

MAATALOUDEN TALOUDELLISEN  
TUTKIMUSLAITOKSEN  
TIEDONANTOJA N:o 53, 1-4

---

*THE AGRICULTURAL ECONOMICS  
RESEARCH INSTITUTE, FINLAND  
RESEARCH REPORTS, No 53, 1-4*

# ECONOMICS OF DAIRY PRODUCTION AND PROCESSING

Maatalouden taloudellisen  
tutkimuslaitoksen

TIEDONANTOJA N:o 53, 1-4

The Agricultural Economics  
Research Institute, Finland

RESEARCH REPORTS, No. 53, 1-4

### ECONOMICS OF DAIRY PRODUCTION AND PROCESSING

Lectures given by the Finnish participants at the second Finnish-Hungarian-Polish seminar of agricultural economists in Poland, April. 24-28, 1978.

AALTONEN, SEPPO: Farm Specialization and Scale of Dairy  
Production in Finland, 20 p.

TORVELA, MATIAS: Main Features of Milk Subsidy Policy, 20 p.

JÄRVELÄ, HEIKKI: The Profitability of Dairy Farming on  
Finnish Bookkeeping Farms, 8 p.

HAUKKA, JUKKA: The Problems of Dairy Production in Finland, 6 p.

ISBN 951-9199-45-4

Helsinki 1978

## Preface

The second Finnish-Hungarian-Polish seminar of agricultural economists took place on the territory of Sudeten Agricultural-Industrial Association in Książ, Poland April 24-28, 1978.

The lectures given at the seminar concerning the economics of dairy production and processing, will be published in the scientific publication serie of the Research Institute for Agricultural Economics, Warsaw, Poland.

In addition to the lectures given by the Finnish participants, the following papers were presented by the Hungarian and Polish delegations:

### Hungary:

- CSEPELY-KNORR, A.: Price, Costs, Income Conditions and Budget Relationships in the Cattle Branch. 19 p.  
TOTH, B.: Situation of the Milk Production and Cattle Keeping and their Development Tendencies in Hungary. 17 p.  
UJHELYI, T.: The Hungarian Cattle Sector and the World Market. 15 p.

### Poland:

- GRABOWSKA, U.: Milk Production in Peasant Farms in Poland. 15 p.  
IMBS, B.: Present-day State and Prospects of Milk Processing in Poland. 28 p.  
KAŹMIERCZAK, M.: Individual Peasant Farms Specializing in Milk Production in Poland. 18 p.  
MAJDAŃSKI, F.: Sudeten Cattle in Lower Silesian Region. 12 p.  
RAJTAR, J., WIŚNIEWSKI, L.: Economic and Technical Aspects of Milk Production in State Farms. 19 p.

Helsinki, August 1978

Maatalouden taloudellisen  
tutkimuslaitoksen

TIEDONANTOJA N:o 53, 1

The Agricultural Economics  
Research Institute, Finland

RESEARCH REPORTS, No. 53,1

FARM SPECIALIZATION AND SCALE OF DAIRY

PRODUCTION IN FINLAND

SEPPO AALTONEN

# FARM SPECIALIZATION AND SCALE OF DAIRY PRODUCTION IN FINLAND

Seppo Aaltonen

Agricultural Economics Research Institute, Finland

Abstract. A remarkable change in the structure of agricultural production has taken place in Finland during the last three decades. Some details of this rapid development are presented in this short paper. Agricultural specialization is briefly discussed by describing a number of farms specialized in producing the main products such as milk, beef, pork and eggs. Some other indicators of the development have also been introduced.

The main chapter deals briefly with the scale of dairy production in Finland. Milk plays a very important role in Finnish agriculture and the main aim of this paper is to clarify the developmental process in the dairy sector as it occurred in the 1970's. Some details are also devoted to the agricultural policy measures introduced for dairy production. Regional aspects of milk production are also examined, but only briefly.

## 1. INTRODUCTION

The development of agricultural production in Finland has been very rapid during the past three decades. After the war agriculture was obliged to recover in order to produce enough food for the people - and also to absorb that part of the agricultural population that lost their farms because of the war. Soon after the war over 50 000 new farms were established in Finland and this has meant for Finnish agriculture a very remarkable development, but also in many ways it has had a negative influence on the agricultural structure.

The increased agricultural production has been achieved through the development of agricultural technology and also by putting more land under cultivation. In this way the total agricultural production has increased sufficiently to make Finland an exporter of agricultural products, mainly dairy products. This change has

occurred in spite of poor natural conditions for agricultural production and in spite of the fact that the population engaged in agriculture has decreased extremely rapidly, in other words, agriculture has given a major part of its population to the expansion of e.g. industry, construction, trade and services.

The number of the population engaged in agriculture has developed since 1950 as follows:

	Total agricultural population (1000 pers.)	As % of whole population	Economically active agricultural population (1000 pers.)	As % of total economically active population
1950	1375	34.1	785	39.6
1960	1141	25.7	604	29.8
1970	676	14.7	364	17.2

Source: Statistical yearbook of Finland 1976

A rapid decrease in the number of persons employed in agriculture has been possible through the enormous development in agricultural mechanization and technology. The development has not, however, been completely positive. That part of the agricultural population which has left agriculture, has been mainly young people and this has also caused a serious problem - farmers are getting too old and in many cases their sons are not interested in farming. The age structure of farmers and family workers was in 1970 as follows:

Group of age	Farmers		Family workers	
	(1000 pers.)	%	(1000 pers.)	%
15-24	38	11.7	32	24.8
25-34	40	12.5	21	16.3
35-44	71	22.0	28	21.5
45-54	84	26.0	29	22.2
55-64	72	22.4	18	13.5
65-	17	5.4	2	1.7
Total	322	100.0	130	100.0

Source: Statistical Yearbook of Finland 1976

Since 1970 the development has been continually unfavourable and the number of old farmers has increased.

The share of agriculture in the net national product (NNP) has been relatively small compared with number of people employed in agriculture.

