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ROTHAMSTED
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The Art and Science of Cultivation

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Account of the Discussion

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THE DISCUSSION

SIR DANIEL HALL, in opening the proceedings, said that the business of cultivation ranks as one of the most pressing economic problems of agriculture.

The methods and systems in use at the present time are for the most part closely related to those which were existing in the middle of the eighteenth century. Given plenty of cheap labour these methods may be effective in producing good and profitable crops, but when the cost of labour is high in relation to the value of the produce, the profit coming to the farmer from the use of them is seriously diminished. In 1750, when our methods of cultivation were systematized in their present form, the wages of a full-grown agricultural labourer were about 7s. per week. At the same time the price of wheat was from 50s. to 60s. per quarter.

Putting the wages in terms of wheat, one quarter would pay one man for seven or eight weeks' work.

In July 1927 the price of wheat was about the same (50s. to 60s.), but the price of labour was very different, and one quarter of wheat would pay one man for about ten days only.

It is obvious that where such changes of economic balance have occurred, readjustments of farming methods must be considered, and a great problem which arable farmers have to face at present is that of remoulding their practice to suit a period of dear labour and cheap produce.

Mr J. R. BOND, in congratulating Sir John Russell on arranging a conference of such wide interest, remarked that cultivation was undoubtedly the most costly single item which appeared in the budget of an arable farmer, and it was in all probability the one on which he had the least detailed information. From the papers which had just been read one could not help arriving at the conclusion that the actual principles of cultivation have not as yet been arrived at, for what one farmer laid down as essential, another immediately contradicted.

As an example of the chaos of principle which exists he called the attention of the meeting to the fact that most farmers use implements of compression (rollers, etc.) on their land, whereas gardeners and allotment-holders avoid compression at all costs, even laying down boards on the soil to walk on.

Mr H. INSKIP said that during the course of the conference it had been stated that deep ploughing was an essential.

Speaking from many years' experience on his own land (light

loam), he entirely agreed with this principle, and would even go so far as to say that nine out of ten farmers do not plough deep enough. In answer to a question relating to the depth of his ploughing, Mr Inskip replied that he "varied in depth from 12 to 15 in. with a furrow 15 in. wide." He obtained this with a "Single Furrow Oliver Plough," drawn by a Fordson tractor.

Deeply ploughed land stood the drought well, and one only had to consider the cultivation given for such plants as sweet-peas, which involved deep trenching, in order to realize that on some lands the principle of making the crops search downwards for their food and water could be used with profit.

Mr W. HASLER, whose land embraced the heavy clays of Essex, stressed the present cost of production coupled with the low price of the products. He thought that there had never been a more pressing need for a reduction in the cost of cultivation operations than at the present time.

The problem of deep ploughing was one which, in his opinion, needed careful consideration; for should the ploughing be too bold, the ultimate result would be the laying on the surface of the field a large amount of useless soil. This applied especially to steam-ploughing; and the depth at which the plough was to be set, when such tackle was used, was one which only the farmer with a full knowledge of his field could answer.

Mr J. G. STEWART stated that he had been very interested in the results obtained from the experiments in Rotary Cultivation. He was of the opinion that more beneficial results would have been obtained on a different soil.

In the south of England one of the most difficult operations to perform was that of obtaining a level crop with all under-sown "seeds." The headlands and the portions of the field by gateways invariably showed a good crop. In mid-field, however, the result was inclined to be thin. Mr Stewart put forward the idea that this difference might be accounted for by the fact that the headlands, having had more traffic on them, would naturally be more compressed, and the "seeds" would therefore be only very lightly covered, but at the same time would rest on a moist bed; whereas in the centre of the field they would most certainly be sown deeper, and on a looser bed. It seems therefore that there is a general tendency to cover seeds too deeply.

In drawing attention to the many multiple and labour-saving agricultural implements which were in everyday use in America Mr Stewart remarked that he rather thought they were "children of necessity, rather than of perfection," and were the outcome of an

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endeavour to cultivate and harvest immense areas with the minimum amount of man labour.

Substitution of crops might in some cases save labour, and kale was perhaps to be preferred to turnips, since there was a definite saving of labour in the cultivation of the crop.

Mr J. H. SPILMAN did not agree with the last speaker (Mr Stewart), and said that, in his opinion, there was not a crop which keeps the sheep so long on the land as that of turnips.

On the Wolds the practice of growing turnips for sheep-feed, in preference to kale, was almost universal. He supposed that the reasons were, first, that turnips did not exhaust the land so much as kale, and secondly, that the crop went further. In his district they reckoned that one acre of turnips would winter ten sheep.

The sowing of turnips was performed mainly by the use of the "Kirby Moorside" drill—an implement which sowed the seed and manure in one operation, and therefore effected a considerable saving of man- and horse-power.

