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THE AGRICULTURAL RESEARCH CENTRE/JOKIOINEN CONSTRUCTION PROJECT 1974—1983

The Agricultural Research Centre was earlier situated in the city of Vantaa near Helsinki. The available field area, 50—60 hectares, was not sufficient for the Centre's needs and it was not possible to conduct animal experiments. Furthermore most of the buildings were old and not satisfactory for modern research purposes.

The Finnish state owns a large estate, 820 hectares of fields and c. 250 cows at Jokioinen, 120 km from Helsinki. It was thus decided to construct new buildings for the Agricultural Research Centre at Jokioinen.

The Institute of Plant Breeding has been situated there since 1928.

The project involved the construction of buildings with a total floor area of 36 000 m^2 and a volume of 150 000 m^3.

The total number of staff in Jokioinen is nearly 500.

STAGE I (1976—1979)

The first stage of the construction project included:

— Institute of Animal Husbandry, with space for 200 bulls, 200 sheep, 6 000 laying hens, 500 cocks, 3 000 chicks, 3 200 broilers, and housing for animals in digestibility experiments.
— Institute of Plant Husbandry
— Institute of Agricultural Chemistry and Physics
— the heating plant
— pot experiments sheds, a greenhouse, machine hall, and a potato barn including 26 separately air conditioned climate chambers
— 16 staff apartments

STAGE II (1979—1981)

The second stage of the project included:

— Institute of Animal Breeding
— Institute of Soil Science
— Central Laboratory
— Computing Service
— Library and Information Office
— meeting rooms
— Administrative Bureau, old manor house build 1798 was repaired

STAGE III (1981—1983)

The final stage comprised:

— Institute of Plant Pathology
— Institute of Pest Investigation
— greenhouses and storage building

The Pesticide Regulation Unit will be transferred under the National Board of Agriculture during 1984.

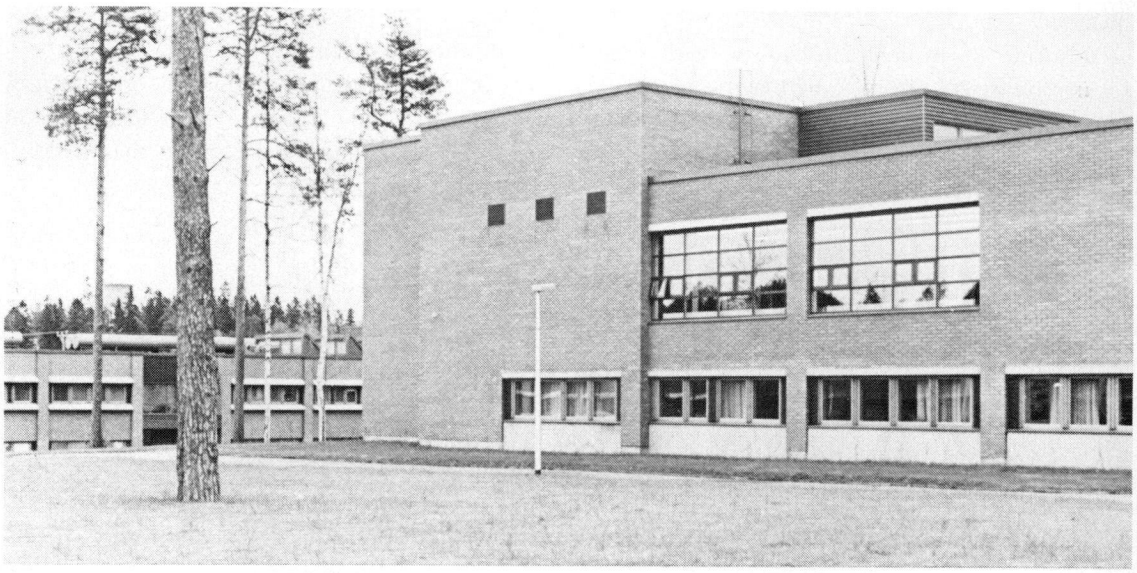
The Institute of Plant Breeding functioned in the Jokioinen Estates from 1928 until the completion of its own building in 1971. New greenhouses for plant breeding experiments will be completed in 1986.

JOKIOINEN SEED CENTRE

The seed centre, which was established at the Jokioinen Estates in 1945, was joined together with the Estates to the Agricultural Research Centre in 1971. Since 1972, the Jokioinen Seed Centre has functioned as a business enterprise in close connection with the Institute of Plant Breeding.

The main storage building with packing rooms was completed in 1983. About 45 % of Finnish arable land is sown with seed varieties produced by the Institute of Plant Breeding.

The new facilities were inaugurated on 15.6.1983. The lectures, speech and greetings given on this occasion follow below.



The effective area of the new buildings is 26 000 m^2.

ANNALES AGRICULTURAE FENNIAE, VOL. 22: 249—253 (1983)

DIRECTOR GENERAL J. PAATELA
Agricultural Research Centre

The standard of living has risen to a particularly high level in industrial countries compared with agrarian societies, where the majority of the population is involved in agricultural production. When economic growth was at its strongest FAO presented calculations which indicated that a decrease in the proportion of the agricultural population by 25 percentage points means the doubling of the national income per capita. In Finland there are not more than 200 000 people employed in agriculture any more, i.e. approximately 10 % of the working population, and the standard of living is fairly high. However, the importance of agriculture in securing food supply capacity has not diminished but rather grown. The food processing industry acquires approximately 90 % of its raw materials from domestic agriculture. We are not content with quantitative objectives alone; more and more attention is being paid to quality from the point of view of industrial processes and the diet of the consumer. The chain of food production from the producer to the consumer involves about 40 thousand million Finnish marks yearly. The further development of the domestic food supply capacity nowadays receives unreserved appreciation, and agriculture is more and more widely regarded as an important contributor to national security. On the other hand, the growth in the production of certain key products has led to overproduction, which causes a considerable burden on the economy and has proven a difficult issue in agricultural policy.

The yields of field crops per hectare as well as the yields from livestock are particularly high in Finland though agricultural production takes place in the northernmost fields of the world. While the yields of field crops were still in the region of 1 200 kilos a hectare in the 1920s and 1930s they have more than doubled to the present day. The annual milk yield of cattle has also more than doubled over the same period and is nowadays an average of approximately 5 000 kilos. Thanks to breeding the bacon fat layer of pigs has become thinner year by year and their daily growth increment is 200 g more than before or almost 800 g. Hens lay over 100 eggs a year more than before and broiler chickens reach their selling weight in half the time they took 20 years ago. It is estimated that the hectare yields of field crops will continue to grow by 1 % annually. The present milk production level in Finland will be reached with 7 000 fewer cows in each of the following years or, if the number of cows is kept the same, the effect of breeding will result in about 30 million additional kilos of milk annually at the present level of feeding.

The progress in plant and animal breeding and the development in production technology thanks to new research findings have made

growth in production possible. The growth in production also derives from increased use of production inputs — fertilizers, machines, energy — and also means greater dependency on imported production inputs. If world food production is to double by the year 2000, as it should if the requirements for nourishment in the developing countries are to be maintained at least at their present level, this may cause pressure on the real prices of the above-mentioned production inputs. The increasing competition for the dwindling raw material supplies will thus be more sharply felt and will become apparent in the form of zero growth, inflation pressure and high levels of unemployment. On the other hand, if the aim is greater self-sufficiency and lesser dependency on imported production inputs, the researcher will have to discover and demonstrate by calculation how and under what conditions our food supply capacity can be maintained by using domestic production inputs. Creativeness, i.e. research, which serves as a foundation for know-how, is an important production factor in addition to capital and work. New knowledge, and its most valuable part in particular, is of crucial importance in maintaining and developing production, securing employment, increasing amount of income, and more generally in developing society and satisfying its needs. Agricultural research is constantly in a key position in the development of the nation's food supply capacity and thus investment in research is highly desirable.

However, the total research input in Finland is smaller than in other comparable countries. In 1981 it was 2 500 million marks, which is only 1,2 % of the GNP in market prices, while in many western countries it was in the region of 1,7 %. A conscious effort has, however, been made to direct the means at the disposal of research to dynamic target research, and the means will be increased by the state to 1,8 % of the GNP in the coming years. If the quantitative increase in spending on research by the business sector continues at its present rate, the total investment input may rise to even 2 % of the gross national product by the end of the decade in Finland. This will render Finland a position which stands international comparison insofar as the material and intellectual aspects of research and development work are concerned.

The main objective of agricultural research is the acquisition of new knowledge for the promotion and development of production. Larger yields and output usually mean a decrease in production costs per product unit, until the additional output decreases towards its limit value or is not even reached because of unfavourable production conditions. One of the main objectives of agricultural research is to develop production so that the production costs at any particular time remain as low as possible in comparison to the output and thus ensure that the consumers get their food at a reasonable price and farmers make a reasonable living out of their production. Because of increasing energy prices and a larger stock of machines, production costs have, however, risen while the average field area on farms has grown relatively slowly. An attempt has been made to use specialisation as a way to increase the area of cultivated land but the risks of mono-culture farming have become apparent at the same time. The risks are increased by the larger machine stock as a result of the packing of the soil as the air and water economy of the field and its biological activity are disturbed. Nutrition extension work, on the other hand, has paid increasing attention to the quality of food products; thus agricultural research together with other research in the food sector is faced with the obligation of securing and developing a comprehensive food supply capacity for consumers.

The present total research input is approximately 2 500 million marks, of which the proportion of research in agriculture and forestry is about 10 %. Roughly half of this, i.e. 125 million marks, is spent on agricultural research. The proportion of the public sector was 59 million marks in 1982, of which the Agricultural

Research Centre's share accounted for 55 million marks. The figures do not include investment costs or expenditure on higher education, which is under the Ministry of Education. Because the Agricultural Research Centre uses the main part of the public sector's research means its external research conditions must naturally also receive sufficient consideration. We are here today to witness that the Research Centre has been provided with modern facilities and valuable equipment, spacious facilities for animals, and vast experimental fields. The situation was different in Tikkurila, where the Research Centre had carried out research and experiments since 1898, i.e. for 85 years. There the Research Centre had only modest cattle sheds and a limited field area, whose value for experiments suffered due to the growth of the city of Vantaa and its industrial plants. The background to the Research Centre's transfer to Jokioinen was created by the proposals put forward by the board of the Research Centre for improving the working conditions of its various units, and by Parliament's decision to transfer the Jokioinen Estates under the Agricultural Research Centre as of March 1, 1971.

The planning of the construction started at the end of 1972. The land development plan for the Jokioinen area was completed in 1973, and supplemented later as the planning continued. It was drawn up by the architect's office Olli Kivinen Ky, which was also assigned the planning of the institutional buildings of the area. As a result of area comparisons the location and grouping of the planned buildings were included in the land development plan. Primary criteria for the different alternatives were connection with the central built-up area according to the master plan, harmony with the landscape, use of the existing road network, economic aspects, construction in stages and extension later, and historical factors.