	NNP in agriculture, hunting and fishing
1965	8.7 % of total NNP
1970	6.7
1975 <sup>a</sup>	6.1
1976 <sup>a</sup>	5.9

<sup>a</sup>preliminary figures

It must be noted that forestry is closely related to Finnish agriculture and in many cases is also a solution to existing capital problems on small Finnish family farms. The importance of forestry varies according to regions, the highest earnings from forestry being in Eastern and Central Finland and the lowest earnings in South and Southwest Finland. Forestry is of great importance to agricultural investments, as the capital formation is very low because of the small size of farm holdings and because of high production costs in Finnish agriculture.

Self-sufficiency ratios in some of the main agricultural products have developed as follows:

	Milk and milk products	Meat and meat products	Eggs	Bread grain and grain products	Sugar and sugar products
1960	126	92	121	78	27
1970	126	110	136	114	29
1977 <sup>a</sup>	128	104	166	125	39

<sup>a</sup>preliminary figures

The above-mentioned degrees of self-sufficiency give the share which domestic production has in the total consumption. If we are interested to ascertain real self-sufficiency, calculations also taking into account the quantities of imported raw materials, machines etc. used in agriculture, should be made.

Finnish agriculture is characterized by some special features. To begin with, Finland is geographically situated in the far north which limits our possibilities for agricultural production and for which reason animal husbandry is traditionally a very important part of agriculture.

Because of the northern location of Finland, it has sometimes been doubted if it is profitable to try to reach self-sufficiency in many agricultural products. Naturally, there are many products that it is not possible to produce in Finland. It is not, however, not only a question of profitability: the population in rural areas e.g. must also be taken into account. The Finnish countryside has traditionally been rich in culture, in which agriculture has played a prominent role. As the rural population vanishes, so vanishes an important part of the Finnish cultural heritage.

## 2. FARM SPECIALIZATION IN FINLAND

### 2.1. General

Traditionally agriculture in Finland is comprised of small farms with a very versatile structure of production. Animal husbandry has been practised on almost every farm and, in addition extensive plant husbandry. The same farm was rich in many kinds of domestic animals and plants. Agriculture had a nature of self-sufficiency. Since the agricultural population has decreased, new methods had to be found. A common solution was to specialize and mechanize



production. This has meant e.g. a decreasing number of farms and an increase in the average size of farms. Trends in Finnish agriculture can be seen in table 1.

Table 1. Trends in Finnish agriculture in 1920-1975.

Year	Total arable land area (1000 hectares)	Number of farms 1) (1000 pcs.)	Average size of farms 1) (hectares)	Average forest area per farm 1) 2) (hectares)
1920	2015.2	184.9	10.89	59.69
1930	2245.2	209.1	10.74	50.28
1941	2296.0	207.4	11.07	49.33
1950	2430.9	261.8	9.29	41.23
1959	2536.8	284.6	8.91	30.43
1969	2621.2	263.7	9.94	32.83
1972	2554.6	246.6	10.35	33.30
1973	2538.1	239.8	10.43	33.65
1974	2529.0	233.3	10.68	33.89
1975	2501.0	225.4	10.95	..

1) Farms over 2 hectares of arable area

2) Before 1959 total forest area, after that only the effectively growing forest area

Source: IHAMUOTILA 1976 (table 1) and Official Statistics of Finland. Annual Statistics of Agriculture.

The number of farm holdings in Finland is decreasing very rapidly, about 20 farms per day according to the calculations of the Board of Agriculture. During the years 1969-1975 the number of farms (over 2 hectares of field area) decreased by 14.5 %, which means an average decrease of 2.4 % in a year. Assuming a continuation of this trend, the number of farms will be about 198 000, even less in 1980. It may be mentioned, that according to some projections the economically active agricultural population will be about 158 000 - 228 000 in 1985 depending on various assumptions.

The average size of farms has increased since 1969 by 10.2 %. Table 2 shows the development of farm structure in detail since 1959.

Table 2. Numbers of farm holdings according to size in 1959-1975 (more than 2 hectares of field area).

Field area (hectares)	1959		1969		1975		Change as %	
		%		%		%	1959-69	1969-75
2- 5	101 173	35.5	75 223	28.5	57 591	25.6	-25.6	-23.4
5-10	101 848	35.8	97 935	37.2	81 877	36.3	-3.8	-16.4
10-15	44 702	15.7	47 299	17.9	40 130	17.8	+5.8	-15.2
15-20	17 522	6.2	20 690	7.9	20 020	8.9	+18.1	-3.2
20-30	12 631	4.4	14 556	5.5	16 052	7.1	+15.2	+10.3
30-50	5 330	1.8	6 069	2.3	7 253	3.2	+13.9	+19.5
over 50	1 572	0.6	1 912	0.7	2 437	1.1	+21.6	+27.5
Total	284 778	100.0	263 884	100.0	225 360	100.0	-7.4	-14.5
Average size of farm (hectares)	8.91		9.94		10.95		+11.6	+10.2

Source: Agricultural Register, Board of Agriculture.

The most prominent and positive feature in the development is the rapid decline in the number of small holdings under 10 hectares of field area. The rate of decline has been 31.3 % since 1959. Correspondingly, the number of farms with 10-15 hectares of field area has decreased by 10.2 %.

As to the average size of farm holdings, big regional differences can be found. The enclosed map 1 shows the average sizes of farms (over 2 hectares of field area) according to different regions in 1975 and also as a percentage change since the year 1972.

The average size of farms is increasing relatively more slowly in Central and Eastern Finland. Because of intensive animal husbandry these farms are not, however, so dependent of acreage as farms in the southern parts of the country.

## 2.2. Dairy production

The figures showing the development in numbers of farms do not indicate directly the farm specialization process. In the following, however, a brief attempt is made to describe it by examining farms specialized in various production branches.

Table 3 shows the number of farms specialized in milk production in 1969 and 1974. Unfortunately there is no data available since 1974.

Table 3. Distribution of farms and dairy cows according to the size of herd.

