and Returns per Acre for Three Years 1927, 1928 and 1929,
combined and arranged in Soil Groups.

(The yield, cost and return figures shown below are simple averages of the three year soil groups. As the cost data from some fields are incomplete, the number of items concerned with each individual cost average is shown.)

Soil group:—	Light to medium.		Medium to heavy.		[Fen, warp and allt.		Very light		Sewage farms.		Over-all.	
Total acreage	3059.75		1078		1377.25		1291.5		283		7089.5	
Average size of field	11.5 acres		10.4 acres		13.8 acres		24.3 acres		11.1 acres		12.9 acres	
Unwashed yield per acre	9.920 tons		10.077 tons		12.154 tons		7.277 tons		9.998 tons		10.083 tons	
Washed yield per acre	8.592 tons		8.504 tons		10.638 tons		6.276 tons		8.746 tons		8.711 tons	
Tare	13.27%		15.52%		12.60%		13.71%		12.15%		13.57%	
Effective sugar content	17.6%		17.8%		16.3%		17.3%		15.6%		17.3%	
Sugar per acre	3402 lb.		3430 lb.		3923 lb.		2456 lb.		3060 lb.		3384 lb.	
Lb. sugar per £ labour	332		306		385		275		321		351	
Tops per acre	7.7 tons		7.9 tons		10.3 tons		5.8 tons		9.2 tons		8.1 tons	
Costs and returns:—	Per acre.		Per acre.		Per acre.		Per acre.		Per acre.		Per acre.	
	£ s. d.	No.	£ s. d.	No.	£ s. d.	No.	£ s. d.	No.	£ s. d.	No.	£ s. d.	No.
Preliminary cultivations	2 14 0	267	2 14 6½	102	2 5 7	100	2 4 1½	50	2 11 8	27	2 11 9½	546
Seed, drilling and after-cultivations	3 14 7½	265	3 19 3½	99	3 12 2½	100	3 10 7½	50	3 7 11½	27	3 14 4½	541
Total manures	5 5 4½	267	6 3 8	101	3 1 9	95	4 2 2½	50	2 18 3½	27	4 16 0½	540
Total harvesting	4 12 5½	264	5 5 2	95	5 0 4	94	3 14 10½	50	4 4 7½	27	4 14 3½	530
Total overheads	2 9 5½	267	2 9 1½	101	3 14 6½	95	1 18 11½	50	2 9 10½	27	2 12 10½	540
Farm cash cost	£18 15 5½	264	£20 12 5½	95	£17 16 2½	94	£15 10 8½	50	£15 12 4½	27	£18 9 10	530
Transport and growers' representative	2 7 0½	264	2 9 4½	95	2 9 6½	94	2 1 8½	50	2 1 7	27	2 7 1½	530
Total cash cost	£21 2 5½	264	£23 1 9½	95	£20 5 9½	94	£17 12 0½	50	£17 13 11½	27	£20 16 11½	530
Gross cash receipts	23 13 5	264	23 17 4½	95	27 4 7½	94	16 18 11½	50	21 10 10½	27	28 11 0	530
Cash {Profit	2 10 11½	264	16 7	95	6 18 9½	94	—	—	3 16 10½	27	2 14 0½	530
Loss	—	—	—	—	—	—	13 1½	50	—	—	—	—
Residual values bt. fwd.	18 6½	264	15 8½	95	18 6½	94	1 8 1½	50	16 9½	27	18 3	530
Gross cost	£22 1 0	264	£23 17 0½	95	£21 4 4½	94	£18 15 1½	50	£18 10 9½	27	£21 15 2½	530
Total credits	4 19 2½	264	5 10 5½	95	4 9 10	94	3 14 5	50	4 1 8½	27	4 16 4½	530
Net cost	£17 1 9½	264	£18 7 1	95	£16 14 6½	94	£15 0 8½	50	£14 9 0½	27	£16 18 9½	530
Net {Profit	£6 11 7½	264	£5 10 3½	95	£10 10 1	94	£1 18 2½	50	£7 1 9½	27	£8 12 2½	530
Loss	—	—	—	—	—	—	—	—	—	—	—	—
Distribution of cash profits (+) and cash losses (—)	+177 (67%) — 87 (33%)		+52 (55%) — 43 (45%)		+83 (88%) — 11 (12%)		+23 (44%) — 28 (56%)		+20 (74%) — 7 (26%)		+354 (67%) — 176 (33%)	
Distribution of net profits (+) and net losses (—)	+281 (87%) — 33 (13%)		+79 (83%) — 16 (17%)		+91 (97%) — 3 (3%)		+37 (74%) — 13 (26%)		+24 (89%) — 3 (11%)		+462 (87%) — 68 (13%)	
NET COST.												
Standard deviation	£3 11 3½		£3 8 3		£3 9 8½		£2 15 3½		£2 13 9		£3 10 8½	
Standard error of mean	4 4½		6 6		7 2½		7 9½		10 4		3 0½	

Appendix E—continued.