The construction work was carried out in three stages. The preliminary plan for stage I was completed in April, 1975, and stage I was fully completed in autumn 1979. The Institute of Agricultural Chemistry and Physics, the Institute of Plant Husbandry and Institute of Animal Husbandry moved from Tikkurila by the end of 1979. The heating plant had been completed earlier, in spring 1977, as well as the Lintupaju experimental bull house, which was completed in summer 1977, and the sheep shed on the Kuuma farm and the staff residential block in summer 1978. Residential blocks for 15 families were built for the technical staff of the institutional buildings. A shed for research animals, potato barn, threshing barn, machine hall, green-houses, pot experiment halls, poultry houses and a soil sample store were also built to serve the institutes.

The preliminary plan for stage II was completed in January, 1977 and the building design was started in May the same year. The construction work was started in June, 1979 and stage II completed in April, 1981. The Institute of Soil Science, the Institute of Animal Breeding, the Computing Service. Library and Information Office moved into these premises. The isotope laboratory moved to the Central Laboratory, which is a new unit at the Research Centre, and provides in addition to the previous isotope laboratory considerable facilities for analytical services for the institutes and experimental stations. The meeting, sports and recreation facilities are also new. The main building of the Jokioinen Estates was renovated during stage II and the Administrative Office moved there at the beginning of December, 1980. The dining-hall was also renovated during stage II.

The preliminary plan for stage III was completed in June, 1978 and the building design was started in October the same year. Due to overheating in the building sector the start of construction work had to be postponed by a year till the end of 1981, and the buildings were completed in February, 1983. The last units of the Research Centre, the Institutes of Plant Pathology and Pest Investigation, moved from Tikkurila to Jokioinen by May 1, 1983. The

completion of the three stage construction project thus took approximately 10 years. The total area of the buildings is 36 000 m^2, building volume 150 000 m^3 and the total cost about 101,2 million marks. The green-houses of the Institute of Plant Breeding, which moved to Jokioinen earlier, are still under construction. The estimated total cost of this project is 17,6 million marks and it will be realised in 1985 and 1986.

The Agricultural Research Centre will be better able to produce and distribute knowledge in these new premises and thus improve the utilization of fields and cattle stock in Finland. There are 240 dairy cows at the Estates and the livestock researchers can now choose at any particular time a total of 64 cows which are at the same production stage and house them for feeding experiments in the renovated experimental cow shed at Lintupaju. There is a bull house for 200 bulls for beef cattle research on the same farm. On the Kuuma farm there is an up-to-date sheep shed with room for 200 ewes, lambs and rams. Furthermore, there are the hatchery and chicken rearing house, poultry house for broiler chickens, poultry house for laying hens and the hen breeding house for a total of 10 000 hens. In addition the Institute of Animal Husbandry has premises for experimental animals and a fodder mixing plant, where the mixtures for the Research Centre's animal experiments are prepared. The plant production units have 800 hectares of fields, of which approximately 100 hectares are used as experimental fields, 120 hectares as additional fields for the Jokioinen seed centre, and the majority for fodder production.

The Agricultural Research Centre has also a network of experimental stations with 14 regional research stations all over Finland and a swine research station in Hyvinkää. Their total field area is over 1 000 hectares and it is partly used for various field experiments. Livestock research is concentrated to the Northern Savo Experimental Station at Maaninka, where there is a modern research cow shed for 96 dairy cows, and to the North Ostrobothnia Experimental Station at Ruukki with a cattle shed for 100 bulls.

The Agricultural Research Centre's operating principle is aimed at developing and increasing the versatility of plant and livestock production in Finland, preventing environmental damage caused by agriculture, and securing the continuity of a quantitatively adequate food production, which is also able to meet the consumers' qualitative demands. Approximately 55 million marks has been reserved for the expenses arising from these tasks in the state budget for this year. The budget also includes an additional 15 million marks reserved for investments. The Agricultural Research Committee has provided capital of over one million marks. The Finnish National Fund for Research and Development, the National Research Council for Agriculture and Forestry of the Academy of Finland, and the business sector also finance research.

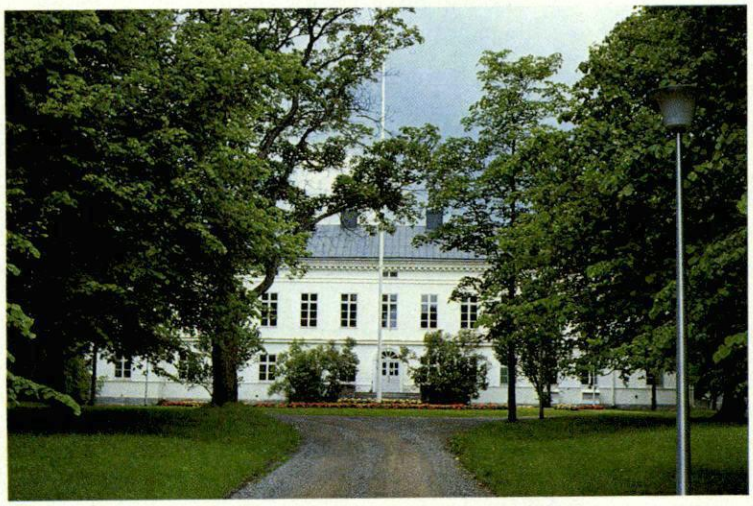
The plans for research projects started this year have been dealt with by the research committee and its sub-committees, and as far as research at the Research Stations is concerned by the committees of the respective research stations. Research proposals have been combined where necessary and coordinated to eliminate unnecessary overlapping of research and to make sure that they are sufficiently wide-ranging and comprehensive. The above mentioned groups have invited external specialists in various fields, experts, and representatives for the farmers to examine the proposals, so that the essential needs for information in the different fields can be taken into account.

Forty-five research projects have been started this year, 255 research projects continue, and at the beginning of the year 41 research projects were transferred from the research register to amongst research projects ready for publication, which now total 100. There is thus a total of 400 research projects being worked on; an average of

0,8 staff work years will be spent on each project. If the indirect work involved in preparing the background for research work is also considered, the work contribution per project totals 1,6 staff work years. Thus the total work input in research is 640 staff work years.

The transfer of the Agricultural Research Centre to the Jokioinen Estates has now been completed and the research work has started. I am particularly grateful to the State and want to express my sincere thanks to it for having provided the capital for building modern, adequate facilities with the necessary research equipment for agricultural research. The Research Centre also expresses its gratitude to the National Board of Building, which as the construction authority has been most flexible in its collaboration with the user, and the designers and the workers, and to all, who in one way or another participated in the project that has now reached completion, without forgetting the members of our own construction committee, who have taken an active part in the various stages of the project. The completion and inauguration of the new facilities will naturally mean increased responsibility and greater expectations from us. I believe that we will be able to fulfil these expectations. The good spirit and devotion of all the staff at the Research Centre show that we enjoy our work here and are grateful for these new facilities.

Mr Minister of Agriculture and Forestry, honoured guests, ladies and gentlemen — I wish you all heartily welcome to the inauguration of the Agricultural Research Centre's new buildings.



The administrative bureau of Agricultural Research Centre is located in the old manor house of Jokioinen Estates.

ANNALES AGRICULTURAE FENNIAE, VOL. 22: 254—255 (1983)

T. YLÄJÄRVI
Minister of Agriculture and Forestry

Finnish agricultural production is of a high standard despite the fact that the growth conditions are not always favourable in these the northernmost fields of the world. Unsettled weather conditions cause considerable annual variation in yields. The dry periods in early summer sometimes limit the growth considerably; autumn rains may cause difficulties in harvesting cereals and storing them while maintaining satisfactory quality. A particular hardiness and security of cultivation is therefore required from plants growing in Finland.

The basis for successful agricultural production is the cultivation of hardy and secure field crop cultivars. Plant breeding has done particularly valuable work towards this end. Domestic plant breeding produces mainly varieties which mature early enough, are resistant to lodging and are of improved quality. We will have to rely considerably on plant breeding also in the future. New techniques — haploid breeding, cellular cultures, gene manipulation — will provide us with the opportunities for producing better property combinations.

Breeding has also enabled livestock production to increase the quantity and quality of yields, feed utilization efficiency, and the health of livestock. The application of embryo transplantation in livestock breeding in the future will make it possible to reach breeding objectives considerably faster than with present methods.

Research is in a key position in attempts to adjust agricultural production to the natural growth conditions and to develop the utilization of natural resources as a basis for food production. The fields man has cleared in nature are cultural ecosystems which remain fields only through continuous cultivation; even then the functional principles of natural economy have to be taken into consideration in cultivation. The soil nutrients must not be exploited and their balance upset. The fertility, microbial activity, aeration and water economy of the soil, i.e. the soil's growth capacity, must be improved and maintained. This is the only way to guarantee the continuous production of adequate yields.

It is mainly thanks to research that the standard of agricultural production is so high. Productive activity is so efficient that the domestic agricultural production greatly exceeds the total demand in the case of some products. Overproduction has to be marketed at low world market prices, and the farmers have to assume marketing responsibility for the excessive production. This fact may give rise to the question of whether it is worthwhile making considerable investments in agricultural research. In my opinion agricultural policy and the financing of agricultural research are two separate matters and should not be confused with each other.