Size of herd (cows)	Number of farms			Number of cows		
	1969 pcs.	%	1974 %	1969 pcs.	%	1974 %
1- 4	125 585	58.0	46.8	342 655	35.3	21.8
5- 6	52 715	24.3	22.5	290 000	29.9	21.9
7- 9	28 647	13.2	18.7	229 000	23.6	26.3
10-19	9 181	4.2	11.0	107 541	11.2	30.0
20-29	304	0.2	0.7			
over 30	145	0.1	0.3			
Total	216 577	100.0	100.0	969 196	100.0	100.0
			(144 115 pcs.)			(818 052 pcs.)
Average size of herd				4.5 cows		5.7 cows

The number of farms with 1-9 cows, has declined sharply the average annual rate of decline being 8.9 % in the period of 1969-1974. On the other hand, in 1974 there were nearly three times as many farms having over 10 cows than in 1969; in 1969 only 11.2 % of cows were in herds of over 10 cows and in 1974 the corresponding percentage was about 30 %.

It is estimated on the basis of the number of farms which deliver milk into dairies that the average number of dairy farms was in 1977 around 114 000 and the average size of herd 6.7 cows.

The figures below show the distribution of cows according to size of farms in 1974.

Size of farm field area (hectares)	Number of cows (1000 pcs.)	%
1 - 5	86.6	10.6
5 - 10	264.1	32.2
10 - 20	328.5	40.2
20 - 30	88.4	10.8
over 30	50.4	6.2
Total	818.1	100.0

There are relatively few cows on farms having over 20 hectares of field area. It is typical of Finland that a major part of dairy cattle is on small family farms. This is why any big changes will evidently not occur in the immediate future as to the structure of dairy production. On the other hand, it is of great importance for the small farms to specialize in an intensive animal husbandry so that all the resources of a family are effectively used.

### 2.3. Beef production

As to beef production in Finland, it is closely related to dairy production, as beef production is based on dairy cattle calvings. Formerly beef and dairy production were usually practised on the same farm unit, but nowadays there are many farms specialized in beef production. Unfortunately no detailed data is available.

Because of the decreasing number of dairy cows, it may be difficult to satisfy beef demands through domestic production in the future. This is why the numbers of pure breed beef cattle are also starting to increase in Finland. At the moment we have about 2500 head of pure breed beef cattle, of which 1800 are Herefords, 600 Aberdeen Angus and the remaining 100 are Charolais. According to some estimates the number of beef cattle will increase relatively rapidly when using both pure cattle and crossbred animals.

### 2.4. Pork production

In the table 4 the distribution of farms practising pork production and the number of pigs are presented. It can be seen that in 1974 41.9 % of all farms had less than 10 pigs, 47.8 % of farms had 10-100 pigs and the remaining 10.3 % of farms had more than 100 pigs.

Table 4. Numbers of pigs and farm holdings practising pig husbandry in 1971 and 1974.

Size of units (pigs pcs.)	Number of farms			Number of pigs		
	1971 pcs.	%	1974 %	1971 pcs.	%	1974 pcs.
1 - 9	14 285	51.8	41.9	46 501	6.2	-
10 - 19	4 878	17.7	17.8	65 573	8.7	-
20 - 49	4 765	17.3	17.2	145 869	19.4	-
50 - 99	2 072	7.5	12.8	142 457	18.9	-
100 -199	990	3.6	6.5	135 043	18.0	-
200 -499	485	1.8	3.0	139 712	18.6	-
500 -999	78	0.3	0.7	49 620	6.6	-
over 1000	18	0.0	0.1	27 479	3.6	-
Total	27 571	100.0	100.0	752 278	100.0	1 027 300

(24 069 pcs.)

Average number of  
pigs per unit

27 pcs.	43 pcs.
---------	---------

Source: Agricultural Register, Board of Agriculture

When comparing the years 1971 and 1974 with each other, we find that the number of farms with less than 50 pigs has decreased. On the other hand, the number of farms with more than 50 pigs has doubled. This naturally has a positive influence on the average number of pigs per farm. Unfortunately, there are no statistics available for 1974 as to the distribution of pigs based on the size of units.

In 1974, 18.5 % of all pigs were on farms having under 10 hectares of field area, 37.5 % of pigs on 10-20 hectare farms, 21.8 % on 20-30 hectare farms and 22.3 % of pigs on farms having over 30 hectares of field area, respectively. Thus the production is concentrated on larger farms than e.g. milk production.

## 2.5. Egg production

The fourth main production branch in Finland is egg production. Table 5 shows that the number of farms having hens is almost similar in both years, 1971 and 1974. The majority of farms have only

10-50 hens whereas the majority of hens are, however, in units of 200-500 hens. Because of insufficient statistics, it can only be mentioned that farms with a large number of hens have increased their share of the total. This is naturally profitable as to production costs per unit, but taking into consideration the excess in egg output in Finland, this kind of development is unfavourable.

Table 5. Numbers of hens and farm holdings practising egg production in 1971 and 1974.

Size of units (hens pcs.)	Number of farms			Number of hens		
	1971 pcs.	%	1974 %	1971 pcs.	%	1974 pcs.
1 - 9	14 867	28.2	93.1	76 432	1.5	-
10 - 49	18 627	35.3		388 481	7.6	-
50 - 99	6 571	12.5		435 951	8.6	-
100 - 199	5 825	11.0		748 243	14.7	-
200 - 499	4 773	9.0		1 354 568	26.6	-
500 - 999	1 452	2.8	4.3	934 319	18.3	-
1000 - 1999	447	0.8	2.6	567 610	11.1	-
2000 - 2999	88	0.2		200 265	3.9	-
3000 -	79	0.2		393 968	7.7	-
Total	52 729	100.0	100.0	5 099 837	100.0	6 278 200
			(52 026 pcs.)			
Average number of hens per unit				97 pcs.		121 pcs.

