# THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XLII, No. 11, FEBRUARY, 1936

*Principal Contents*

(*See also p. XI*)



LONDON
PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE
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Marvellous is recommended for early sowing on good soils, as is the new Cambridge Plant Breeding Institute production Resistance, which, though primarily a winter variety, also produces high yields when sown early in spring.

As to barleys, the Institute restricts its recommendations to the well-known varieties Plumage-Archer 1924 and Spratt-Archer. Trials in progress suggest that Dr. Beaven's "1935" Plumage-Archer will usually give rather higher yields than Plumage-Archer 1924. Where late sowing cannot be avoided Svalof Victory or the Danish Kenia and Maja barleys deserve trial.

Whichever variety is chosen, early sowing almost always pays. English-grown seed gives just as good results as imported seed, if the standard of purity and germination is the same. A further leaflet dealing in general terms with choice of seed in which such points as purity, germination, variety, origin and price are dealt with has been compiled by the Institute, and those who obtain it (gratis) either from County Organizers or direct from the Institute should find it of considerable use when deciding what seed to buy.

## Motors in Agriculture

THE use of motors in agriculture, including steam engines, petrol engines and electric motors has been surveyed by the International Institute of Agriculture and is reported by H. J. Hopfen of the Institute in its International Review just issued at Rome. This report shows that the United States has the largest number of tractors engaged in agricultural work, more than in all other countries combined, while Soviet Russia and Canada hold second and third places respectively. The United States also has the largest number of fixed internal combustion engines, but Germany leads in the number of electric motors used in agriculture. In numbers of harvester-threshers the United States leads, with Russia, Argentina and Canada following in the order mentioned. With high prices, highly mechanized farms have realized bigger profits than farms using animal power, but agricultural distress has been more felt during the years of crisis on highly mechanized farms than on farms where animal traction has been retained in addition to mechanical traction, because the costs of up-keep of animals have decreased considerably while the working costs for tractors have remained the same or have increased. The degree of mechanization depends on a number of factors, of which size of farms and conditions of land tenure may be considered the most important. Conditions for mechanization are less favourable in European countries (excluding Russia), where farms are smaller and, even more, the wide distribution of small fields is a handicap to highly developed mechanization.





The article suggests that mechanization has had an enormous influence on production, and has reduced the cost in a measure that would have been considered impossible until recent times. Most countries reacted to this lowering of production cost, which in turn caused a fall in prices, by establishing quotas and custom duties.

## The Manufacture of Humus by the Indore Process

THERE is surely no technical subject on which all classes of cultivators are so closely in agreement as on the intimate relationship between productivity and the supply of organic matter in the soil. In our home agriculture, the quest for humus extends from large-scale mechanized cereal farming at one end of the scale to intensive market gardening at the other. In the tropics, where the oxidation of organic matter takes place most rapidly, the provision of humic material is often the first step in land improvement. The more intensive the cultivation and the bigger the demands on the soil, the greater the need for steps to maintain the content of organic matter. In England, the very success and persistence of our traditional arable system, based on livestock and temporary grass, is a sign that it supplies the essential needs of the soil. Nevertheless, the question arises whether we are in general maintaining our soils in full productivity. Are we not supplying in the form of artificial fertilizers nutrients that would be better provided, or at least supplemented, by specially-prepared wastes derived from the farm, from industry, and from town refuse or sewage?

To utilize waste organic matter, some form of composting is necessary. Compost making is perhaps nearly as old as agriculture itself. In their various modifications, composting and the utilization of town wastes form the mainstay of the intensive farming of the thickly-populated and self-supporting districts of China and Japan. From time to time, scientific investigators have turned their attention to these matters, and have conferred precision on what had hitherto been a rule-of-thumb operation. Starting with the work of H. B. Hutchinson and E. H. Richards, whose first paper on "Artificial Farmyard Manure," appeared in this JOURNAL in 1921, the conditions underlying the rotting of straw and waste organic materials generally have been worked out. Another service which the scientific worker has been able to perform is to systematize existing knowledge and practices and draw up methods suitable for local supplies of waste materials, cropping systems, and labour conditions. Finally, there is the possibility of mechanization in its many forms, with the idea of reducing the labour costs of handling bulky material. The possibility of controlled compost-making has been eagerly taken up in many quarters, and there is already an extensive literature on the subject.

