

MANUFACTURE OF FERTILIZER FROM URBAN WASTES

By GEORGE BRANSBY WILLIAMS

THE importance of organic fertilizer in maintaining the humus content of soils, which is essential for growing crops in a healthy condition, is now widely recognized. Many definitions of the nature and functions of humus have been given, but the most practical is that given by Mr. G. V. Jacks in a paper read before the Royal Society of Arts on February 12, 1941; he said, "Humus does many things all of which can be summed up in the statement that it makes a mass of otherwise dead rock particles a suitable habitat for living plants. It is the substance which distinguishes soil from a mere geological deposit." The luxuriant growths produced by artificial fertilizers deplete humus of its essential elements unless an adequate supply of suitable organic manure is used to restore them.

It has for a long time been generally assumed that it is impossible to feed more than a fraction of the population of Great Britain on home-grown food, and the nation has resigned itself to seeing agriculture slowly decay until in many parts of the country landowners and farmers have been more concerned with the value of the land for building than with its fertility. Actually it seems that there would be no physical difficulty in growing the greater part of the food we require in our own country. The production of home produce has been in normal times an economic question, but in war-time it has become a vital matter on which the survival of the nation may depend.

If the quantity of food produced in Great Britain is vital, then so is the supply of an adequate supply of organic fertilizer. Both house refuse, and the sludge that settles out of domestic sewage, contain considerable quantities of organic matter that can be converted into humus by simple methods in a longer or shorter period. Sir Albert Howard has estimated that there is 10,000,000 tons of refuse in the controlled tips around the cities of Great Britain, and hundreds of thousands of tons of fresh house refuse are being removed from the urban areas each year. Much of this refuse is incinerated and its organic fertilizing ingredients destroyed, and the problem of finding waste land on which to tip the remainder is yearly becoming a more difficult one. The matter in the sewage amounts to nearly another million tons per year. A portion of this is discharged into the sea, and considerable expense is incurred annually in disposing of the rest by drying, pressing, trenching or digesting.

These materials, as first produced, are not in a suitable condition for application to the land, but they can be transformed into humus by composting. The system of composting urban wastes had its early development in India. Mr. R. D. Anstead related in a paper read in 1932 how, in the first instance, simple waste products, such as leaves, weeds, old straw and the like, were fermented. This method proved so successful that Dr. Fowler and others turned their attention to dealing with the refuse of Indian cities in the same way. The high temperature of initial fermentation kills all fly larvæ and all weed seeds.

Ordinary sedimentation tank sludge can be used.

It has also been found that cover is not essential, for the process can be carried on very successfully in the open.

The large amount of cellulose in pulverized house refuse is just what is needed by the fungi and bacteria which synthesize microbial tissue in a manure heap.

A process for converting household refuse into fertilizer by inoculating it with a bacterial culture has been evolved by the Hyganic Company and is in operation on a large scale at the Kensington Borough Works in Wood Lane, London. Here it deals with about 100 tons of refuse per day from 180,000 persons. The process is rapid in action, but as exemplified at Wood Lane is expensive.

Simple composting or mixing in heaps on a concrete floor as carried out at Maidenhead is cheaper. The process of manufacture of the fertilizer is carried on at the sewage works. About 20 tons of refuse collected from a population of about 30,000 is delivered at the works daily. The house refuse, after picking, screening, magnetic separation and pulverizing, is stacked in heaps to a depth of about 4 ft. 6 in., the top surface of the heaps being left saucer-shaped; sludge with a moisture content of about 96 per cent is pumped daily on to the heaps. After four days, the heap is turned over on the concrete floor, then left for another three days. During this period active fermentation takes place, and the temperature rises to about 160° F. The compost is then removed to a maturing heap, here it remains for not less than four months. It is most important to mature the compost; if insufficiently matured compost is added to soil the material continues to immobilize nitrogen, and this action will compete with any plant life and lead to starvation of the crop. Sufficient maturing is only a matter of sufficient time; no additional turning is required. Neglect of this precaution in England has led to quite false ideas about the value of this compost. The price obtained for the fertilizer is from 7s. 6d. to 10s. a ton. The demand is greater than the supply.

The humus heap which has matured for three to four months is almost completely broken down into the condition suitable for addition to the soil. A noticeable feature is the absence of weeds, and particularly of the tomato plants which are common when sludge that has been dried on drying beds is used.

Very large sums of money are spent yearly in the urban areas of England in getting rid separately of two obnoxious waste products, namely, household refuse and sewage, without in most cases getting any return for the money. By mixing them together and passing them through a series of simple processes, not only is nuisance and expense avoided, but also a fertilizer is produced which is vitally needed by agriculture and for which a price can be obtained that should more than repay the cost of its production. The Maidenhead composting works give evidence that there is no serious difficulty in preparing the fertilizer, and it may be anticipated that in future many other towns will appreciate the simplicity and feasibility of the process. In particular it is reasonable to hope that those seaside towns which now turn crude sewage into the sea, fouling the foreshore and making bathing unpleasant and even dangerous to health, will introduce settlement, combined with composting of their refuse, and at the same time make use of the fertilizing value of seaweed. At the present time the need for such a fertilizer is urgent.