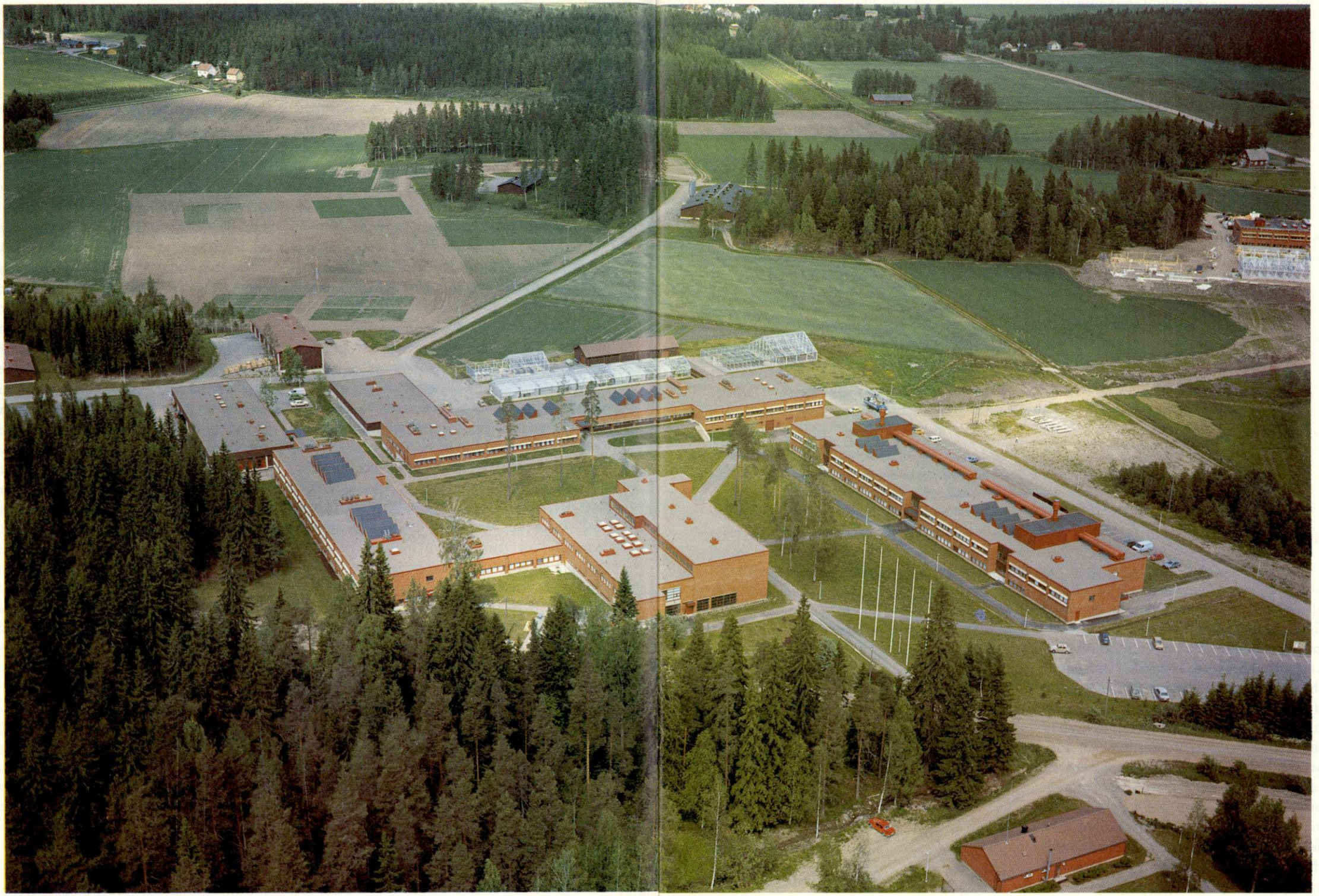
Research has a continuous task in promoting and developing production. Research combined

with extension services gives the farmer the required knowledge for the most effective production. It is not always advisable to try to reach maximum yields and results; production should be suited to the most appropriate level of the input-output ratio with an economic optimum as the aim. Maximum yields do not necessarily imply excellent quality. Thus the farmer may be able to make the same living with a lower, but qualitatively better production. This way the consumer — the central target in all food production — also benefits from it.

Very little research has been done on the quality of agricultural products. Now that the interrelationship between nutrition and many endemic diseases has been discovered, the requirements for the supply of healthier food have become stronger. In attempts to produce healthier food it is not only the possible biocide residues that should be considered but also the chemical composition of food products, i.e. their intrinsic quality. It is considered necessary to improve the impoverished micronutrient composition, unstable ratios of minerals and vitamins, and low fibre contents. These aspects, as well as the taste, preservation, and appearance of the products can be affected by cultivation techniques. This may open up new prospects also in agricultural policy. The environmental pollution in continental Europe has already had adverse effects on the purity of food products. This may open up new markets in continental Europe in the near future for pure, high quality Finnish food products.

I find it of particular importance that the Institutes of the Agricultural Research Centre now have a Central Laboratory with modern equipment. This enables the Agricultural Research Centre to direct its research work to a key sector, i.e. the quality of food products.

The Ministry of Agriculture and Forestry notes with satisfaction the Agricultural Research Centre's constant efforts to conduct a research policy which aims at serving the farming population in producing food products for the people. Now that the research conditions have been greatly improved by the new facilities the Ministry is looking forward to new, valuable research results. The main part of the Jokioinen construction complex having now been completed I thus officially open the buildings for use. I wish a successful and prosperous future for the work of the Agricultural Research Centre.



ANNALES AGRICULTURAE FENNIAE, VOL. 22: 258—263 (1983)
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PLANT PRODUCTION RESEARCH IN FINLAND

PAAVO ELONEN

ELONEN, P. 1983. **Plant production research in Finland.** Ann Agric. Fenn. 22: 258—263. (Agric. Res. Centre, Inst. Agric. Chem and Phys., SF-31600 Jokioinen, Finland.)

The aim of plant production research is to develop agriculture so that fields and gardens will produce as abundant high quality yields as possible for human nourishment and animal fodder while keeping the production costs to a minimum.

The Agricultural Research Centre carries out plant production research in seven institutes and 14 research stations. The research is divided into three main areas. The first deals with soil management: the analysis of soil growth properties, the development of fertilization, tillage and soil improvement methods and the organization of soil water economy. The second main area in plant production research is plant breeding and the development of cultivation techniques. Plant protection is the third main area. Its objective is the development of control methods for weeds, plant diseases and pests. These three areas are so closely connected with each other that the successful development of plant production requires smooth cooperation between all of them.

ACHIEVEMENTS AND PRESENT AREAS OF EMPHASIS

The following is a short survey of the present areas of emphasis and of some results which have had a considerable effect on the development of Finnish agriculture over the last two decades. It should be emphasized, however, that these important results are not to be attributed only to the Agricultural Research Centre but that they are the result of smooth collaboration between many contributors. Factors of crucial importance in promoting Finnish plant production are the inputs of other research institutes, advisory organizations and business, and the correct attitude of the Finnish farmer to the research results.

Increasing yields

During the last two decades the yield levels of Finnish cultivated plants have risen considerably. This is particularly true of grain crop cultivation. While the grin-producing area has grown to account for approximately half of the total field area nowadays, the grain yields per hectare have risen by approximately 2/3 over the last two decades. (Fig. 1.)

The annual variation in yields is, however, fairly large. Deviations of approximately 20 % from the trend yields are possible. Large variations in yields are natural here in the

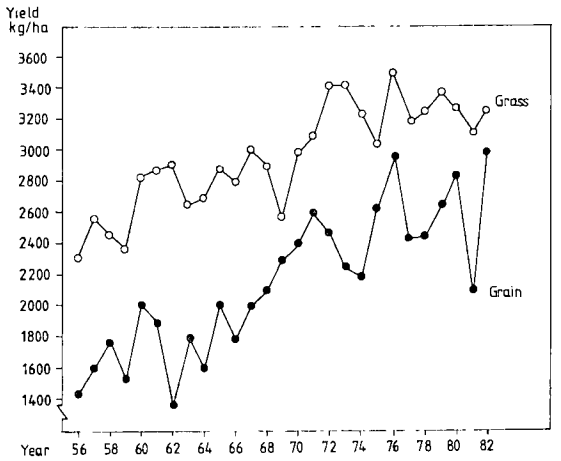

Fig. 1. Development of the grain yields and the dry matter yields of grasslands in Finland since the year 1956.

peripheral areas of plant production, where even relatively slight differences in the weather conditions have a considerable effect on the growth of plants. In addition to using soil management, cultivation techniques, plant breeding and plant protection to increase cropping potential researchers have also attempted to give more consideration to the regional variation in weather conditions. The causes of the variation in the yields of different plant species and varieties are surveyed regionally in a wide-ranging research project called "The risk susceptibility of cultivated plants". An extentive joint research project was started over a year ago to develop the regional meteorological service for agriculture. The annual variation in yields causes so much trouble to all agriculture that he improvement of cropping potential is one of the most important areas of emphasis even nowadays.

The development of fertilization

The main reason for the sharp rise in the yield level has been the vastly increased use of artificial fertilizers. Since the early 1960s the use of nitrogen fertilizers has almost quadrupled, and the use of phosphate and potassium fertilizers has almost doubled. The present level of fertilizer use was reached in the mid 1970s and according to present studies it seems nearly sufficient — on the basis of the very latest trials phosphate fertilization could be reduced slightly. (Fig. 2.)

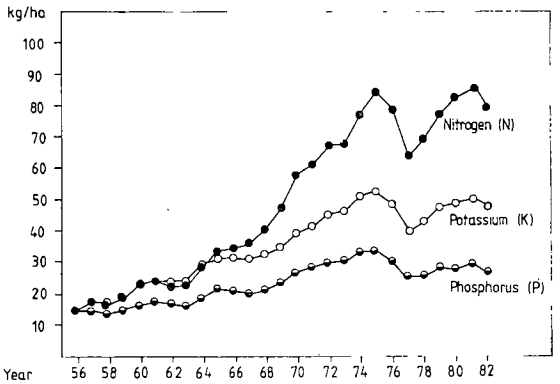

Fig. 2. The use of fertilizer nitrogen, phosphorus and potassium in Finland since the year 1956.

The development of the placement method in fertilizer application

Fertilizing methods also developed fast in the 1960s. It was observed that surface fertilization was inadequate mainly for two reasons: in root system research it was discovered that the surface layer of soil sown with spring cereals stays almost rootless to a depth of 5 cm in early summer and the plant cannot therefore make use of the fertilizers on the surface of the ground. It was also demonstrated with soil samples taken in layers downwards from the surface that the fertilizer nutrients do not move downwards to the roots during a dry season.

For these reasons an attempt was made to place the fertilizer deeper in the ground to reach the root system directly, and drilling machine for this purpose was developed at the beginning

of the 1960s. It was equipped with strong coulters, which made it possible to drill the fertilizer down to the desired depth.

Thanks to fertilizer drilling the growth of cereals improved considerably. Root system research showed that the cereals produced dense root system round the drilled fertilizers. It was concluded that the right depth for a fertilizer was about 8 cm. Another important observation was also made: the roots of cereals grow very fast sideways and can even find a fertilizer drilled some distance away if the fertilizer is at the right depth.

This observation made it possible to develop the method further so that the fertilizer was applied at the same time as the seed and placed in the middle of the every second spacing between seed rows. Thus the plant receive fertilizer nutrients from only one side of the seed row. (Fig. 3.)