Source: Agricultural Register, Board of Agriculture

Egg production is concentrated on farms with 10-20 hectares of field area but a remarkable share of the production is produced on farms having under 10 hectares of field area.

x x x x

The types of production presented above represent a major part of total Finnish agricultural output. Table 6 shows the percentage distribution of total value of agricultural production in 1960/61 - 1975.

Table 6. Distribution of total agricultural output on the basis of produce value in Finland in 1960/61 - 1975.

Type of produce	1960/61 %	1966/67 %	1969 %	1971 %	1975 %
Rye and wheat	10.3	8.4	9.0	7.0	5.8
Barley and oats	1.7	1.2	4.8	6.7	6.0
Potatoes	2.5	2.9	2.0	1.6	2.3
Sugar beet	2.1	2.3	1.2	1.5	2.0
Other plants	0.6	0.5	0.5	0.5	0.8
Milk	58.7	56.4	52.5	45.6	45.5
Meat	18.5	22.5	25.2	31.3	31.7
Eggs	5.6	5.8	4.8	5.8	5.8
Total	100.0	100.0	100.0	100.0	100.0

Source: Total accounts of agriculture. Agricultural Economics Research Institute.

A rather clear change in production structure can be seen in table 6. In the 1960's the share of animal husbandry was about 85 % of the total output, but there has been a slight decline in the 1970's. On the other hand, the infrastructure of animal husbandry has changed so that meat's share of the total animal output especially pork, has rapidly increased.

As a whole, farm specialization seems to be developing favourably taking into consideration the limited agricultural policy measures adopted in order to change the structure of agricultural production in Finland. Especially taking into account the surpluses in dairy products and eggs the government has been obliged to adopt some production control measures that partly hinder an existing farm specialization process. At the moment, new measures are being adopted to cut the production of surplus products and to encourage farmers to specialize in products such as mutton, oil plants, sugar beet etc.

### 3. SCALE OF DAIRY PRODUCTION IN FINLAND

#### 3.1. General trends of dairy production

The dairy sector has traditionally been of great importance in Finnish agriculture. This sector of production has also changed most during the last decades. In 1951-1955, the number of cows averaged 1 159 000, in 1961-65 1 170 800 and in 1971-1975 only 820 220 (calculation date 15th June). The most rapid rate of decline in the number of cows was in 1969 and 1970.

Date	Number of cows (1000 pcs.)	Annual change in %
1969	969.2	
1970	889.1	-8.3
1971	849.3	-4.5
1972	836.5	-1.5
1973	823.6	-1.5
1974	818.5	-0.6
1975	773.2	-5.5
1976	763.1	-1.3
1977	751.6	-1.5
Average annual change in 1970-77		-3.1

The decrease in dairy cattle numbers is due to many different factors. As a whole it is also a part of the structural change in Finnish agriculture. First of all, problems in exporting the surpluses of dairy products were very topical at the end of the 1960's. In order to curb dairy production as well as other agricultural production, the land reserve programme was introduced in 1969. Under this system the government offered an annual payment to farmers who did not use their lands for agricultural production. Contracts were made for three year periods, but not longer than for 6 years. In 1978, this system was extended as far as 1981. No new contracts have been made since 1974. At the end of 1977, the field area under contracts was nearly 134 600 hectares and about 24 700 hectares of afforested field area. In 1973, the field area under contract was 223 800 hectares or 8 % of the total arable area of Finland.



In 1969 and 1970, the cattle slaughter schemes were adopted to curb, in particular, milk production. The compensation paid for slaughtered cows and calved heifers reduced the number of cattle by some 55 000 head. In 1969, the scheme was applied to farmers who made land reserve contracts and the premium was 1 Fmk per kg of liveweight. In 1970, a premium of 500 Fmk per cow was paid and all farmers could make a contract.

In 1977, farmers were offered a payment when summerfallowing at least one third of their arable area. This system will be continued also in 1978 to curb surplus agricultural production. The system also has a slight decreasing effect on the number of cattle.

Also in 1977, a new scheme was introduced for farmers over 55 years of age. Farmers are able to make a contract with the government according to which they are not allowed to produce on their farms any such products that can be regarded as surplus products for five years which will naturally decrease the number of cattle to some extent. This compensation scheme is being continued in 1978 and it takes in the whole country except Lapland. In addition to the agricultural policy measures, there are also some other factors tending to decrease cattle numbers. These are e.g. relatively low profitability, high human labor input compared with other production branches and also in many cases a shortage of capital. The age structure of farmers is also very unfavourable for milk production. The marketing levy system applied since 1970 for milk may also reduce milk production, especially on large farms.

As to the factors encouraging farmers to continue dairy production may be mentioned that milk provides a continuous source of income and it occupies the farmer and his family throughout the year. In certain very remote areas milk production is practically the only possible form of farming. On the other hand, milk production is also encouraged by various regional subsidies and prices paid by the government and this makes milk comparable with other agricultural products.

The total milk production has not, however, decreased as quickly as the numbers of cows. This is due to an increase in the average milk yield per cow. The development of total milk output has been as follows: in 1951-55 milk was produced at the rate of 2763 mill. litres per year, in 1961-65 3617 mill. litres and 1971-75 3123 mill. litres, respectively. Production was at its highest level at the beginning of the 1960's. In table 7 the short-term development of the total milk production, the average milk yield per cow and the average fat content of the milk is presented.

Table 7. Trends in milk production in the 1970's.

	Milk total (in mill. l)	Annual change (as %)	Milk received by dairies (as % of total)	Average milk yield per cow (in l)	Annual change (as %)	Average fat content (as %)
1969	3494.6		84.4	3406		4.33
1970	3213.7	-0.8	87.2	3480	+2.2	4.30
1971	3197.5	-0.5	87.5	3806	+9.4	4.31
1972	3189.9	-0.2	87.6	3889	+2.2	4.31
1973	3107.3	-2.6	88.0	3839	-1.3	4.30
1974	3055.9	-1.7	88.7	3856	+0.4	4.32
1975	3065.7	+0.3	88.8	3997	+3.7	4.26
1976	3176.0	+3.6	89.4	4200	+5.1	4.37
1977	3130.4	-1.4	90.2	4197	-0.1	4.33
Average annual change (as %)		-1.3			+2.7	

The average annual rate of decline in the total milk output has been 1.3 % during the period 1970-1977 and the number of cows correspondingly 3.1 %. The average milk quantity produced per cow increased in the same period of time on an average of 2.7 % per year. In dairy production there are, however, big annual variations mainly due to quantity and quality of crops.