Mr SHORTEN (Howard & Son, Bedford) said that it was only natural that his firm should take a very keen and live interest in this conference, for it was their business to manufacture the implements of cultivation required by the farmer, and if possible to embody their own experiences coupled with the results of soil cultivation as carried out by the scientific investigator, in order to produce better, and perhaps more economic, instruments. Mr Shorten held the opinion that the more modern implements which were now available for the farmer were not being used to full advantage, and that a great improvement in the destruction of many weeds could be brought about by the use of modern and correct cultivation implements at the same time that adequate tilths were being obtained.

Mr W. LAWSON admitted that in certain parts of the country improvements might be made in relation to the destruction of weeds by using modern machinery. In the south of England, where weeds grew all the year round, the problem was one of great difficulty.

Speaking of the depth of ploughing, he said that, as far as his experience went, it was a question which the soil on the particular field answered for itself. He believed that good cultivation always meant an enormous amount of cultivation, and that at the present time the subject had to be viewed from two different angles. In the first place there was the matter of cultivation as viewed academically and fundamentally. Taking this view, it appeared that we

know very little of the underlying principles of the operations which we perform, and that there is a very large field for fundamental research in the matter. In the second view the economic balance between cost and return had to be considered, and he thought that there is a very excellent opportunity for the use and popularization of both labour-saving crops (such as kale) and machinery.

Mr J. W. COLLES (Caterpillar Tractors) said that he had sometimes heard the merits of various tractors being discussed in terms of speed. Speed was not an essential factor in the manufacture of an agricultural tractor. What was required in such an implement was reliability. A machine which was slow, but could be relied upon to give steady and reliable work, was worth far more than one which covered the ground at a great speed, but at uncertain times. One of the difficulties that makers of the more powerful tractors meet with at present is the dearth of implements suitable to really deep ploughing and subsoiling, and he thought that there was room for a good deal of practical research.

Mr J. PORTER remarked that drainage is very often the forerunner of cultivation, and as an instance quoted some of the heavy soils in Buckinghamshire, where four horses and two men were required for a single-plough team. In many of the cases cultivation would be rendered far more easy if the draining and liming were first attended to. Another fact of topical interest bearing on the same point—of the necessity for adequate drainage if good tilth is to be obtained—is found in the preference shown by the Eastern Counties farmers for ridge as against flat sowing for sugar-beet.

Sir JOHN RUSSELL, in summing up the discussion, expressed his thanks to all the speakers, and mentioned that this was the fifth of the Rothamsted Conferences, and from the interest which had been taken in this and the previous ones it was evident that they were fulfilling the objects for which they were started.

Referring to the discussion which had just taken place, he said that the three chief objects of cultivation were :

- (1) Preparation of the seed-bed.
- (2) Conservation of moisture.
- (3) Removal of weeds.

At the present time not so much stress was laid upon the aeration of the soil as had been done in the past.

With regard to the correct depth of ploughing, it was evident from the discussion that very little agreement could be arrived at on the subject. The fact that one season differs from another,

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and that farm differs from farm, acre from acre, and field from field, made the reduction of cultivation to a set of rules impossible. There seemed to be, however, certain underlying principles which exist through many temporary conditions, and which form the basis of all successful operations.

Two points of interest arising from recent laboratory work were found in the lessening of the resistance of land to the passage of implements after the application of chalk, and by the considerable reduction of friction on plough breasts which appear when an electric current is passed through them, and induce a lubricating film of moisture to form upon them.

SUMMARY OF POINTS: GENERAL

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(1) The objects of cultivation are threefold :

- (a) The elimination of weeds and unwanted plants.
- (b) The control of soil moisture in relation to the crop.
- (c) The production of a condition of soil favourable to plant growth—*i.e.* the making of "tilth."

(2) Cultivation processes as we have them are for the most part the outcome of many years of practical experience on the land, and can be traced through many stages of gradual improvement.

(3) From time to time startling innovations have appeared, and a few of these have remained to revolutionize some of the operations of agriculture. The name of Jethro Tull, who invented the seed-drill and the system of horse-hoeing husbandry, is particularly associated with one of the greatest of these steps in progress.

(4) The great development of industry and mechanics during the nineteenth and twentieth centuries made possible great developments in the construction of implements of tillage, but this was not accompanied by any great change in principle, and the form of the early types has remained easily recognizable in many of the most modern productions.

(5) Despite the accumulation of many centuries of experience, we still know very little of what really happens to the soil when it is cultivated, or when the forces of the weather act upon it; and it seems that a close study of the intimate relations of soil particles to each other and to moisture should form the basis of any further advance both in implement design and in systems of cultivation.

(6) The level of cultivation maintained at any period depends