

Danish Experiments in Plant Culture and Details about the Trade in Controlled Danish Seed.

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Plant culture experiments in Denmark are carried out to a very large extent, partly on *the experimental stations* and partly by the agricultural societies as *local experiments*, i. e. experiments of short duration, mainly one year, and carried out at ordinary farms for direct instruction on the spot.

The Government Experiments in Plant Culture, started in the seventies by the state counsellor *P. Nielsen* of the Royal Danish Agricultural Society, are now entirely carried out at the government's expense, the yearly allowance being at present about 600,000 kroner. The experiment department is superintended by the *State Committee on Plant Culture* consisting of 5 members who are appointed by the Royal Danish Agricultural Society, the Associated Danish Agricultural Societies, the Associated Danish Smallholder Societies, the Royal Agricultural High-School and the horticultural organizations. The appointments are confirmed by the Ministry of Agriculture.

The experiments are carried out at experimental stations and substations, and the work is supplemented by laboratory investigations. The individual station with its substations embraces an area of from 75 to 150 acres and in some cases even more.

The undermentioned stations and sections are now attached to the Experimental Department:

Agricultural Experimental Stations:

Tylstrup in the North of Jutland, with a *substation for moor experiments* (in Store Vildmose).

Studsgaard in Central Jutland (near Herning) which includes an area in western Jutland (near *Borris*) and also a *substation for moor experiments* near Herning.

Askov in the Southern Jutland.

Aarslev in Funen.

Lyngby in the North East of Seeland (near Copenhagen) which embraces the substation at *Aakirkeby* on Bornholm.

Tystofte in the South West of Seeland with the substation at *Abed* on Lolland.

Horticultural Experimental Stations:

Hornum in Northern Jutland.

Spangsbjerg in the South West of Jutland (near Esbjerg).

Blangsted in Funen (near Odense).

In addition there are special sections for *marsh experiments*, for *root experiments*, for *eradication of weeds*, for *investigations concerning fodder plants* and for *controlling plant diseases*, the last mentioned section has a laboratory in Lyngby.

In connection with the experiments botanical, chemical, physical and bacteriological investigations are carried out, partly at laboratories belonging to the experimental stations, partly and mainly at the *State Laboratory for Plant Culture* in Lyngby, where also tests as to the need of lime in the soil are made and bacteria for leguminous plants are produced.

Under the state experiment department for plant culture also ranges the *experimental station at Højvig* near Thorshavn on the Faroe Islands.

As shown above the experimental stations and substations are spread all over the country. They are thus situated under different climatic conditions and on soil of different quality, and within each district the particular experimental areas are chosen with special regard to the quality of soil in the district so that the area is typical for the soil of the district in question (loam, sand, high moor, low moor). In this way it is secured, that the experiments of which mainly the results depend on soil and climate, will be of the greatest possible importance for agriculture and horticulture in the district, while, at the same time, experiments, which on account of their nature must be run on more or all the stations at the same time, are made on as wide and reliable a basis as possible.

The work at the experimental stations is to some extent specialized. Some experimental problems are especially assigned to certain stations, as for instance experiments with stable manure are carried out at *Aarslev* (clay soil), *Askov* (clay loam and sand soil) and *Studsgaard* (sand soil), while the principal work with potatoes is done at *Tylstrup*, and the plant breeding at *Tystofte* and *Abed*.

Every year a detailed common *working scheme* with detailed regulations for the laying out and the carrying out of the planned experiments and investigations is prepared. The homogeneity of soil has been one of the points in view when an experimental area

has been secured, and besides that a great number of *replicate plots* is used to avoid disturbing influences of variations in the soil. Replicate plots are plots which are manured, sown and treated alike and spread over the field in such a way, that their average fertility is supposed to be the same as the fertility of the whole field. The number of replicate plots can vary from 5 to 20 or more and their size varies from $\frac{1}{800}$ to $\frac{1}{40}$ of an acre according to the kind of experiment, the homogeneousness of soil etc.