The share of milk received by dairies of the total milk production is continually increasing. In 1951-1955 it was only 57 % and at the beginning of the 1960's the corresponding share was 77 %.

According to some estimates the number of dairy cattle in Finland will total about 600 000 in 1985 (see KETTUNEN 1977, pp. 115-117). It means an almost 20 % decrease in present herd numbers. The average milk yield is, on the other hand, assumed to increase up to 4850 litres per cow. Thus the rate of decline in total milk yield will be only 7-8 % of the level of 1977.

### 3.2. Regional aspects of dairy production

The most favourable natural conditions for agricultural production are in South and South-West Finland. Especially in plant husbandry these regions are rich in plant varieties and crop yields are higher than in other parts of the country. Dairy production is, however, practised all over the country. As the main part of the population is located in the southern parts of Finland, there are some transport problems as far as milk intended for consumption is concerned. The most important aspect is, however, that farmers in very remote areas have the opportunity to practise the kind of production that is suitable for them taking into account natural and economic circumstances.

In table 8 can be seen the number of cows, the average milk yield per cow and the total milk output for different regions in the years 1970 to 1977 (see also map appendix 1).

Table 8. Trends in regional dairy production in Finland.

	South Finl.	Central Finl.	Ostro- bothnia	North Finl.	Whole country
NUMBER OF COWS (1000 pcs.)					
1970	332.3	240.5	125.6	175.7	874.1
1977	267.3	220.6	107.3	150.6	745.9
Difference betw. 1970-77(as %)	-19.6	-8.3	-14.6	-14.3	-14.7
TOTAL MILK OUTPUT (in mill. l)					
1970	1281.9	854.9	447.7	629.2	3213.7
1977	1138.5	932.1	440.9	618.9	3130.4
Difference betw. 1970-77(as %)	-11.2	+9.0	-1.5	-1.6	-2.6
AVERAGE MILK OUTPUT (in l)					
1970	3858	3555	3564	3581	3677
1977	4259	4225	4109	4110	4197
Difference betw. 1970-77(as %)	+10.4	+18.8	+15.3	+14.8	+14.1

The number of cattle has decreased as mentioned earlier over the whole country, but there are big regional differences; the biggest change has occurred in South Finland and the smallest change in Central Finland.

As to the total milk yield, South Finland's share has dropped from 40 % to 36 % since 1970. At the same time there has been a decrease of 11 % in the total milk produced in South Finland and a 9 % increase in Central Finland, respectively. The average milk yield per cow is continually increasing, especially in Central and North Finland because of a relatively low yield earlier. The increase in the average milk yield per cow is also partly due to a different distribution of cattle breeds in 1970 and 1977.

The percentage distribution of cattle breeds has been as follows:

	1970	1977
Ayrshire	63 %	80 %
Finnish cattle	33 "	9 "
Friesians	1 "	8 "
Others	3 "	3 "
	<hr/>	<hr/>
	100 %	100 %

The regional distribution is almost the same, only in North Finland is the share of Finnish cattle still 13 %. On the whole, the number of Friesians is increasing very rapidly at the moment.

The intensity of dairy production can also be illustrated by introducing in brief the results of Finnish milk records for the years 1976 (table 9).

Table 9. Milk recording results for the recording year 1976.

	Cows included in recording (in 1000 pcs.)	As % of all cows in region	Size of herd (cows)	Milk produce per cow (in litres)	Average fat content (as %)
South Finland	101.0	37.1	10.2	5234	4.48
Central Finland	63.8	31.0	10.0	5109	4.46
Ostrobothnia	36.3	38.5	9.3	4884	4.45
North Finland	48.5	32.0	9.0	4997	4.48
WHOLE COUNTRY	249.6	33.0	9.7	5106	4.47

It will be noticed that the cows on farms which took part in milk recording, comprised only one third of all cows, but produced about 40 % of the total milk output in 1976. Milk yield per cow was in 1976 36 % higher than the average milk yield of the cows not included in milk recording activities. Regional differences in yields per cow are not very substantial.

If we calculate the average yield per cow in monetary terms according to regions we find the difference very small. This is due to the fact that the producer price for milk is relatively more subsidised in North Finland than in the other parts of the country.

In North Finland about two thirds of all farm incomes are derived from milk, in Central Finland about one half and in South Finland the corresponding share is 20-40 % depending on region. Average milk incomes per farm are, however, highest in Central and Eastern Finland. The map appendix 2 shows the average milk income per farm and the share of milk income of the total farm income in 1974, both according to regions (see PAKKANEN 1977, pp. 9-10).

#### 4. SOME CONCLUSIONS

Agriculture can be regarded as an important part of the Finnish national economy. Finland is self-sufficient in the main agricultural products in spite of the unfavourable natural conditions for agricultural production. This is only possible through the use of modern technology and machinery, especially when the agricultural labour force is diminishing very rapidly. However, the agricultural population still totalled 14.7 % of the whole population in 1970 and this is very essential for the rural areas of the country.

The number of farm holdings is remarkably lower at the moment than at the beginning of the 1970's. Simultaneously the infrastructure of agriculture has changed: farmers have more and more specialized in milk, beef, pork and egg production, whereas the traditional Finnish farms with a very versatile structure of production, are disappearing.

As to dairy production, it still plays the most significant role in Finland. Dairy production is practised on every second farm and milk represents about 45 % of total agricultural revenue. Regional differences in dairy production are noticeable; milk incomes per farm are highest in Central Finland, but the share of milk income of the total income per farm is highest in North Finland. Thus, regional aspects in dairy production are of great importance.

