ROTHAMSTED RESEARCH

Guide to the Work of the Departments 1984

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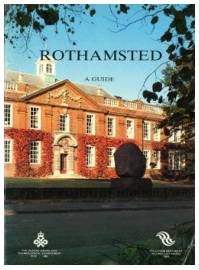

Soil Survey of England and Wales

Rothamsted Research

Rothamsted Research (1985) *Soil Survey of England and Wales ;* Guide To The Work Of The Departments 1984, pp 40 - 43

When water moves, it carries dissolved salts with it, and salts can also move by the process of diffusion. This is important in loss of plant nutrients, such as nitrate, and the distribution of fertilizers and agrochemicals. We aim to predict such movements in the field situation.

Analytical methods

All our work involves analyses of soils and plants, and we use modern equipment including emission and absorption flame spectrophotometry. The recent acquisition of an Inductively Coupled Plasma Emission Spectrometer (ICP) has made possible rapid analysis of plant and soil extracts for up to 28 elements.

SOIL SURVEY OF ENGLAND AND WALES

Land is our most important and most enduring natural resource and soil is a vital component of land. The nation needs to use and conserve its soils to obtain optimum productivity and to develop a rational approach to protecting and improving urban and natural environments. To implement these broad requirements reliable information is needed on the quantity and quality of our land resources. The Soil Survey of England and Wales was established in 1939 to systematize the production of this information. The work of the Survey involves development of a suitable classification system, production of soil maps at various scales and for various uses, interpretation of maps and soil experience for a variety of users and development of a soil information system.

Soil classification

The soil mantle over the landscape is continuous except where broken by water, bare rock or ice. Classification systems are needed to identify individual soil types within this continuum for soil mapping and to facilitate the transfer of information from one area to another. The basic unit of soil classification is the soil profile, in which vertical variation can be observed as a sequence of soil horizons parallel to the land surface. The Survey has developed a hierarchical classification system for England and Wales in which are defined 10 major groups, 43 groups, 107 sub-groups and some 700 soil series. The lowest category, the soil series, defined as collections of soil profiles showing the same successions of horizons and developed in lithologically similar materials, is the class used to identify map units at scales of 1 : 63 360 or larger. Soil series are often divided into phases on the basis of other internal or external features significant for land use, such as climatic characteristics, stoniness, slope. Soil series with similar phase characteristics are homogeneous for farming and advisory purposes.

Soil mapping

Field mapping is carried out by hand augering or digging to about 1·5 m depth to expose the soil profile. Soils are mapped at various scales depending on the level of detail required. Much of the early mapping was published at scales of 1 : 63 360 and 1 : 25 000, each covering about 10% of the land surface of England and Wales. These surveys were made on a field by field basis with

Soil corer and digger.

observations at about 1 per 2 ha. Such detailed surveys aim to delimit areas with one predominant soil series. The map units are designated by a single series name when most of the soil belongs to that series. Less uniform areas are shown as complexes of two or more series.

In 1977 the detailed mapping programme was suspended to give priority to the production of a soil map for the whole of England and Wales at a scale of 1 : 250 000. This is now published as six regional sheets, with accompanying bulletins. The map was constructed using the firm base of earlier detailed mapping and by field observations from small pits or borings on previously unsurveyed ground at an average frequency of 250 per 100 km^2. Aerial photographs, geological maps and other sources were used to help position boundaries. The units on the map are associations; these are groupings of soils developed on similar parent material (e.g. Chalk) and on related landscape features such as valley sides and plateau surfaces. The map shows 296 associations, identified by the most frequently occurring series within them and combinations of ancillary series.

The Survey also produces maps at other scales, e.g. 1 : 100 000, 1 : 10 000. Most of the mapping has been made by free survey using the surveyors knowledge of soil types and distribution patterns in relation to landscape features.

On completion of the 1 : 250 000 scale map, a new programme of detailed surveys at 1 : 50 000 and 1 : 25 000 scales has been introduced. Mapping con-

tinues to be by free survey supported by some grid sampling to estimate the purity of selected map units.

The mapping programme is aided by aerial photograph specialists and by mineralogical, physical and chemical laboratory services.