Every experimental station or chief section is managed by a *director*. For each series of experiments one of the directors is appointed as a *reporter*. The series of experiments often run for several years and generally at several of the stations at the same time. When a series is finished, the reporter has to compile the results and write the report, which, after approval by all the directors, is published by the State Committee on Plant Culture in its journal, the »*Tidsskrift for Planteavl*«. As a rule a brief summary in English will be found at the end of each report. Popular pamphlets containing the results of the experiments are published and reprinted in the daily papers and in professional journals for the information of farmers and horticulturists and distributed in large numbers at the experimental stations, at the agricultural schools, at meetings and exhibitions. They are also published in the »*Tidsskrift for Planteavl*«, which besides contains several reports from the local experiments, the State Seed Testing Station etc. Subscription to the journal will be received in the »Gyldendalske Boghandel, Nordisk Forlag«, Copenhagen; the price being 10 kroner the volume.

The State Seed Testing Station carries the control with seed and assists the experimental work by examining the seed used for or grown in course of the experiments. Moreover these state experiments are carried out in correspondance with the state experiments on farm animals and also with

The Local Experiments in Plant Culture.

These are in charge of the agricultural societies and to a lesser extent of the horticultural organizations. Besides the *Royal Danish Agricultural Society* there are in Denmark 137 *Agricultural Societies* (»*Landboforeninger*«) with about 115,000 members, and 1,162 *Smallholder Societies* (»*Husmandsforeninger*«) with about 81,000 members. To conduct the experiments and other arrangements to promote plant culture the agricultural societies or a union of these appoint *Local Plant Culture Committees* which engage *Experts* to carry out the experimental work. The agricultural societies and the smallholder societies cooperate separately within each district under the charge of a *plant culture committee for the district in question*, which also employs experts and publishes annual reports dealing with the experiments and other arrangements for the encouragement of plant culture

in the districts. Finally these committees co-operate with the state experimental department.

In Denmark the local experiments were started in the nineties, and the number of local experiments is now more than 3000 a year. In the beginning the local experiments almost entirely applied to the use of artificial manure, and still the manure experiments hold a very prominent position, but year by year the experimental work has been extended to nearly everything which has to do with plant culture.

The local experimental work is paid by the agricultural organizations but they are compensated by the state to the extent of 40 per cent (previously 50) of their expenses in making the experiments. The contribution, which the state in this way yields to the work of the agricultural organizations for promotion of plant culture, amounts to about 600,000 kroner yearly.

As intimated above the experimental work in plant culture in Denmark deals with almost all problems of interest to the practical farmer and the horticulturist, thus including experiments in soil improving, soil preparing, manuring and sowing, nursing of crops, harvesting and storing, crop rotation, controlling weeds and plant diseases, seed growing, comparison of plant varieties and strains, and at some of the stations also plant breeding. The last named work is to a great extent also done by private firms and persons.

Among the work performed at the state experimental stations we may besides the experiments with varieties and strains of cereals specially mention *the experiments with strains of roots, clover, pasture plants and vegetables.*

The object of these experiments is three-fold, 1) to designate the best strains so as to procure more valuable crops, 2) to support the work for improving the yield capacity of the strains and 3) to give more stability to the seed trade.

Before a series of these strain experiments — in which foreign strains also are included for comparison — is started, a public invitation for participation is issued. Everybody is allowed to have their strains tested on certain conditions, the tests being free to the applicants as the State bears all expenses connected with the experiments.

As an example we may mention strain experiments with fodder roots.