The future prospects for dairy production will continue to follow the development of the past decades. In summing up it may be said that according to projections made for the year 1985: the number of cows will then be about 600 000 and the average milk yield about 4850 litres per cow. Thus, the total milk output will decrease by only some 7-8 % compared with the level of production in 1977. However, in 1985 milk will be produced on bigger dairy farm units than at present, and evidently in areas highly specialized for dairy production in Central and Eastern Finland.

#### REFERENCES

- KETTUNEN, L. 1977. Production Forecasts. Bulletin No 40: 109-120. Research Institute for Agricultural Economics. Budapest.
- IHAMUOTILA, R. 1976. Maatilataloutemme kehittämisen ongelma. — pääomaongelma (Summary: Capital — the main problem in developing Finnish farm and forest holdings). The Economic Survey of the Cooperative Banking Organisation 4: 5-11. Helsinki.
- PAKKANEN, R. 1977. Markka pyörii maataloudessa. The Survey of the Marketing Research Institute of Pellervo Society 3: 7-11. Helsinki.

MAP APPENDIX 1

FINLAND

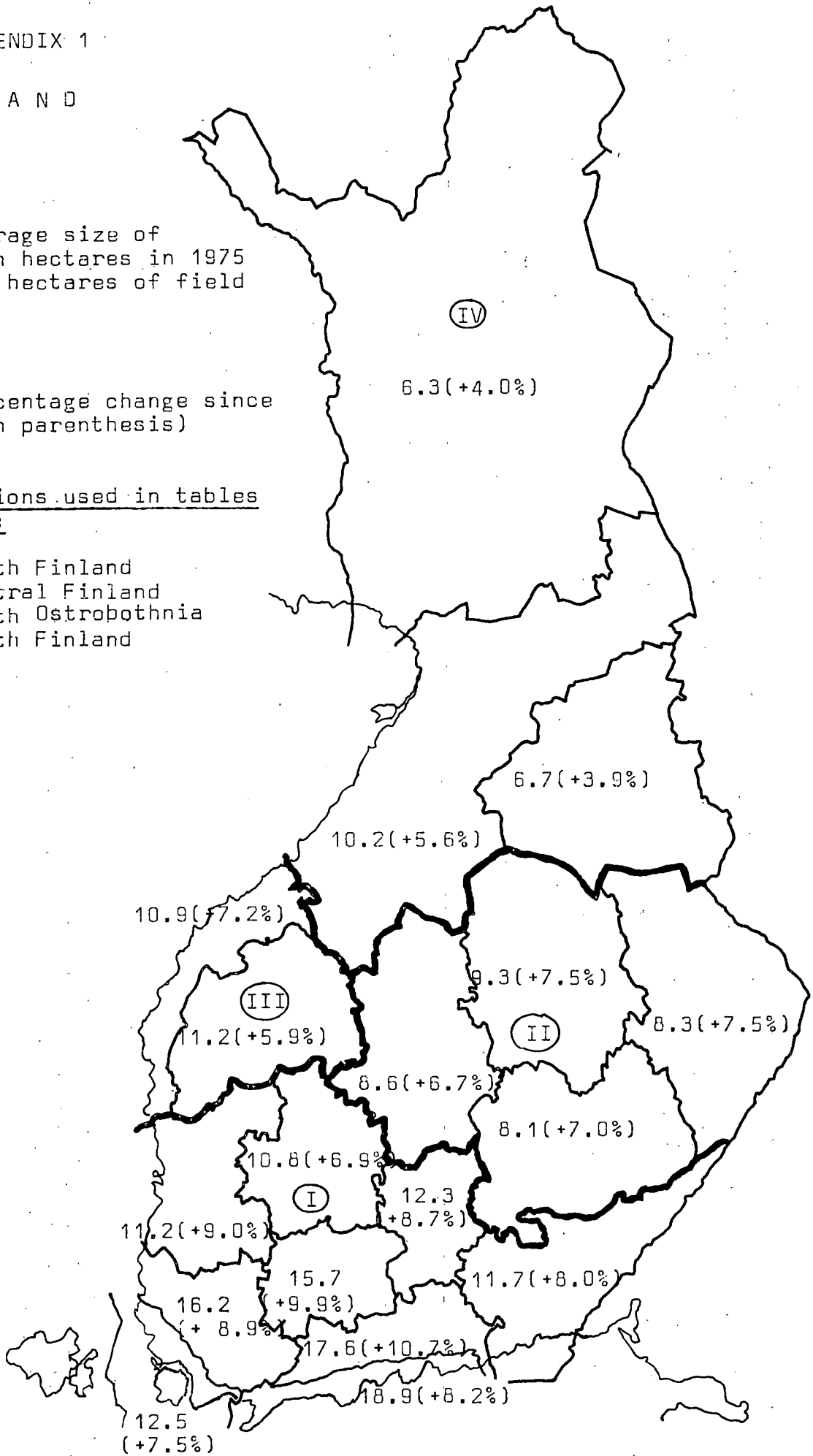
The average size of farms in hectares in 1975 (over 2 hectares of field area)

and

the percentage change since 1972 (in parenthesis)

The regions used in tables 8 and 9:

- I South Finland
- II Central Finland
- III South Ostrobothnia
- IV North Finland