TABLE V.

Average Costs and Returns per Washed Ton in 1927 arranged in Soil Groups.

Soil Class:—	Light to Medium.		Medium to Heavy.		Fen, Warp and Silt.		Very Light.		Sewage Farms.		Over-all.	
	Per ton.	No.	Per ton.	No.	Per ton.	No.	Per ton.	No.	Per ton.	No.	Per ton.	No.
Costs and returns:—												
Preliminary cultivations	6/10½	86	8/3½	41	5/5	38	9/0½	13	5/9½	5	6/11	189
Seed, drilling, etc.	9/4½	84	10/10½	39	8/9½	38	16/9½	12	8/0½	5	9/9½	178
Total manures	13/11½	86	14/2½	41	6/11	38	15/10½	12	5/1½	5	13/1½	189
Total harvesting	13/4½	83	15/10½	35	11/8½	37	15/7½	12	9/11½	5	12/11½	172
Total overheads	6/5	86	6/10	41	8/8	38	8/4	12	5/8½	5	7/1	189
Farm cash cost	48/10½	83	56/5	35	41/8	37	65/8½	12	34/7½	5	48/9½	172
Transport and G.R.	5/10	83	7/1½	35	4/8½	37	7/6½	12	5/0½	5	5/10½	172
Total cash cost	54/8½	83	63/6½	35	46/4½	37	73/2½	12	39/8½	5	54/7½	172
Gross cash receipts	56/4½	83	56/10½	35	52/5½	37	56/10	12	60/6	5	55/4½	172
Cash { Profit	1/7½	83	—	—	6/1½	37	—	—	10/9½	5	0/8½	179
Loss	—	—	6/8½	35	—	—	16/4½	12	—	—	—	—
Residual values brought forward ..	2/0½	83	1/10½	35	2/4	37	5/11	12	2/-	5	2/2½	179
Gross cost	56/9½	83	65/5	35	49/8½	37	79/1½	12	41/8½	5	56/10½	172
Total credits	13/3½	83	13/7½	35	10/2½	37	12/6½	12	9/0½	5	12/5	172
Net cost	43/6	83	51/3½	35	38/6	37	66/8	12	32/7½	5	44/6½	172
Net { Profit	12/10½	83	5/1	35	13/11½	37	—	—	17/10½	5	10/10½	172
Loss	—	—	—	—	—	—	9/10	12	—	—	—	—

Appendix E—continued.

TABLE VI.

Average Costs and Returns per Washed Ton in 1928 arranged in Soil Groups.

Soil Class:—	Light to Medium.		Medium to Heavy.		Fen, Warp and Silt.		Very light.		Sewage Farms.		Over-all.	
	Per ton.	No.	Per ton.	No.	Per ton.	No.	Per ton.	No.	Per ton.	No.	Per ton.	No.
Costs and returns:—												
Preliminary cultivations	6/6½	90	6/8	25	4/6½	31	7/5	15	6/8½	12	6/3½	178
Seed, drilling, etc.	8/7½	90	8/9	24	6/10½	31	10/2	15	8/4½	12	8/4½	179
Total manures	12/8	90	16/6½	24	6/8½	26	10/7½	15	7/3½	12	11/3½	167
Total harvesting	10/4	90	11/5½	24	8/11½	26	10/7½	15	9/4	12	10/3½	167
Total overheads	5/8	90	5/8½	24	6/10½	26	6/0½	15	5/9½	12	5/11	167
Farm cash cost	43/9½	90	48/9	24	33/9½	26	44/10½	15	37/6½	12	42/3	167
Transport and G.R.	5/4½	90	5/0½	24	4/6½	26	6/2½	15	4/8½	12	5/2	167
Total cash cost	49/2½	90	53/9½	24	38/3½	26	51/1½	15	42/5	12	47/5	167
Gross cash receipts	54/10½	90	56/1½	24	50/4	26	53/3½	15	48/8	12	53/7½	167
Cash { Profit	5/8½	90	2/3½	24	12/0½	26	2/2	15	6/5	12	6/2½	167
Loss	—	—	—	—	—	—	—	—	—	—	—	—
Residual values brought forward ..	1/10½	90	1/9½	24	1/6½	26	3/2½	15	1/3½	12	1/10½	167
Gross cost	51/0½	90	55/7½	24	39/10½	26	54/3½	15	43/6½	12	49/3½	167
Total credits	11/4½	90	13/8½	24	8/4½	26	12/1½	15	9/11	12	11/1	167
Net cost	39/8½	90	41/10½	24	31/6	26	42/2½	15	33/7½	12	38/2½	167
Net { Profit	15/2½	90	14/2½	24	18/10	26	11/1	15	16/0½	12	15/8½	167
Loss	—	—	—	—	—	—	—	—	—	—	—	—