At first the experimental period was only one year, later on it became 3 years and it is now 4 years. Three samples of the same strain are used in the experiments, two from stock seed and one from commercial seed, and the experiments are always carried out on several stations simultaneously, comprising so many replicate plots that a reliable result is attained in every experiment. The strains are compared with regard to the following points: yield of bulk, percentage of dry matter, leaviness, inclination to run to seed, length of neck, colour, shape, easy lifting, branching of the roots and homogeneous-

ness, as well as possibly occurring crossing and diseases are noted. Classification of the strains is made on the basis of *the yield of dry matter per area unit*. The percentage of dry matter is therefore ascertained with the greatest accuracy possible. To procure pulp for analyses 50 middlesized roots, taken from each 3rd replicate plots, are sawn through in section 4–6 times. When there are 12 replicate plots, there will be 4 analyses, the average of these indicates the percentage of dry matter of the strain in that station. Strains classing in the best third, estimated at yield of dry matter per area unit, are designated as first class strains and have to their name attached a Roman numeral, stating in which experimental period the strain proved a first class one. Thus the Roman numeral V refers to the last experimental period (1914–1919) completed.

Culture experiments with strains of sugar beet are also now being carried out.

Experiments with strains of clover and pasture plants, started in 1909, and with vegetables, started in 1917, are now carried out on principles similar to those of the root experiments. Strains of clover and pasture plants are not marked by Roman numerals.

Detailed reports on the strain experiments are published in the »Tidsskrift for Planteavl« where information on the best Danish strains, their cropping capacity and other qualities may be found at any time.

On application to »*Det kongelige danske Landhusholdningsselskab*«, (The Royal Danish Agricultural Society), *Vestre Boulevard 34, København B*, information can be obtained about those Danish varieties and strains which are considered the most profitable and of which small samples can be spared for use in experiments abroad, either free or at reasonable price. The society will, if requested, assist in arranging trials with foreign varieties in Denmark to such an extent as circumstances might allow.

Seed from the best strains is immediately in great demand by the seed firms, because they know the farmers will require seed from these. The propagation is done by respectable firms under the supervision of professionally educated assistants in order that the firm fully can take over the responsibility that the seed, sold and sealed by it, is genuine as to strain. Every buyer, wishing to have it confirmed that the goods corresponds to the guarantee, can apply to The State Seed Testing Station (*Statsfrøkontrollen*), Copenhagen V, by whom a sample is drawn from the consignment. After sampling the lot is leaded by the State Seed Testing Station as a proof, that it has drawn a sample. This is then examined with regard to purity, amount of weed seeds, germinating speed and germinating power and with regard to genuineness of sort, if this is possible from the exterior of the seed or the colour of the sprouts.

If it is required to know, whether the goods are genuine as to sort, and, as regards the roots also whether they are genuine as to strain, and lastly as regards the cereals whether it is free from diseases, transferred with the seed sown, such as burnt and stripe disease (*Pleospora graminea*), the State Seed Testing Station undertakes in its control fields to sow the samples drawn and, on account of frequent investigations in course of the summer on a sufficient number of plants thus produced, to make a declaration with regard to the goods being genuine as to sort and strain and for seed of cereals with regard to its freedom from diseases.

Every buyer who has purchased under the compensation regulations of the State Seed Testing Station can by the said Control be furnished with proofs, so that compensation can be obtained if the goods are below the standard guaranteed by the seller. If desired, the State Seed Testing Station will, according to the rules, calculate the compensation for too low a purity and germinating power and too high percentage of foreign seeds.

Compensation for defects as to genuineness and freedom from diseases of seed of cereals, sold for export on the basis of the »Regulations for the State Seed Testing Stations control with seed of cereals sold for export« is fixed by the State Seed Testing Station in accordance with the said regulations. For other seeds compensation for defects as to genuineness is settled by a court of arbitration consisting of two representatives appointed respectively by buyer and seller, and an arbitrator selected by the Seed Control Committee, appointed by the Ministry of Agriculture.

Compensation Rules and regulations for control cultivation of cereal seeds and root seeds may be had on application to »*Statsfrøkontrollen*« (The State Seed Testing Station), *København V*, where also all further information may be obtained.
