The Manufacture of Humus by the Indore Process

(Being the substance of an illustrated address given by SIR ALBERT HOWARD, C.I.E., *to the Society on 15th November,* 1935.)

THE Indore Process is one developed by Sir Albert Howard and his co-workers at the Indore Experimental Station, during the last 15 years, for the utilisation of agricultural residues and waste material in producing humus in quantity off the land or in a corner of the field, for subsequent incorporation with the soil. It is of great importance in growing healthy crops of high quality, which are an important factor in the production of healthy cattle and a healthy human race. This humus is essentially a manufactured product, the result of the man-controlled activities of fungi and bacteria, operating on any available organic waste materials, in carefully adjusted conditions of moisture and air supply, and in association with a supply of necessary bases and mineral salts, including combined nitrogen.

The original process uses natural residues and natural sources of the necessary organisms only. The materials are any waste vegetable residues which occur on the farm, the droppings of any kind of farm stock, urine earth from cattle standings, and ashes. Coarse materials are chaffed, or crushed by farm road traffic. In pits, 30 × 14 × 2 ft. deep, a 3-in. layer of plant residues is spread over the floor, sprinkled with dry urine earth and a little ash, and covered with a 2-in. layer of dung or muck. This layer is watered and then covered by a second similar layer, and so on to a depth of 30 in., each added layer being watered. The last dung layer is topped off with urine earth and ashes, and a final watering is given. The heaps are watered once a week subsequently and at each turning. The first turn, after 10 to 14 days, consists in spreading one half of the heap over the other; the second, after a further 14 days, in turning the whole heap over on to the empty half of the pit; and the third, a month later, in removing it to build a clamp above ground, 10 × 9 × 3½ ft. high, in which it ripens for a further month. Thus, in three months, there is produced a dark crumbling humic material, ready for use in the field.

In dealing with farmyard manure, green manuring, disposal of vegetable residues, town wastes, sewage sludge and crude sewage, although there is

extensive knowledge of the individual materials and of the changes which proceed in each, this knowledge has not been co-ordinated and utilised on any wide scale to make the best use of them. The Indore Process does this and can be adapted to meet any local set of circumstances. An account was given of the success which the process had achieved in many tropical countries, e.g. on coffee plantations in Kenya, tea in India, Ceylon and Assam, sugar cane in India—all utilising their own particular waste materials. Similar possibilities are being explored in the growing of maize and sisal. Full details of the process and illustrations of its employment in varied circumstances are given in a reprint of a lecture by Sir Albert Howard to the Royal Society of Arts, copies of which he has made available in quantity to the members of the C.U.A.S. since he lectured to us.

An instance of the wholesale utilisation of wastes on a factory scale is provided by a Nairobi undertaking, which utilises coffee parchment, tannery waste, hair, wool, fleshings, hoof and horn, bones, cotton seed residues, chaff, wood ashes, and limestone to produce up to 20 tons per day of rich humic material. It is suggested that the process renders possible the utilisation of sewage, town refuse and peat on the large scale and could ultimately eliminate the waste incurred by our present systems of sewage disposal.

At home there is an increasing need for humus in producing both ordinary field crops and fresh vegetables. The accumulated turf of old grassland and all leys could be turned to much better account than is actually the case. The same principles can be applied, and are being applied. Mr. Secrett, in developments in Cornwall, has applied farmyard manure to old leys and ploughed them so as to set the land up in the form of sandwiches of turf and farmyard manure in which the humification is encouraged prior to subsequent cross-discing and incorporation with the soil. Mr. Hosier improves and manures his grassland by his milk bails and then breaks it up for an arable course. Professor Stapledon uses artificials such as nitrochalk and basic slag to incorporate with the old turf surface of his poor mountain grassland before breaking it up for re-seeding with suitable grass mixtures. The utilisation of weeds, hedge trimmings, bracken, old surplus straw and any similar wastes is urged as a means of augmenting the supply of humus, in the increasing deficiency of farmyard manure in this country, and strong support is given to the introduction of temporary leys in arable farming to increase the humus content of the soil, to lower the incidence of disease and pest infestation of crops, and as a result to improve the health of all stock produced on the land.

The research workers of the past century stand accused of foisting an N.P.K. mentality on to the agriculture of the Occident. They have put yield first, and quality second. They persist in trying to eliminate disease by laboratory research, the use of fungicides, insecticides and vaccines, instead of toning up the soil with humus and thus improving in succession its crops, stock and humanity in general. If the problem is tackled on the latter basis, disease will gradually disappear.

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Sir Albert Howard's lecture before the Royal Society of Arts produced a long and lively discussion. His paper was reviewed in *Nature* on 15th February last. The reviewer admitted the existing waste of vegetable and other organic wastes in Great Britain, but expressed doubt whether the elimination of such waste could vastly increase the amount of humic manure available on the ordinary English farm. He foresaw great difficulty in mucking and discing green manure crops prior to ploughing them in effectively afterwards. He was sceptical of quality, "an elusive concept," being able to confer immunity to disease on stock and mankind, and suggested that evidence on the point was lacking. He agreed that humus was very important and that there was need to emphasise it in this country where mechanisation of agriculture was increasing. In commenting on the review, Sir Albert Howard denied the views on immunity to disease attributed to him by the reviewer, but reiterated the importance of the study of quality and resistance to disease, and the dependence of these on adequate supplies of humus in the soil, although this might be only one of many factors involved.

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As before the R.S.A., so in the C.U.A.S., the views of Sir Albert Howard aroused much interest and a vigorous discussion. The meeting was thrilled and secretly elated to hear the competence of the experts so openly, even brutally, called in question. Stung by the taunt of an N.P.K. mentality, and the ineptitude of scientific agriculturists and agricultural scientists alike, some of his listeners vigorously assailed Sir Albert Howard, who as enthusiastically replied. The main criticisms levelled against the greater use of the process were the impracticability on English farms of collecting the scattered waste materials for centralised composting, the cost of the considerable manual labour involved in the process, the failure of all efforts to deal economically and effectively with surplus straw in arable farming conditions, and the difference between general farming and intensive specialist crop growing.