The Indore process of compost making developed by Sir Albert Howard and his co-workers at the Institute of Plant Industry, Indore, Central India, from 1925 onwards, is already well known. The process was fully described in a book "The Waste Products of Agriculture," published in 1931, and more recent developments have been reported from time to time. In a lecture to the Society of Arts, on November 13 last, Sir Albert Howard gave an account of the present position and future prospects of the Indore process and its modifications; and, since it appears possible that certain aspects of the system may find application in British farming, the following notes may be of interest.

The Indore process is based on the idea that soils need organic matter, and that the waste organic matter derived from the unutilized parts of farm crops, from weeds and so forth, can supply this need, provided that they are first submitted to a preliminary rotting





process. To promote this decay, an outside source of available nitrogen and mineral matter is required, these likewise being supplied by the farm itself in the shape of "urine earth" from the cattle sheds, and wood ashes respectively. The other additions are a certain amount of cattle dung, water, and air. The compost heaps are mixed, made, watered, and turned according to a carefully considered system; and, after they have undergone hot aerobic fermentation, the resulting product is a humic powdery material that has proved itself a useful organic manure.

Having developed the system and made it work on a large scale, the most ready avenue of development turned out to be by way of the plantation industries. The need for humus is almost universal, but the necessary organization and drive required to give a new process a trial were usually found in the directorate of some plantation group in London.

Sir Albert outlined recent progress with the use of composts on coffee, sisal and maize in Kenya, on tea and sugar-cane in India. Sugar-cane, maize and sisal, each provides residues in quantity, but the remaining crops need to be supplemented from outside sources to make up the required bulk of organic matter. In some circumstances, special crops of quick-growing grasses and legumes have been employed for this; the latter, in virtue of their high nitrogen content, serve to accelerate decomposition in the heap. Some difficulty is experienced in inducing peasant farmers to adopt the new method, and the procedure is to establish demonstration centres on Government farms or with influential agriculturists.

The next step is to attack the bigger problem of the utilization of the wastes of urban communities. A beginning has been made by the Indore workers in adapting their process to this purpose, and town waste is already being converted at a number of centres in India. The most promising development, from the point of view of western nations, is reported from Nairobi, Kenya, where by the composting of town refuse and various wastes of the animal industries, a relatively concentrated organic manure is obtained, which is eagerly taken up by local cultivators.

Turning to home agriculture, Sir Albert Howard

points out that certain existing practices are based on the composting principle. When, for example, clover or grass turf is dunged and turned over, the turf and dung are allowed to decay together. The suggestion is that, in our large areas of turf, we have a supply of potential humus that should be realized by means of composting *in situ* with dung. To provide the necessary dung, the existing manure would have to be supplemented by the incorporation of all available farm wastes into the dung heap. The place of artificials in a system based largely on humic manures would be to enrich the compost heap itself, thereby facilitating decay and grading up the final product. The ultimate disappearance of the water-borne sewage system is envisaged, to the gain of the soil in nutrients and organic matter.

Those who have what Sir Albert Howard calls the "NPK Mentality" may not agree in full measure with all his views. Some proposals are clearly for the future, and the present efficient fertilizer industry can reasonably and justly look to expansion in the role it has long occupied on most farms, namely the supplement to the home-produced animal manures. Nevertheless, the case for the salvage and utilization of organic wastes needs a strong advocate. The paper records substantial achievement, with every prospect of further development.

## Further Experiments on the Control of Flea Beetles in Seed-Beds

THE following note has been contributed by Messrs. F. R. Petherbridge and I. Thomas, School of Agriculture, Cambridge:—

In 1934, the authors obtained a good control of Flea Beetles, in Brassica seed-beds in Bedfordshire, with Derris dusts*. In the same year, Miles† obtained a good control in the North-West Province with a dust consisting of 50 per cent. naphthalene and 50 per cent. silica. In Germany, a proprietary dust that consists of finely-powdered quartz, has been officially recom-

* Petherbridge, F. R., and Thomas, I.: "The Control of Flea Beetles in Seed-beds," this JOURNAL, Vol. XLI, No. 11 (February, 1935), p. 1070.

† Miles, H. W.: "The Control of Flea Beetles with a Naphthalene-silica Dust," Id., p. 1079.