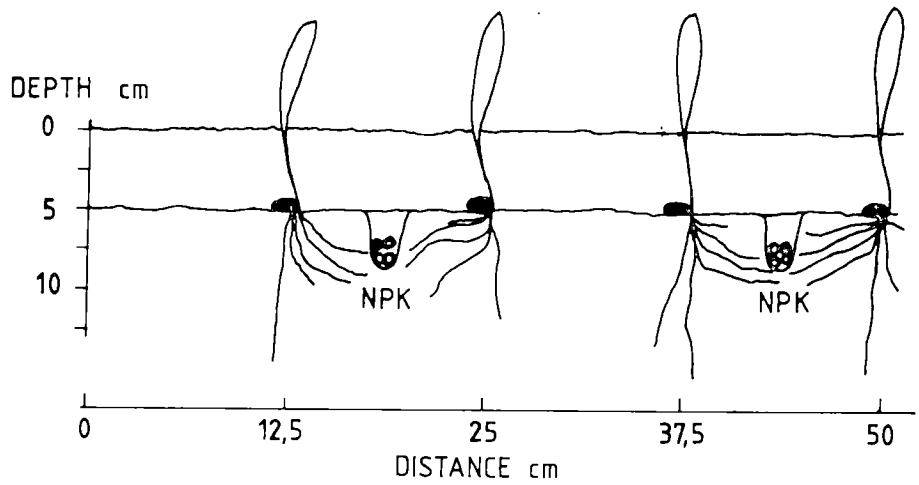

Fig. 3. The principle of the combined seed and fertilizer drill method. The spacing of seed rows is 12,5 cm and the sowing depth 5 cm. The fertilizer is placed in the middle between every other seed row into the depth of 8 cm.

This was sufficient to meet the nutrient requirements of the cereals. Dense root system developed in every fertilized row spacing, while in every non-fertilized row spacing the development is weak. The great advantage of this combined seed and fertilizer drill method is possible to sow the seed and apply the fertilizer at the same time and that the resistance to draw the fertilizing unit at the wide coulter spacing is relatively low.

The development of the combined seed and fertilizer drill method can be considered the major single improvement in plant production research in the 1960s. The method is widely used on Finnish cereal farms and Finnish seed and fertilizer drilling machines are also manufactured for export. Thanks to combined seed and fertilizer drilling, yields have improved by about 15 % in Finland, and at the same time the grain ripens earlier and is of more uniform quality for threshing. (Fig. 4.) The method can be used as such in the cultivation of oil seed crops. Attempts have also been made to use the placement technique in the cultivation of potato, sugar beet, and field vegetables and root crops.

A continuing comprehensive research project

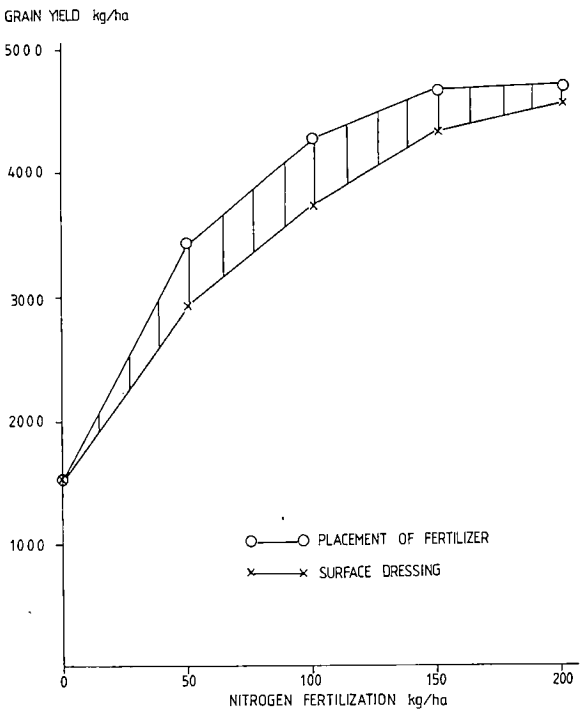

Fig. 4. Effect of placement of fertilizer compared to surface dressing at different nitrogen fertilization levels. Grain yields of spring cereals as the mean values of long-term field experiments in Southern Finland.

into the more efficient use of manure has shown that the placement technique can also be applied to the spreading of liquid manure.

Reducing nutrient losses

The placement technique has ment a considerable improvement in the degree of utilization of fertilizer nutrients and smaller nutrient losses. (Table 1.) In spite of this nutrient losses are still rather large; as much as about 40 % of nutrients is not taken up by plants and enters the watercourses, atmosphere or ground as useless compounds. This means a loss to agriculture and it may also be detrimental to the environment. Intensive research work is being done to discover the reasons for nutrient losses and the ways to reduce them. The transfer

Table 1. Improvement of recovery of fertilizer 120 kg/ha) by placement technique and irrigation. Experiment in Southern Finland.

Method	Apparent recovery of nitrogen by spring wheat	
	at ear emergence	at harvest
Without irrigation		
surface dressing	12 %	36 %
placement of fertilizer	24 %	60 %
Irrigated		
surface dressing	38 %	76 %
placement of fertilizer	54 %	96 %

to Jokioinen has provided us with modern facilities and research equipments to help us in this work.

Drawing up fertilizing recommendations

At the same time as fertilization has developed into the most important production factor in plant production it has meant considerable additional costs to the farmer. Disproportionate or extra fertilization is expensive for the farmer. For this reason the importance of the soil testing method which was initially developed for the use of the advisory services and farmers, has grown year by year. It has been defined and developed further. It seems that in the near future we will see fertilizing recommendations which are based on fertilization experiments and soil analysis, and which can be jointly accepted by research, advisory services and the fertilizer industry.

Sprinkler irrigation

Other methods for improving the general conditions for plant production include sprinkler irrigation, which developed into a crop farming method in Finland as late as in the 1970s. While the irrigation area was only a little over 10 000 hectares at the end of 1960s, the present

approximately 8 000 irrigation units are able to irrigate over 100 000 hectares. With the help of research detailed sprinkler irrigation instructions have been drawn up for dry spells. Sprinkler irrigation is also the most important frost protection method.

Mechanization of cultivation work

The use of machines in cultivation work and the development of tilling techniques have also improved the general background for plant production. The sowing season used to be a month long when horses were used for the sowing work, but on most farms nowadays it does not last more than a week. This means more efficient utilization of the short growing period.

The problem of soil compaction

The use of machines in the cultivation work and the heavier machine stock have led to a difficult problem — excessive compaction of the soil. A compacted soil prevents the access of melted snow and rain water into the drain pipes delaying the cultivation work and making it more difficult. Compacted earth is also a poor substrate. The problems of compacted soil are considered of crucial importance by the farmers, too. The alleviation of these problems has become the major challenge for soil management research.

Plant breeding and protection

Plant breeding and protection have been well able to answer the present day challenges. We have nowadays stiff-strawed cereal varieties, which can make good use of relatively abundant fertilization and are well-suited for combine harvesting. The proportion of domestic varieties developed for Finnish conditions had grown year by year. It should be noted that as a proportion of all field plant varieties cultivated in Finland the number of varieties developed at Jokioinen has grown from less than 10 % to over 40 % in two decades.

Chemical weed control has also developed so much that nowadays we have weed-less stands of cultivated plants and we are able to control even very hardy weed species. Nowadays weed spraying is done yearly on about 3/4 of the area under cereals. In addition to chemical control in preventing plant diseases research is concentrating more and more on breeding for resistance, i.e. breeding varieties which are resistant to plant diseases. Pest control has also developed considerably, and the Finnish farmer can, for instance, avoid the damage caused by aphids nowadays.

'Green line' grass cultivation

The extensive 'green line' research project was started in the 1960s. It was based on the production of grass fodder rich in protein with the help of nitrogen fertilizer. It is largely thanks to this research that the production of good fodder from pasture and silage has advanced in Finland, so much so that even with highly productive cattle we can do without imported protein feeds.

Two problems have, however, appeared in the 'green line' cultivation: the overwintering of fertilized pasture has become poorer, and the proportion of clover in grass has decreased sharply. Fairly extensive research has been started to improve the overwintering of grass and develop the cultivation of clover.

The cultivation of oil seed plants

One of the most notable results of plant production research is the advancement in the cultivation of oil seed plants. The breeding of varieties which are free from erucic acid and glycosinolate have led to an increase in oil seed plant cultivation from zero level to almost self-sufficient production within only a few years.

Potato growing

The most notable progress in growing potatoes has been the establishment of the Seed Potato Centre and the start-up of the production of healthy seed potatoes. This has been made possible by a method developed at the Institute of Plant Pathology by which the meristematic tissue of the potato can be freed from viral diseases.

The cultivation of berry plants

The same method has also proven successful in the production of healthy berry plant seedlings. This has led to the establishment of Production Unit for Healthy Plants thus the berry farmers can get plant material that produces better yields from the nurseries.

The breeding of fruit trees

Regarding the complex garden research it should be mentioned in particular that the domestic breeding work, which was started about 20 years ago, has started to produce results, and that the first Finnish fruit tree varieties will soon be available.

Biological control and cultivation methods

It may be mentioned finally that even though plant production research mainly attempts to promote intensive cultivation, it also values ''biological cultivation''. The Institute of Pest Investigation is most advanced in this respect; it has been developing biological pesticide control methods for several years. As an example of the results in this research area it may be mentioned that about 75 % of farmers growing cucumbers in green-houses use the predatory mite to fight the cucumber's worst enemy, the two-spotted spider mite.

The methods of ''biological cultivation'' may gradually spread themselves from green-houses into gardens and onto fields. The official agricultural research is willing to support this development as long as it is based on the natural sciences and not on biodynamics or other mysticism.

It's some 100 hectares experiment fields at Jokioinen.

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Seria ANIMALIA DOMESTICA N. 69 — Sarja KOTIELÄIMET n:o 69

RESEARCH IN ANIMAL PRODUCTION IN FINLAND

KALLE MAIJALA

MAIJALA, K. 1983. **Research in animal production in Finland.** Ann. Agric. Fenn. 22: 264—272. (Agric. Res. Centre, Inst. Anim. Breed., SF-31600 Jokioinen, Finland.)

A review was made of the development of Finnish animal production during the 70 years (1912—1983) when animal research has been performed by the Agricultural Research Centre or its predecessors. Curves based on agricultural statistics showed that large quantitative changes in the production had taken place. The numbers of ruminants and other animals eating roughage had decreased while monogastric animals living on concentrates had increased. There were also changes in the importance of various products. Considerable development was gained in the production capacity of many animal species. The development was considered to be based jointly on research, extension service and on farmers' efforts. Research had been very important in many cases and its importance was considered likely to increase while challenging the future problems.

INTRODUCION

Research in animal production started in Finland about 70 years ago when, in 1912, the department of Farm Animal Biology was founded at the Institute of Agricultural-economical Research at Tikkurila. This was divided into two separate departments, Animal Husbandry and Animal Breeding in 1924. Some research has also been carried out at some experimental stations.

In the following I will review the various fields of research in animal breeding and husbandry, their earlier achievements and future tasks concerning different animal species.

THE SCOPE OF ANIMAL RESEARCH

There are about twenty farm animal species in Finland (Table 1). Many of them are able to convert material inedible to man, into valuable products. Such animals would be, in particular, ruminants like cattle, sheep, goats, and reindeer, but also horses, rabbits and geese.

Table 1. Farm animal species kept in Finland and their products.

