

Excursion to the Karcag Research Institute of the Debrecen University of Agriculture

The participants of the Seminar visited the Karcag Research Institute of the Debrecen University of Agricultural Sciences. The results outlined here will give some idea of the research and development carried out in the Institute, which is primarily concerned with the protection and improvement of fertility in the soils of the Trans-Tisza Region and with the improvement in the system of conditions making soil utilization efficient even under extreme ecological conditions.

For a considerable number of years the institute, founded in 1947, was involved in very localized research, though right from the beginning an important role was played by research into agrotechnical aspects of chernozem, meadow and salt affected soils. Particular emphasis was laid on improvements in soil cultivation technologies, and major achievements in this field include the determination of the soil porosity requirements of major field crops and the elaboration of various methods of deep loosening, special cultivation techniques for extremely heavy-textured soils, and, last but not least, time- and energy-saving systems of soil cultivation.

When a national complex amelioration programme was set up, concentrated on the Trans-Tisza Region, it became necessary to initiate or extend research and development aimed at elaborating scientifically-based methods for the radical amelioration of soils with unfavourable chemical and physical properties. Research aimed at promoting the more efficient amelioration and utilization of such areas with extreme ecological properties became more and more extensive.

Amelioration research was principally concerned with improvements in the moisture regulation within the field of soils with heavy texture and unfavourable chemical properties, and with the discovery of correlations between soil moisture regulation, chemical soil amelioration and the efficiency of deep-loosening.

The results of ameliorative soil moisture regulation research on growing sites consisting of salt affected - mostly meadow - soils, saline in the deeper layers, with heavy texture and periodically or permanently affected by water, can be summarized as follows:

- Soil drainage starting at an average depth of 1 m, ditch filtering and the deep-loosening closely associated with these measures, make it possible even in these soils to drain away the excess water arising on the surface and in the soil until the water level is within the tolerance limits of the crop;

- the more favourable state of soil loosening created by these ameliorative measures leads to a more intense mobility or leaching out of the materials in the soil. Despite the fact that this process is generally favourable or even desirable in the case of deeply saline or alkali soils, from the point of view of water quality protection it is possible that NO_3 will appear in the ground- or drainage water, which may affect some 60-70% of the nutrients distributed to the soil in autumn. This unfavourable process can be considerably moderated by agrotechnical methods;

- With respect to the ameliorative deep-loosening of the soil, studies were made on the major correlations and parameters of depth, optimum timing and frequency, and on the role played by this technique in soil moisture regulation in various pedological and hydrological situations. Deep-loosening combined with mole drains is of great significance in the uniform distribution of moisture in the soil at satisfactory intensity, particularly if the soil drainage system is also to be used for water replacement;

- Examinations carried out using Hungarian and foreign cutting machinery indicated that under the given conditions, with the use of adequate filtering materials, these machines could be used to good purpose and at low cost in the regulation of soil moisture within the field.

As a result of research on soil utilization and soil cultivation:

- It was found that under the given conditions heavy cultivators could be used to excellent purpose in the preparation of the soil for winter cereals, leading to a saving of 25-30% in working hours and 10-15% in fuel.

- An inexpensive irrigation technique elaborated for use with mole drains and deep-loosening was also found to be highly suitable for the distribution of liquid manure to the soil. The method can also be used when growing intensive crops on rice fields temporarily in disuse due to crop rotation.

- A measurement, evaluation and direction system was elaborated based on computerized data storage and evaluation in order to protect the fertility of irrigated soils and to improve the efficiency of irrigation at field level. The system can be used for the dynamic analysis of the effect of irrigation on the physical and chemical properties of the soil, for the prediction of any detrimental processes which may occur, and for the determination of the necessary corrections.

In order to analyse the effect necessarily exerted by soil moisture regulation and soil utilization methods on the movements of substances in the soil under various hydrological and pedological conditions, and in order to approach the subject from the point of view of the soil-plant system, large volume compensation lysimeters were set up. The results obtained promoted a more reliable interpretation of field research results.

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