ROTHAMSTED RESEARCH

The Art and Science of Cultivation

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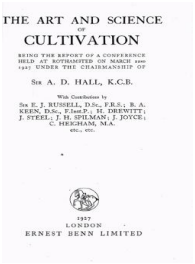

Summary of Points

C. Heighman

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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

By C. HEIGHAM, M. A.

Rothamsted Experimental Station

(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

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partly upon the type of machinery and power which is available for the production of a perfect tilth and partly upon the amount of labour which a farmer can afford to use for any particular crop. It may often happen that good and thorough cultivation is unsound in the economic sense.

(7) The existing methods of cultivation depend for continued success upon a large supply of cheap man labour. Such labour is no longer to be obtained, and in consequence the economic principles upon which the older systems were founded have ceased to apply. The comparative values of such matters as speed, depth and high finish in ploughing and other operations, which were fairly well established all over the country, are now once more in question.

(8) There is a considerable divergence of opinion among farmers as to the value of deep ploughing. It is claimed, on the one hand, that it will make possible the preparation of a deep seed-bed in which plant roots may penetrate quickly to a constant water supply. On the other hand, it is said that it may lead to the transference to the surface of raw subsoil, or to the drying out of the top soil to a considerable depth.

Despite this clash of opinion, it appears that bold and thorough ploughing in autumn and winter is the best foundation for good cultivation on most soils. The depth of ploughing must depend in each case upon the depth of the top soil and the nature of the subsoil. Where it is intended to deepen the ploughing, care should be taken to avoid the exposure of more than an inch or so of unkindly subsoil at one time.

(9) There appears to be very little reliable information as to the value of subsoiling, and there is need for widespread and well-designed investigation on this point.

(10) There is a curious clash of opinion as between the farmer, who rolls his land and uses sheep in order to obtain compression of the surface, and the gardener, who takes particular care to keep his soil loose and friable. In both cases it is claimed that the control of the soil moisture in relation to the crop is improved. It would appear that this apparent contradiction can be reconciled to some extent by the adaptability of the plant. In the first case the amount of water relative to the bulk of the top soil is increased and the plant roots have no need to travel far for their supplies. In the second case a deep-rooting habit is definitely encouraged by the looseness of the soil and the drying of the surface layers, and the plant is encouraged to get its nourishment from a depth where the water supply remains constant.

(11) In the economic field there would seem to be a good case for the use of cheap feeding crops such as kale and mixed leys in place of the more expensive root crops. This is in reality

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an avoidance of cultivation, but it may be well justified under conditions of high cost and cheap product.

(12) The sources of power available for the work of cultivation are increasing, and already many farmers have found that an intelligent use of petrol- and paraffin-driven tractors has enabled them to keep up the working force of arable farms at a reasonable cost. The case of the heavy land farm in Essex adduced in Mr Steel's paper is particularly striking in this respect. It may be noted that Mr Steel was a trained engineer and that his power machinery was well looked after.

(13) The speed of work of agricultural implements becomes a matter of great importance as the sources of power are developing. It appears that the soil-resistance to ploughing at $4\frac{1}{2}$ miles per hour increases only 7 per cent. from what it is at $2\frac{1}{2}$ miles per hour. This plain fact suggests great possibilities for development both of implements and tractors in the future.

(14) Certain new implements of a rotary type and driven by internal combustion engines are now available. These would appear to have many uses on the more intensive farms and in market gardens, but at present there is very little evidence available for their performance in comparison to the older and better-known implements of tillage.

(15) There would appear to be a general agreement that in the direction of the cultivations on his farm the farmer is called upon to exercise to the full his personal knowledge of the land and his judgment of the prevailing conditions.

While it is admitted that there is a great deal to be learned about the underlying principles, or the science of cultivation, it appears certain that the art of it as it appears in the work of an individual farmer on a field which he knows well must be maintained as the vital link between precept and practice.

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