**Average Costs and Returns per Washed Ton in 1929
arranged in Soil Groups.**

Soil class:—	Light to Medium.		Medium to Heavy.		Fen, Warp and Silt.		Very light.		Sewage Farms.		Over-all.	
	Per ton.	No.	Per ton.	No.	Per ton.	No.	Per ton.	No.	Per ton.	No.	Per ton.	No.
Costs and returns:—												
Preliminary cultivations	5/6	91	5/-	36	3/3	31	5/6½	23	5/2½	10	4/11	191
Seed, drilling, etc.	8/2	91	8/8½	36	5/3½	31	8/11½	23	6/11½	10	7/8½	191
Total manures	10/4½	91	12/11½	36	4/7½	31	13/8½	23	7/8	10	9/10	191
Total harvesting	9/9	91	10/5½	36	8/3½	31	10/11	23	9/7½	10	9/8½	191
Total overheads	5/3½	91	5/0½	36	5/11½	31	5/1	23	5/6½	10	5/4½	191
Farm cash cost	39/0½	91	42/1½	36	27/4½	31	44/1½	23	35/0½	10	37/5½	191
Transport and G.R.	5/2½	91	5/5½	36	4/9½	31	6/4½	23	4/6½	10	5/3	191
Total cash cost	44/3½	91	47/7½	36	32/2	31	50/6½	23	39/6½	10	42/8½	191
Gross cash receipts	54/2½	91	55/7½	36	51/1½	31	53/0½	23	48/6½	10	53/5	191
Cash {Profit	9/11	91	8/0½	36	18/11½	31	2/6	23	9/0½	10	10/8½	191
Loss	—	—	—	—	—	—	—	—	—	—	—	—
Residual values brought forward ..	2/6½	91	1/10½	36	1/5½	31	2/9½	23	2/5½	10	2/2½	191
Gross cost	46/10	91	49/5½	36	33/7½	31	53/3½	23	42/-	10	44/11½	191
Total credits	10/3½	91	11/9½	36	7/3	31	11/3	23	9/1	10	9/11	191
Net cost	36/7½	91	37/8½	36	26/4½	31	42/0½	23	32/11	10	35/0½	191
Net {Profit	17/6½	91	17/11	36	24/8½	31	10/11½	23	15/7½	10	18/4½	191
Loss	—	—	—	—	—	—	—	—	—	—	—	—

**Average Costs and Returns per Washed Ton for Three Years 1927,
1928 and 1929, combined and arranged in Soil Groups.**

Soil class:—	Light to Medium.		Medium to Heavy.		Fen, Warp and Silt.		Very light.		Sewage Farms.		Over-all.	
	Per ton.	No.	Per ton.	No.	Per ton.	No.	Per ton.	No.	Per ton.	No.	Per ton.	No.
Costs and returns:—												
Preliminary cultivations	6/3½	267	6/6½	103	4/4½	100	7/3½	50	5/11½	27	6/-	546
Seed, drilling, etc.	8/8½	265	9/5½	99	6/11½	100	11/11½	50	7/9½	27	8/7½	541
Total manures	12/4	267	14/6½	101	5/11½	95	13/5	50	6/8½	27	11/1½	540
Total harvesting	10/10	264	12/7½	96	9/7½	94	12/4½	50	9/8	27	10/11½	530
Total overheads	5/9½	267	5/10½	101	7/2	95	6/5½	50	5/8½	27	6/1½	540
Farm cash cost	43/11	264	49/1½	95	34/3½	94	51/7	50	35/9	27	42/10	530
Transport and G.R.	5/8½	264	5/10½	95	4/8	94	6/8½	50	4/9	27	5/5	530
Total cash cost	49/4½	264	55/-	95	38/11½	94	58/3½	50	40/6	27	48/3	530
Gross cash receipts	55/1½	264	56/2½	95	51/3½	94	54/4½	50	49/3	27	54/1½	530
Cash {Profit	5/9	264	1/2½	95	13/4½	94	—	—	8/9	27	5/10½	530
Loss	—	—	—	—	—	—	3/10½	50	—	—	—	—
Residual values brought forward ..	2/1½	264	1/10	95	1/9½	94	3/11½	50	1/11	27	2/1½	530
Gross cost	51/6½	264	56/10	95	40/9	94	62/3	50	42/5	27	50/4½	530
Total credits	11/7½	264	13/0½	95	8/7½	94	11/11½	50	9/4½	27	11/1½	530
Net cost	39/11½	264	43/9½	95	32/1½	94	50/3½	50	33/0½	27	39/2½	530
Net {Profit	15/2½	264	12/4½	95	19/3½	94	4/0½	50	16/2½	27	14/11	530
Loss	—	—	—	—	—	—	—	—	—	—	—	—