SPECIES	Food Stuffs			Clothing				Others	
	Milk	Meat	Eggs	Wool	Fur	Skin	Feather	Work	Recr.
CATTLE	×	×				×		(×)	
SHEEP	(×)	×		×	×	×			
GOAT	×	×		×		×			
REINDEER		×			×			(×)	
HORSE	(×)	×				×		×	×
RABBIT		×		×	×				
PIG		×							
HEN	×	×							
TURKEY		×	×						
DUCK		×	×						
GOOSE		×	×				×		
QUAIL		×	×						
MINK					×				
FOX					×				
RACCOON DOG					×				
POLECAT					×				
TROUT		×							

The underlined species are able to utilize green feed.
(×) = Used for the purpose in some other countries.

The most important function of farm animals is to produce high-quality protein, like milk, meat and eggs, for man. They also produce clothing material, such as wool, furs, leather, and feathers. Some of them are used as sources of power and recreation. On the whole, they are very important sources of employment and income.

The research in animal production will improve important animals and their products to make them as economical as possible at each particular time and preferably being based on domestic inputs. Research in breeding concentrates on developing programs and methods to improve the practical suitability of different animals. This work has to rely heavily on field data.

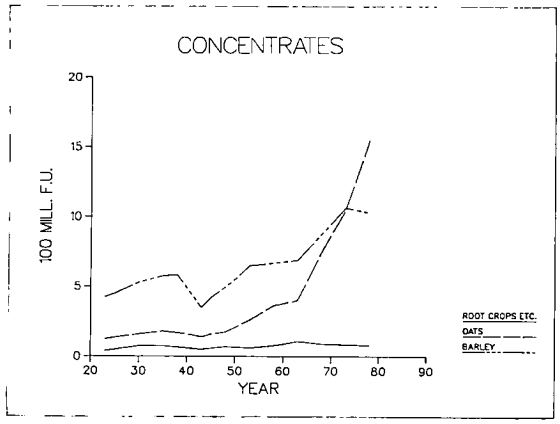
The research in animal husbandry deals with the improvement of the efficient utilization of genetic productivity of animals corresponding to appropriate and economical feeding required for animals' nutrition. It has to test the usefulness of various feeds, the nutritional requirements in animals, and the silageing methods. The work is mainly carried out with animal experiments and laboratory research.

The changing choices in feeds

The ratios in quantity of available feeds have experienced big changes during the last 60 years: the total yield of barley has increased ten-fold and that of oats has doubled (Fig. 1). Barley has overtaken oats. In roughages, hay has decreased while the production of silage has gone up by a factor of ten in two decades and is approaching the same number of feed units as hay. This has meant an improvement in concentration, protein content and digestibility. The straw yields of spring cereals have also increased, but their importance as feed is almost negligible.

There have been changes also in the importation of concentrates (Fig. 2). The import of high energy feed has decreased drastically, while that of oil concentrates has somewhat decreased. There has, however, been a considerable increase in the import of animal protein feeds. Research towards reducing the amount of foreign protein concentrates continues to be topical.

According to feed consumption statistics of milk-recorded herds the use of domestic grains for cows has quadrupled in the last 40 years (Fig.



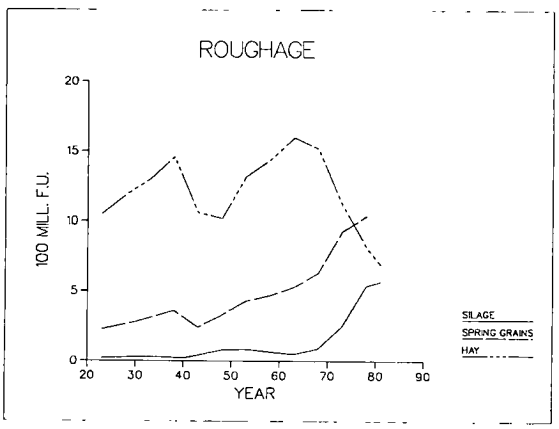


Fig. 1. Total yields of different feeds in Finland.

3). The use of protein concentrates, hay, pastures and straw has decreased, but the use of silage has increased rapidly.

Thus we have made progress in increasing the proportion of home-produced feeds what has also been the aim in research.

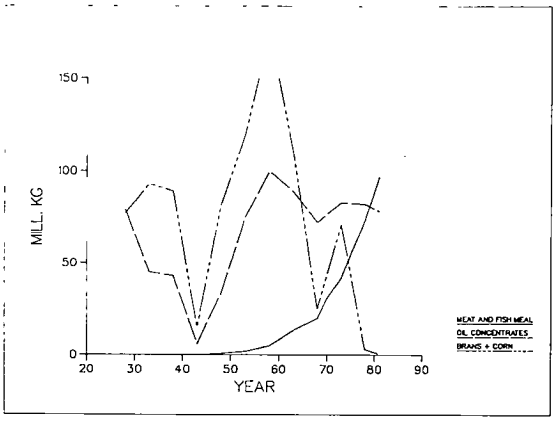


Fig. 2. Imports of various concentrates to Finland.

The development and future of cattle production

The most important farm animal in Finland is still the cow, although their number has decreased by 40 % during the last 20 years (Fig. 4). On the other hand, the number of calves under one year has increased being now the same as the number of cows.

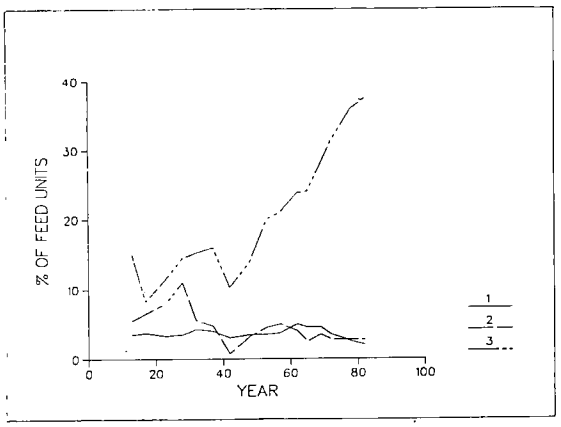
The average yield from a cow has tripled since 1910. As a result the feed requirement per kilo of milk has decreased by about 0,5 feed units, the current value of which is nearly 75 p (ca. 0,13 US$).

In cattle the improvement in the genetic quality represents a good quarter of the total increase over this period. The genetic improvement has, however, been faster during the last few decades, thanks to artificial insemination, frozen semen, computers and breeding programs utilizing these. The annual rate of genetic progress is today over one per cent, i.e. about half of the total rate.

The yield level has thus improved faster than the genetic quality, and is thus probably approaching some kind of upper limit. As a result the productive value of a feed unit decreases and the health of cows is being under more and more severe test. There is thus good reason to continue efficient breeding work but with more varied objectives which also include inherited health characteristics.

The overproduction of milk is no reason to stop the development of the cow's genetic quality. This can be utilized in many ways, e.g. by producing the same yield with less and cheaper feeds.

The evaluation of the objective in cattle breeding has become more important for many reasons. We should be able to predict the needs for 10 years ahead. On the other hand, the



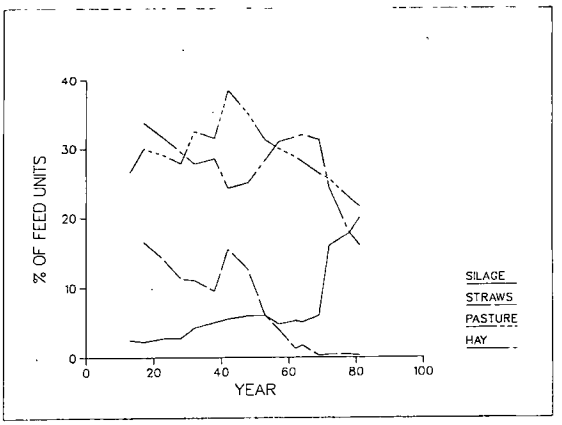


Fig. 3. Shares of different feeds of the feed units used in Finnish recorded herds. 1 = concentrated succulent feeds, 2 = protein concentrates, 3 = grains.

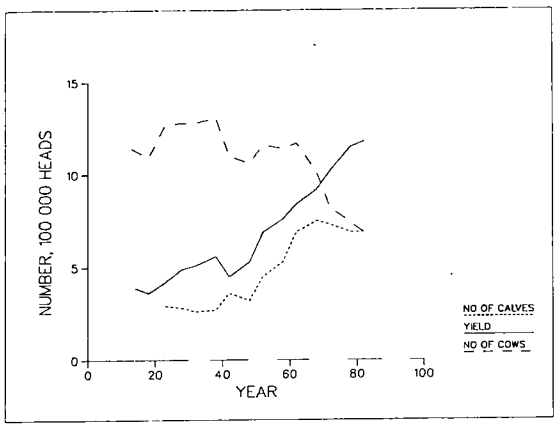


Fig. 4. Development of the numbers of cows and calves and of average yields of recorded cows in Finland.

difficulty of predicting makes it important to find ways of making faster progress so that an objective could be attained before it loses its current interest.

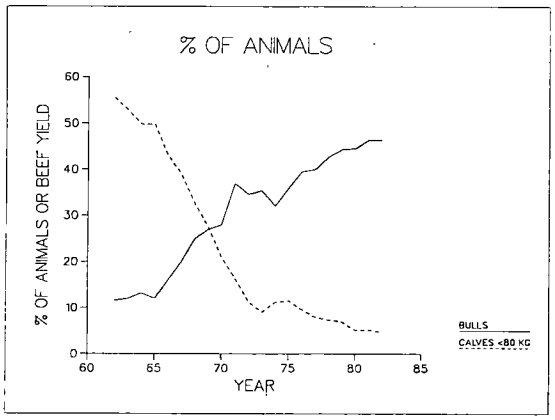
New techniques which can speed up breeding are being developed. One of these is embryo transfer, this technique has developed rapidly and new reasons for its use have been discovered.

The storage of embryos and sperm of present-day animals in gene banks will, on the other hand, help in starting from the base again, if the change of direction is required. In cattle there are many objectives with permanent value, such as feed conversion ratios, fertility and health.

The importance of beef production started to increase in the 1950's (Fig. 5). The majority of beef has been produced from calves obtained as by-products from milk production. The slaughter of small calves has decreased a lot, whereas the slaughter of bigger bulls has increased. The average weight of beef carcasses has doubled since 1960, when the research in this area began. New ways of producing beef at a reasonable price must be found now when it has become more difficult to increase average slaughter weights, and the calf reserves as by-products of milk production have been used up.