Interpretation and application of soil maps

Soil maps together with the measured and estimated data for component soil series provide important sources of information for the agricultural industry and numerous other users. Soil surveys are an essential basis for land classification to control major changes in land use between agriculture and urban, forestry or amenity development. For these purposes and also to interpret soil maps for agricultural applications, very large agroclimatic and land quality datasets have been assembled which can be used interactively on the computer. In recent years the following interpretations based on soil and climate information have been developed: (i) workability, trafficability and poaching risk; (ii) soil droughtiness; (iii) water regime (incidence and depth of waterlogging and/or drying); (iv) water movement (integrating soil and site properties controlling reception, transmission and disposal of water); and (v) risk of erosion by water and wind.

Land has also been evaluated according to its suitability for specific crops, including cereals, grass, sugar beet and potatoes, and classified according to its suitability for specific techniques, e.g. for direct drilling and drainage need and design.

Maps of soil distribution patterns and information on soil properties are also useful to planners and civil engineers. They provide environmental and site information and indicate likely sources of materials. Above all, they provide a basis for integrated land planning.

Soil information system

This system is being developed for use by the Survey in one of its main areas of work namely in evaluating soil properties and predicting the suitability of land for potential uses. To carry out this work there is a need to retrieve and manipulate data from the large volumes collected and derived by the Survey and to express results in various forms. To this end the system, with user-friendly retrieval facilities, will output data in the form of reports, tabulations, statistical summaries and graphics including derivative maps. Currently data on soil profiles, classification and soil analysis are being handled and soil map boundaries and other derived data such as moisture deficit and available water will be added. A scheme is planned to include comparable data from ADAS sources. The Survey is also preparing a National Catalogue of Soil Series which will assemble, and make readily accessible, definitive, descriptive, analytical and behavioural data for each established soil series.

Collaboration and consultancies

Contact with ADAS and AFRC institutes is an important and varied aspect of the Survey's work. The wide ranging nature of co-operation is illustrated by mutual involvement in the following topics: land reclamation; site and soil characterization for experiments; hill farm projects; assessment of minor element deficiency and toxicity; design and feasibility and land drainage; infiltration of farm wastes; within farm allocation of land for nature conservation; land classification for various purposes.

Maps and reports are prepared by contract for individual farms and estates, the National Coal Board, Water Boards and other industrial, agricultural or public bodies.

Publications

The Survey publishes a series of maps and books, details of which are contained in a free publication list obtainable from the Publications Officer.

THE LIBRARY

The Library at Rothamsted began as a small collection of books belonging to Sir John Lawes. This was augmented in 1913 by the addition of Sir Henry Gilbert's library which was presented by his widow. There are now over 80 000 volumes dealing not only with agriculture but all the allied sciences. Three-quarters of this stock consists of serial publications represented by 7000 titles of which 1800 are currently received. Material of interest includes an extensive collection of the publications of the United States Agricultural Experimental Stations, many publications from former colonial territories and a large number of early Russian periodicals.

The growing collection of modern monographs is complemented by substantial holdings of early books and manuscripts relating to agriculture. The books include works published between 1471 and 1840 in England, Europe and America, of which 13 are incunabula. The manuscripts, of which the earliest is the Treatise of Husbandry by Walter of Henley (1200–1283), largely consist of farm records, letters, surveys and Lawes and Gilbert's papers.

A fine collection of prints and paintings of British farm livestock, 1780–1910, which were mainly the bequest of Lord Northbrook, has recently been restored.

The Library maintains author and subject catalogues of its book stock, an author catalogue of papers published by members of staff at Rothamsted, a catalogue of all serial holdings and an annual list of current periodical subscriptions. Catalogues of the early books on agriculture and of the livestock prints are available for consultation.

Photocopying facilities are available and there is an online information retrieval service for staff and visiting workers.

The Library may be used by visitors on application to the Librarian.

PUBLICATIONS

The following are available from the Librarian:

Report, Rothamsted Experimental Station. From 1909 (annual, some are out of print). Prices upon application.

Yields of the Field Experiments. Prices upon application.

Detatails of the Classical and Long-term Experiments up to 1973. 2 volumes. Price £1 each.