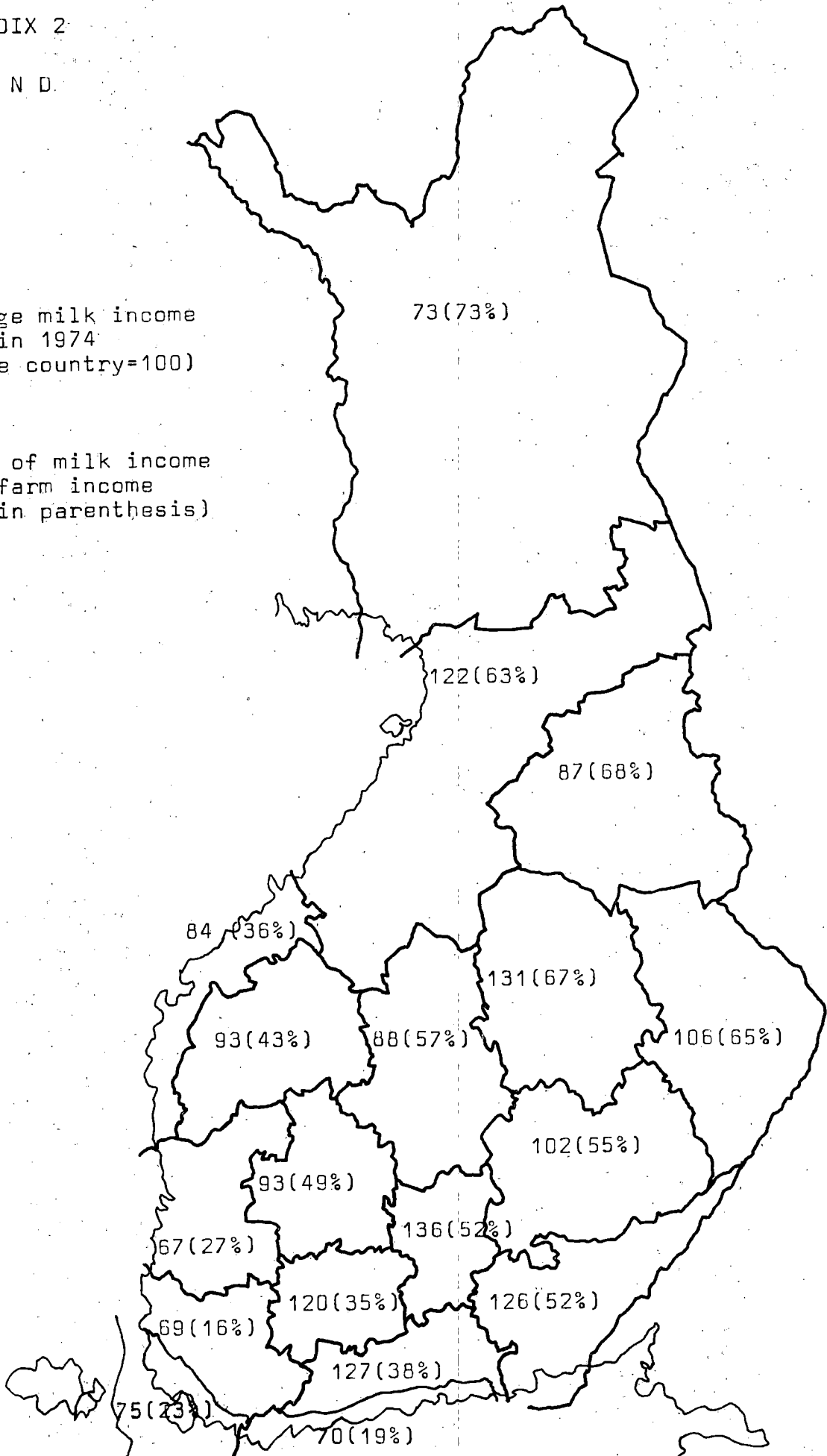
MAP APPENDIX 2

F I N L A N D

The average milk income  
per farm in 1974  
(the whole country=100)

and

the share of milk income  
of total farm income  
in 1974 (in parenthesis)





Maatalouden taloudellisen  
tutkimuslaitoksen

TIEDONANTOJA, N:o 53,2

The Agricultural Economics  
Research Institute, Finland

RESEARCH REPORTS, No. 53,2

MAIN FEATURES OF MILK SUBSIDY POLICY

MATIAS TORVELA

## MAIN FEATURES OF MILK SUBSIDY POLICY

Matias Torvela

Agricultural Economics Research Institute, Finland

### 1. Definitions used for determining less-favoured agricultural areas

The conditions for agriculture in Finland vary greatly between the northern and southern parts of the country. Lapland and northern Finland are among the northernmost areas on earth where regular agriculture based on plant production is pursued. In southern Finland natural conditions permit varied production, and agriculture there is relatively highly developed. Yields from cultivated plants in southern and central Finland and also those for domestic animals are on the same level as in many other agricultural countries.

As the natural conditions in northern and eastern Finland are considerably less favourable than those in the south, production in the north is on a lower level (tables 1 and 2), and production costs are higher than they are elsewhere in the country (table 3). For this reason payment of a regional subsidy has been regarded as necessary. A subsidy payment system has existed since the 1940s. Because milk production in northern Finland and in the developing areas in general is the most important form of production, a large part of the regional subsidy is paid in connection with milk production.

Owners of small farms are at disadvantage when subsidies are paid on the basis of the sales production. This is because they consume a considerable portion of the agricultural products themselves. Part of the subsidy is therefore paid on the basis of the number of cows and the field area, so that small farmers, too, can benefit. In the 1960s the regional subsidy was supplemented in northern Finland with a production subsidy for beef, pork and sheep meat.

Regional subsidies have also been paid on certain cultivated crops. In order to promote production, a higher price for rye has been paid in northern and central Finland since 1958. A higher price was paid in the 1950s and 1960s for barley grown under contract in northern Finland.

The subsidy paid to small farms on the basis of arable area has also been scaled regionally since the 1960s. Accordingly, this subsidy is somewhat higher in northern Finland.

In some parts of Finland the transport of agricultural products and supplies presents a problem. Distances in the sparsely settled areas of northern and eastern Finland, in particular, are long. Transport costs are also high in the inland lake district, and the same applies to the coastal archipelagoes. A transport subsidy is paid to dairies in order to reduce e.g. the costs of milk collection. It is higher in northern and central Finland and in the archipelago areas. Efforts to balance out transport costs of the most important agricultural supplies have also been made by keeping the prices for e.g. compound fertilizers and purchased feed nearly the same throughout Finland.