The sheep and its unexploited potential

The other Finnish ruminant, the sheep, was earlier kept mainly for wool at almost every farm. Even as late as in 1950 there were sheep in 75 % of all the farms. Due to the decrease in the use of home-produced wool there are now sheep in only 3 % of Finnish farms (Fig. 6). Mutton as the sheep's main product is problematic in many ways, and during the recent years there has been a joint research project under way to study the problems of meat production and possibilities for other types of production. The research aims at developing production recording, performance testing of rams, artificial insemination, all-year-round lambing, mothering characteristics, feeding and crossing systems, fur production,



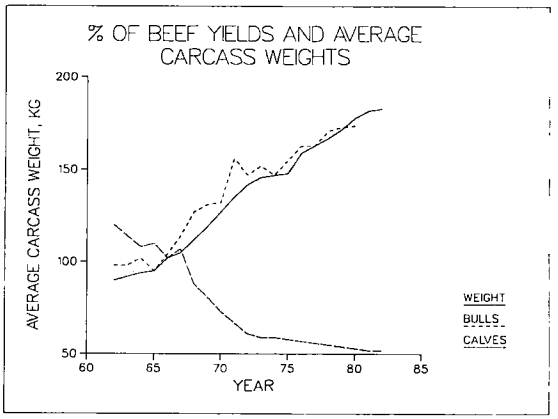


Fig. 5. Shares of bulls and calves of the animal numbers and beef yields in Finnish slaughterhouses.

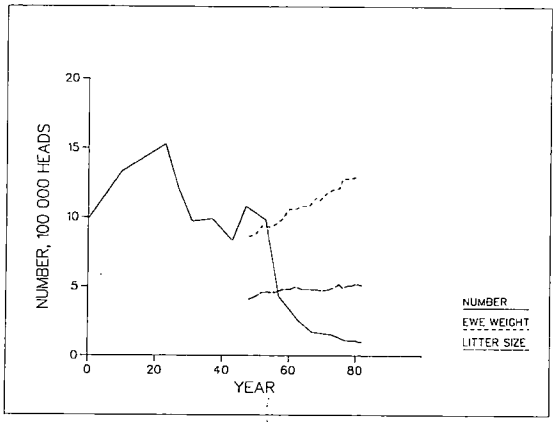


Fig. 6. Development of sheep numbers in Finland and of the autumn weights and litter sizes of recorded Finnsheep ewes.

economic planning and use of mutton. The competitiveness of sheep farming could be distinctly improved by the production of high-quality furs and fine wool for handicrafts and industrial arts. The sheep population has already started to increase, especially in northern Finland.

The meat production capacity of Finnsheep has gradually improved: the autumn weights of ewes have increased by about 50 % over the last 30 years and the litter size at birth has increased by 0,5 lambs. The breed has been experimented on in about 40 countries for twenty years and has been chosen as the reference breed in international research on prolific sheep breeds.

New interest in goats

There were over 10 000 goats in Finland before 1940. After that their number fell to the extent that statistical recording was stopped in 1960 when there were fewer than 3 000 of them. Thanks to the renewed interest the number has risen to 3 000 again. Experiments on nanny goats were started at the Sata-Häme Experimental Station in 1980.

Favourable development in reindeer husbandry

The only ruminant whose number has increased lately is the reindeer. The number of counted reindeer in 1982 was four times more than at the beginning of the 1920's (Fig. 7). Professor Varo concluded in his reindeer breeding study, which started in 1962, that reindeer calves should be slaughtered during their first autumn because their weight increase until the following autumn is very small. Thus the winter pastures would be saved mainly for the reindeer cows. The percentage of slaughtered reindeer calves has in fact doubled while that of the slaughtered older animals has decreased.

The horse has become a leisure time animal

The horse used to be an important worker in fields and forest, and a lot of research was done

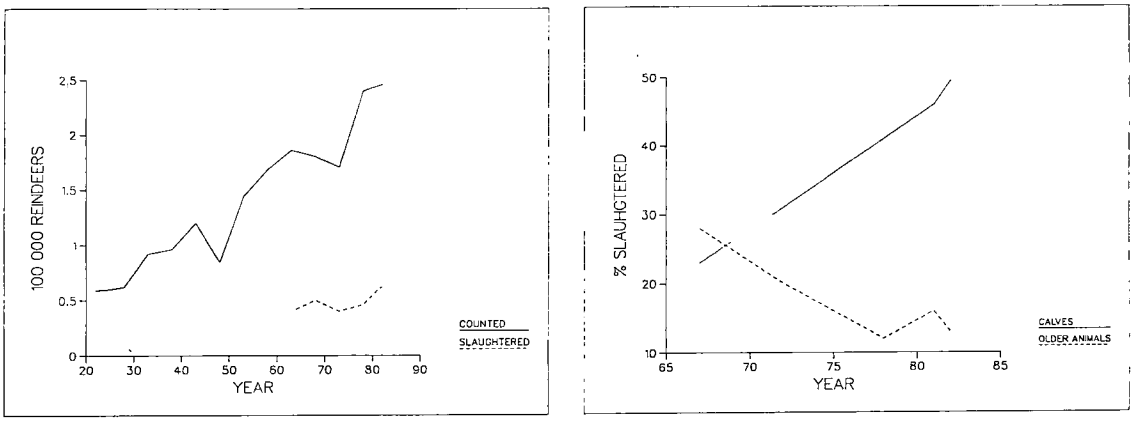


Fig. 7. The numbers of reindeers and the shares of slaughtered calves and older reindeers in Finland.

to improve its working capacity. Now the stock of working horses has diminished to a twentieth of its pervious level. On the other hand, the use of horses in sports has increased, relying largely on foreign breeds (Fig. 8). There is a special State Institute of Horse Breeding at Ypäjä, and the money from betting on horse racing is used to help in financing it.

Vigorous development in pig production

The most important of the monogastric farm animals in Finland is the pig, whose excellent prolificacy and fast growth have made it a competitive meat producer. The decrease in carcass fat and increase in leanness, which are largely due to contributions from the extending research and evaluation efforts done since the 1960's and to the wider use of artificial insemination, have meant a crucial increase in the demand for pork (Fig. 9). The improvement in the feed-efficiency has had a positive effect on the price competitiveness of pork.

On the other hand, the fast progress in breeding for meatiness has caused problems in meat quality, in terms of leg weaknesses and in stress susceptibility. To solve these problems the Institute of Animal Breeding has put forward a proposal for building an experimental pig farm at Jokioinen. The subjects demanding further study include the development of pigs suited for exceptional conditions, the development of evaluation methods for meat quality in live pigs and the development of methods for breeding

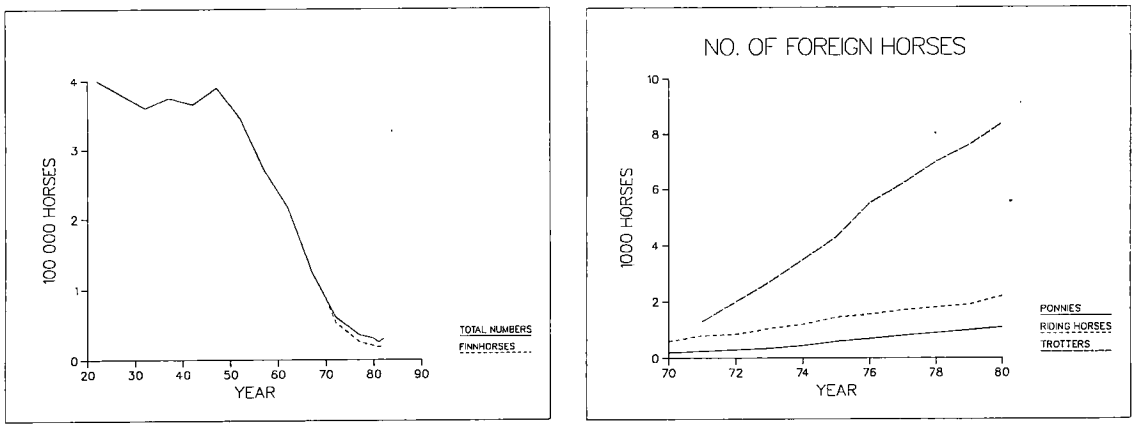


Fig. 8. Development of the number of horses in Finland.

for longevity. The problems related to the use of boar meat, experiments requiring complicated measurements, crossing experiments and the establishment and maintenance of control and gene bank populations also wait for research.

Research in pig feeding has been carried out mainly at the Pig Research Station, which was founded in 1925. Its working potential was improved by the completion of the new buildings in Hyvinkää in 1968. The Research Station has worked out the values of different feeds and the feeding standards for pigs.

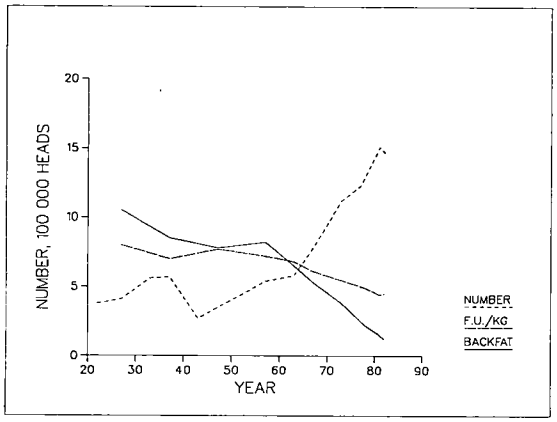


Fig. 9. Development of pig numbers in Finland and of feed conversion rates and backfat thicknesses at litter testing stations.

Fast development and new needs in poultry

The other important grain eating animal in Finnish agriculture is the hen. The population of laying hens has increased five-fold since 1920 and in the same time the average yield has increased seven-fold (Fig. 10). Breeding research really started in the mid 1950's, mainly using materials of the Poultry Breeders' Association. During the last 20 years its aim has been to preserve the independence of Finnish layer hybrid breeding and to develop hens which utilize domestic feeds.

The work has been carried out together with the other Nordic countries since 1969. The opportunities for research improved in 1979 when the new hen house with 1 800 individual

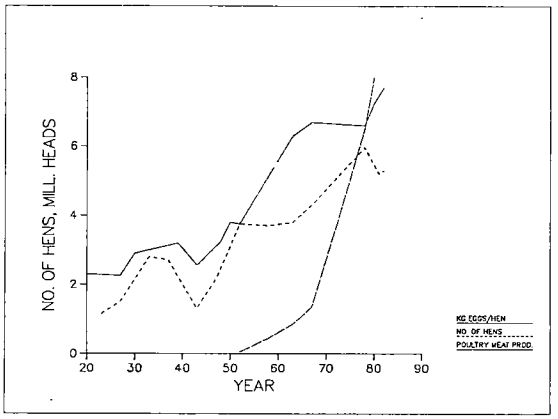


Fig. 10. Development of hen numbers, average egg yields and total yields of poultry meat in Finland.

cages was completed at Jokioinen. This should, however, be expanded now.

The average deviations of domestic hybrids from the genetically constant control stock, in the Finnish Random Sample tests, indicate that considerable progress has been made in many important traits in hen breeding during the 1970's and that the continuation of this progress is possible (Fig. 11). However, more attention must be paid to the quality of eggs in the future.

Hen feeding research has been very active during the last two decades. The objectives have included the potential for increasing the use of domestic feeds and the potential of using single-cell protein and domestic protein sources as feeds. The experiments have been able to make use of the new facilities for over 2 000 hens, completed in 1979.

Feeding experiments have also been done on broiler chickens, whose production has increased during the past 20 years.

Research demands also in fur animal production

The economic value of the fur animal production has increased to the level of poultry. It all started from minks, then came foxes, and the latest have been the raccoon dog and the polecat (Fig. 12).

The Agricultural Research Centre has carried out feeding experiments during the last 20 years

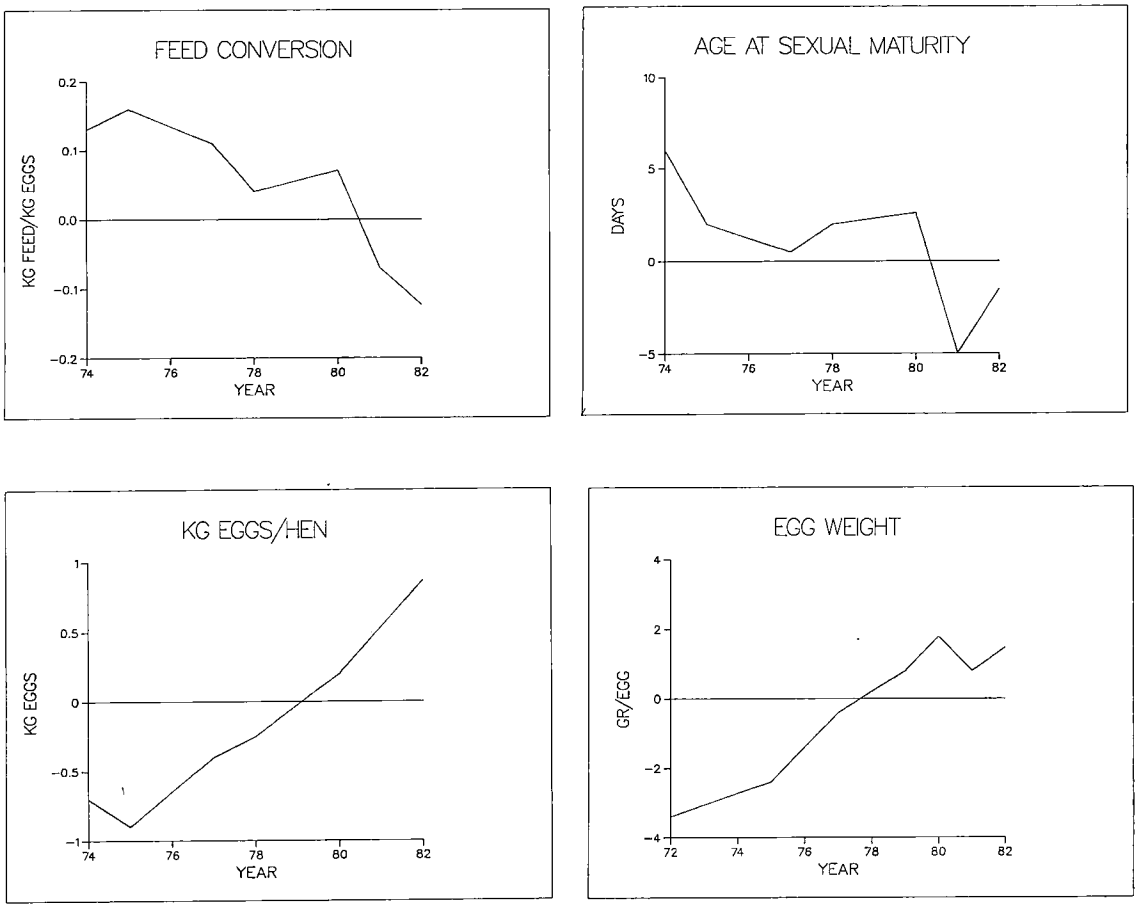


Fig. 11. Deviations of different traits of Finnish layer hybrids from the genetically constant control line (0-line) in Finnish Random Sample tests.

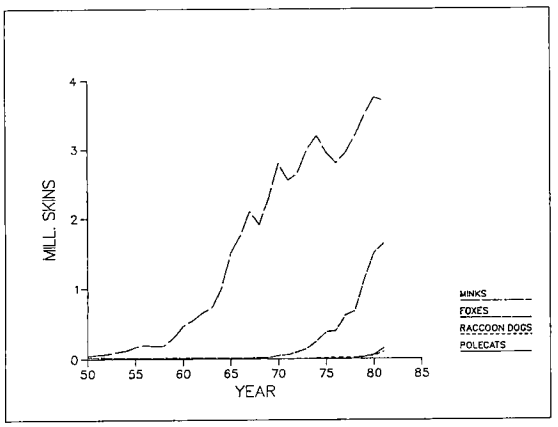


Fig. 12. Fur skins produced in Finland and marketed by the Finnish Fur Sales Ltd.

at an experimental farm run by the Finnish Fur Breeders' Association at Kirkkonummi. The research has been focused on the usefulness of various protein and carbohydrate feeds. During recent years, breeding research has aimed at the development of production recording to allow progeny testing of males. A proposal was made a couple of years ago for building an experimental farm at Jokioinen for the conservation of mink mutants and for the research in feeding and genetics.

An experimental farm was recently completed in Kannus. It is now under the Finnish Game and Fisheries Research Institute but is likely to be transferred into the Agricultural Research Centre.

There have been large quantitative changes in the Finnish animal production during the past decades. The numbers of ruminants and other animals eating roughage have decreased while monogastric animals living on concentrates have increased. There have also been changes in the importance of various products. Considerable development has been gained in the production capacity of many animal species. The development is in general based jointly on research, extension services and on farmers' efforts. It would be, however, difficult to present a breakdown of these contributions. It can be said, that research has been very important in many cases and its importance is likely to increase while challenging the future problems.

Setting the objectives of research in animal breeding and production has become more and more important and more difficult. Success in the work requires closer cooperation between research workers and those in charge of agricultural policy, in order to find lasting objectives as well as appropriate price ratios with respect to input and output in the production.

Finnsheep is known for the large litter size.

Lic. agro SVEND MARTIN NIELSEN

Statens Husdyrbrugsforsøg, Danmark

Som representant for Statens Husdyrbrugsforsøk i Danmark vil jeg gerne takke Landbrugets forskningscentral for den ære at være med ved invielsen af disse nye forskningsfaciliteter.

For os i Danmark er en sådan indvielse måske of særlig interesse. Vi er jo igang med at flytte vores institution fra København til Jylland, en flytning som nok strækker sig over ti til femten år og omfatter ca. 300 medarbejdere. På den baggrund håber jeg at lære en masse af denne begivenhed og mit besøg her på stedet.

Mellem finsk og dansk husdyrbrugsforskning er der mange nære og gode relationer. Gennem NJF og nordiske doktoratkurser er der skabt mange personlige kontakter af stor betydning.

Af konkrete ting der samarbejdes om Finland og Danmark imellem vil jeg gerne blot nævne det fælles proteinprojekt og Nesgårdforsøget.

Jeg vil gerne ønske Landbrugets forskningscentral til lykke med de nye forskningsfaciliteter og arbejdet fremover til gavn for det finske jordbrug. Jeg er sikker på at stedet her vil blive en kilde til inspiration også for danske forskere.

Til slut vil jeg gerne takke for den gode modtagelse som vi danskere altid får her i Finland. Jeg håber vi kan gøre gengæld i Danmark, i hvert tilfælde er man altid velkommen til at besøge os såvel i København som på vores nye institution i Jylland.

Statens Husdyrbrugforsøg i Danmark fylder i år 100 år. Jeg vil gerne overrække to bøger om vores institution. Endvidere vil jeg gerne overrække en gave til Landbrugets forskningscentral som jeg håber man bliver glad ved og kan finde plads til.

Hjerteligt til lykke!

V/adm. direktør JAC. FJELDDALEN

Statens Plantevern, Norge

Først vill jeg få takke hjerteligst for innbydelsen till å delta som norske representant ved denne innvielsen. På bakgrunn av min kontakt med växtskyddsforskningen i Finland gjennom 35 år, føler jeg det som en ære og en glede å få være tilstede på denne betydningsfulle dagen for finsk landbruksforskning.

På vegne av Det Kgl. Norske Landbruksdepartment og norsk landbruksforskning vil jeg få fremføre mine beste gratulasjoner i anledning det nye forskningssenteret som invies i dag.

Det er et forskningssenter som de ulike avdelinger kan være stolte av og som utvilsomt vil bli gagn for landbruket i Finland. De moderne bygninger, laboratorier, utstyr m.m. som vi har sett i dag vil, såvidt jeg kan bedømme, gi meget gode muligheter for å løse dagens og fremtidens forskningsoppgaver.

Anlegget vitner også om at de bevilgende myndigheter har innsett betydningen av de sterke samfunnsmessige interesser som knytter seg til landbruksforskningen.

Finland og Norge har en rekke felles interesser og problemer på de landbruksfaglige områder og det har alltid vært et meget godt samarbeide mellom landene og forskerne. På mitt eget fagområde, växtskydd, er det dessuten 3 årlige fellesmøter: växtskydd, godkjenning av växtskyddsmiddel og fytosanitære spørsmål (karanteneskadegjørere). Videre koordinerer vi alltid vårt syn og står samlet i vår opptreden på de årlige møter i den europeiske växtskyddsorganisasjonen EPPO.

Jeg har hatt gleden av å besøke Finland nesten hvert år siden 1948 og jeg minnes spesielt mine besøk i Dickursby — med faglig diskusjon og meningsutveksling, bl. a. med prof. Jamalainen og prof. Kanervo og deres medarbeidere. Jeg ser frem til den videre kontakt her i Jokioinen.

Med disse ordene vil jeg igjen få gratulere hjerteligst med det nye forskningssenteret og jeg ønsker finsk landbruksforskning lykke til med det videre arbeid.

PROFESSOR JAN RENDEL

Sveriges Lantbruksuniversitet, Sverige

Sveriges Lantbruksuniversitets Lantbruksvetenskapliga fakultet framför sin hyllning och sina lyckönskningar till Lantbrukets forskningscentral när den i dag kallat till fest för att inviga sina nya och mycket ändamålsenliga lokaler.

Förbindelserna mellan de svenska och finska lantbruksforskarna har varit nära och goda sedan mer än et halvt sekel, sannolikt ännu längre. Vår svenska lantbruksfakultet har sänt en tvåmanna delegation till dagens högtidlighet bestående av professor Reijo Heinonen, som representerar växtmarkforskningen och mig själv, som representerar husdjursforskning. Personligen har jag haft nära kontakt med forskningscentralen sedan mer än 30 år och haft glädjen att lära känna tre av dess fyra professorer i husdjursförädling samt i utlandet samarbeta med en av professorerna i utfodringslära.

Den förste ledaren för husdjursförädlingsinstitutionen, professor Terho hade gått ur tiden innan jag kom till Ultuna, men som student fick vi lära om hans banbrytande insatser för att förbättra avelsvärderingen hos arbetshästar, ett arbete som utfördes på 30-talet. Vetenskapligt arbete av hög kvalitet har sedan inom husdjursförädlingens område utförts vid forskningscentralen under ledarskap av professorerna Vainikainen, Maijala och Lindström.

Det vetenskapliga utbytet mellan forskningscentralen och Sveriges Lantbrukshögskola/universitet har varit omfattande och stimulerande. Inom husdjursavelns område vill jag särskilt nämna det betydelsefulla arbetet som på Lantbrukets forskningscentralen utförts för att förbättra metodiken för avelsvärdering av mjölkboskap. Detta har lett till en stimulerande dialog mellan forskare i Finland och Sverige och de övriga nordiska länderna och verksamt bidragit till att Norden kunnat inta en ledande plats inom husdjursaveln såväl inom forskningen som inom den praktiska aveln.

När forskningscentralen nu efter en arbetskrävande tid av flyttning från Dickursby går att inviga sina nya lokaler i Jokioinen, vill Sveriges Lantbruksuniversitets Lantbruksvetenskapliga fakultet önska sina finska kolleger lycka till. På uppdrag av fakultetens dekanus, professor Ulf Rehnborg har jag nöje att överbringa en liten minnesgåva från fakulteten. Gåvan är blygsam men skall minna om det goda samarbete som vi haft under gångna år och det goda samarbete som vi ser fram emot i framtiden.

Lycka till.

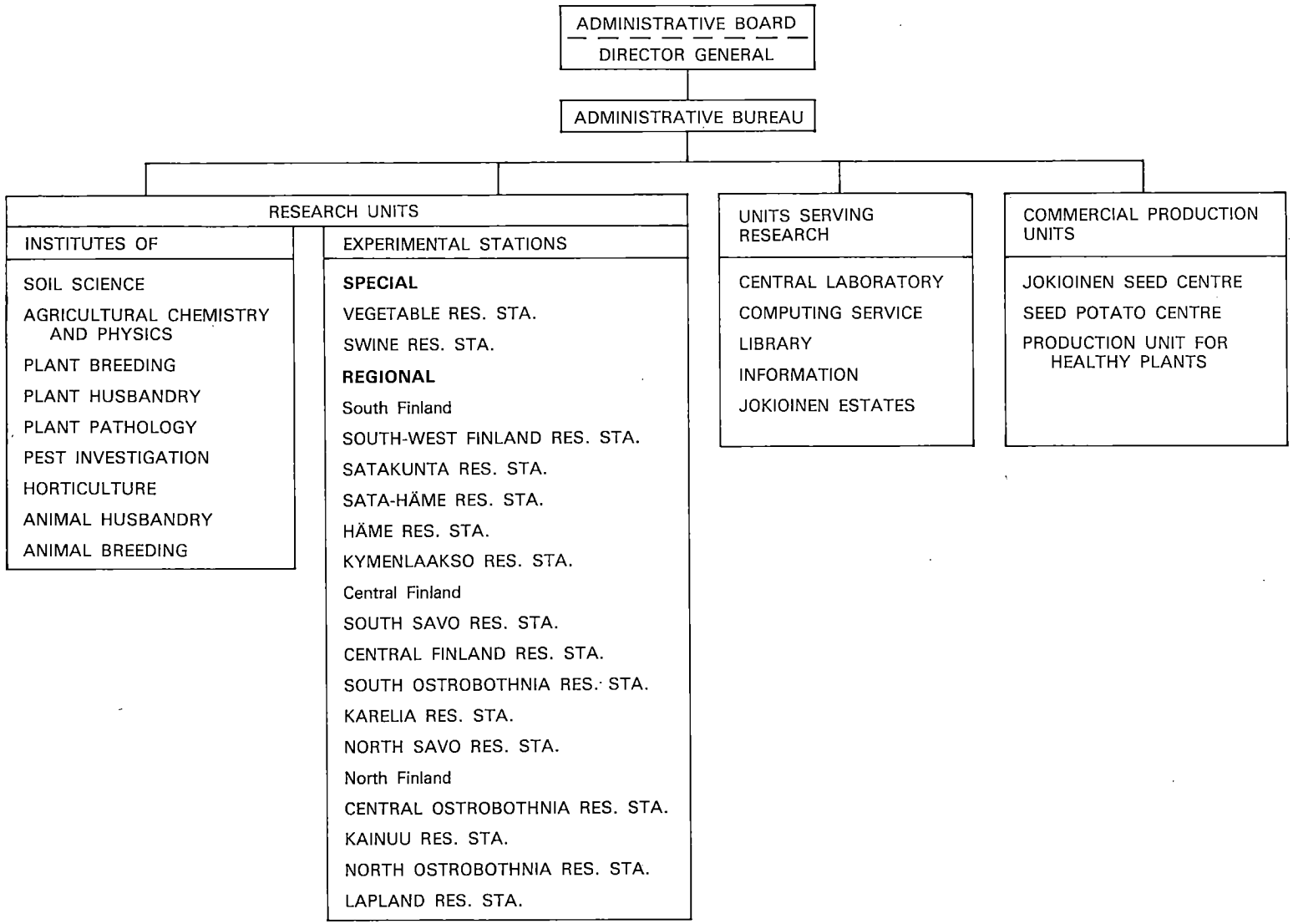
GENERAL INFORMATION ABOUT THE AGRICULTURAL RESEARCH CENTRE

- about 130 researchers; annual staff work inputs is c. 760 staff years, of which nearly 500 carried out in Jokioinen
- the effective area of new buildings in Jokioinen is 26 000 m^2, total floor area 33 500 m^2 and volume 150 000 m^3
- the Centre has total of 5 380 hectares of land, of which 1 817 hectares are arable of which 817 hectares in Jokioinen
- 360 head of dairy cattle, 900 head of beef cattle; 260 sheep, 140 lambs, 55 goats; 75 sows, 1 500 pigs, 460 piglets; 3 000 laying hens, 1 000 pullets, 1 600 chicks; 30 reindeer

INFORMATION

- Annales Agriculturae Fenniae is the main scientific journal; published 4 times a year, in English
- MTKK:n Tiedote (Communications), a duplicated series meant for practical agriculture, in Finnish
- Koetoiminta ja käytäntö (Experimentation and practice), a monthly supplement to the newspaper Maaseudun Tulevaisuus, in Finnish
- researchers also publish numerous articles in professional journals and give presentations at various functions

MINISTRY OF AGRICULTURE AND FORESTRY
AGRICULTURAL RESEARCH CENTRE



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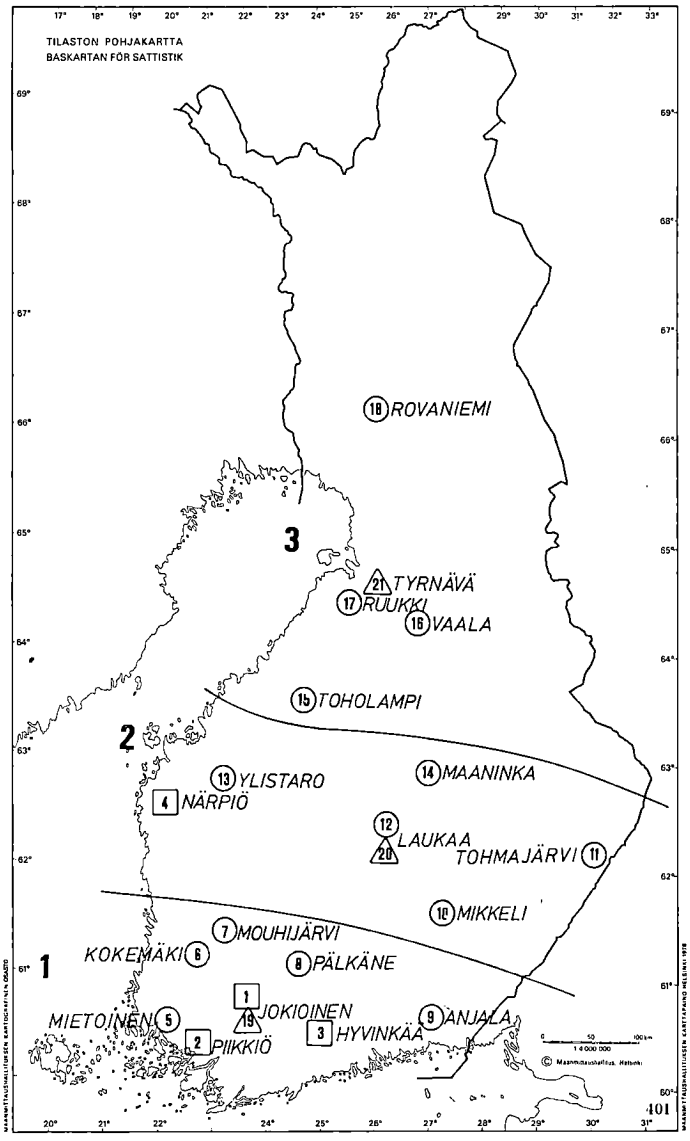

INSTITUTES, RESEARCH STATIONS AND OTHER UNITS OF THE AGRICULTURAL RESEARCH CENTRE

1. Administrative Bureau, Information, Library, Institutes of Soil Science, Agricultural Chemistry and Physics, Plant Husbandry, Plant Breeding, Plant Pathology, Pest Investigation, Animal Husbandry and Animal Breeding; Computing Service, Central Laboratory (JOKIOINEN) — 2. Institute of Horticulture (PIIKKIÖ) — 3. Swine Res. Sta. (HYVINKÄÄ) — 4. Vegetable Res. Sta. (NÄRPIÖ) — 5. South-West Finland Res. Sta. (MIETOINEN) — 6. Satakunta Res. Sta. (KOKEMÄKI) — 7. Sata-Häme Res. Sta. (MOUHIJÄRVI) — 8. Häme Res. Sta. (PÄLKÄNE) — 9. Kymenlaakso Res. Sta. (ANJALA) — 10. South-Savo Res. Sta. (MIKKELI) — 11. Karelia Res. Sta. (TOHMAJÄRVI) — 12. Central Finland Res. Sta. (LAUKAA) — 13. South Ostrobothnia Res. Sta. (YLISTARO) — 14. North Savo Res. Sta. (MAANINKA) — 15. Central Ostrobothnia Res. Sta. (TOHOLAMPI) — 16. Kainuu Res. Sta. (VAALA) — 17. North Ostrobothnia Res. Sta. (RUUKKI) — 18. Lapland Res. Sta. (ROVANIEMI) — 19. Jokioinen Seed Centre (JOKIOINEN) — 20. Production Unit for Healthy Plants (LAUKAA) — 21. Seed Potato Centre (TYRNÄVÄ).

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