A limited production subsidy is also paid for certain other products on a regional basis. These products include sugar beet and potatoes for the starch industry.

In order to implement agricultural policy, the country is divided into several agricultural development zones. Regional subsidies are paid in many different forms and as a result, there are several different borders, defined in different ways. Those borders which are connected with the payment of subsidies on the basis of agricultural production are defined in principle in accordance with the conditions for production. Other borders are defined on the basis of the remoteness of the land cultivated or on other factors that hinder transport.

The basis for defining the borders of agricultural development areas is the difference in natural conditions. In determining these areas the quality of the cultivated land and climatic factors are examined separately. Moreover, the yield level for cultivated plants, agricultural structure and the income obtained by farmers from agriculture are considered. Cultivated land quality is rated on the basis of quality points. Quality points are defined in terms of e.g. soil quality, state of cultivation, drainage, slope, field shape, distance from the economic centre, stoniness, etc. Climatic factors include length of the growing season, the effective day degrees of the growing season and May-June rainfall. The data on climate are thirty-year means. The cultivated plants chosen for examination are those that thrive throughout most of Finland. Mean yields have been computed for barley, oats and cultivated hay. Three-year means have been used in order to eliminate annual fluctuations. Agricultural structure has been measured by the mean field area of farms and the milk production per farm. Income earned by farmers from agriculture is defined on the basis of taxation data.

The above data have been converted to points in accordance with a scale. The number of points depicting the conditions for agricultural production has been computed for each municipality and the various factors have been weighted as follows:

Soil and field quality	1/9
Yield level of cultivated plants	1/9
Climatic factors	3/9
Agricultural structure	2/9
Farmer income	2/9

The number of subsidy areas considered necessary was formed on the basis of the number of points received by the municipalities. As far as possible, efforts were made to make the subsidy areas contiguous and to include municipalities with the same conditions for production. In part, areas formed for different types of subsidy have different bases. For example, variations in milk transport costs between different parts of Finland were taken into account in defining the milk transport subsidy border. The conditions

for agriculture in Lapland are very restricted and Lapland plays a very minor role in Finnish agriculture in general. Factors other than agriculture were considered in defining the borders for Lapland.

To some extent, the existence of several different borders is detrimental. On the other hand, this keeps the subsidy area border from having too great an effect with respect to adjacent municipalities.

In Finland the coastal archipelago and archipelagos in the lake districts form a special regional problem. The same criteria were used to form developing areas in the archipelago as elsewhere in Finland, except that the particularly difficult problems of transport were taken into account as a factor that hinders production.

The above-mentioned factors formed the basis for determining the borders of the less-favoured agricultural areas. Alongside these an effort has been made to take into account employment considerations and certain other regional and population policy factors.

The more important regional divisions used in distributing regional agricultural subsidies are shown in the enclosed figure 2 and 3.

## 2. Objectives set by Governments for agricultural development in such regions

The primary purpose of regional agricultural policy is to reduce income differences between farmers in different areas. Policy is also used to some extent to influence the regional location of production. Agricultural policy also seeks to improve the employment situation in the developing areas and to keep a population balance among the various parts of the country. At the same time, government seeks to develop the non-agricultural sectors of the areas in question.

In a sense, Lapland and the very northern parts of the country in general represent a separate regional policy problem. Agriculture and forestry there form the occupational backbone of the area. The prospects for agricultural production are limited primarily to the production of feed, and hence to the production of milk and beef on this basis. Lapland province, for example, accounts for approximately 5 % of the total number of farms in Finland and only 3 % of the arable area. Thus Lapland's agricultural production is not significant. Sufficient regional subsidies are considered necessary to maintain a population in the area and to assure farmers a reasonable income. Due to the small number of farms and the low level of production, only a small proportion of the total funds used for regional subsidies go to support agriculture in Lapland.

The natural conditions for agriculture elsewhere in northern and eastern Finland are clearly better than those of Lapland. Fields in these areas, too, are best suited for the cultivation of grass-land plants. For this reason the development of beef cattle production in subsidy areas has generally received priority. Efforts to guarantee the future income level of farmers are made by improving the structure of agriculture. Thus special attention is focused on improving the structure in developing areas. In the developing areas agricultural credit is also channelled to those farms on which the incidental earnings of farmers are an important source of income. This aims at guaranteeing the development of farms whose occupants have outside employment. Forest work performed by farmers is of great importance for their income, and for forestry in the developing areas.

In recent years a more concerted effort has been made to improve the entire economy of the developing areas. Financial subsidies are provided to industry that moves to these areas or sets up there. According to the official job and population projection, the aim is to prevent the population in the developing areas from falling below the 1975 level. More thorough plans for regional development are now under consideration than before.

### 3. Actual strategies and policies pursued by Government

Regional agricultural subsidies comprise price support, credit and direct subsidies. Also, the effect of certain social policy measures on farmers in the developing areas is greater than on those living in southern Finland.

The extent of the area receiving subsidies and the area division varies in accordance with the form of subsidy. For most forms of subsidy the amounts paid vary greatly within the area receiving the support. The amount paid per subsidy unit is greatest in the northernmost part of the country.

#### 3.1. Price supports

Milk production and related beef production are the most important forms of agricultural production in the developing areas of Finland. Money incomes from milk in the developing areas account for some 2/3 of agricultural sales revenues. The support given milk production is indeed the most important form of regional subsidy. The area receiving this support is approximately 3/4 of the entire area of Finland and accounts for slightly more than 60 % of total milk production (table 2 and figure 2). The milk production subsidy is paid to farmers in nine areas from north to south as follows (autumn 1977):

Area	Milk production subsidy p/l	% of target price (138 p/l)
I a	36.0	26
I b	30.0	14
II a	15.5	11
II b	14.5	10
III a	12.0	9
III b	8.8	6
IV a	4.2	3
IV b	2.5	2
V (outer archipelago)	8.8	6

The average subsidy in the entire milk production support area is about 8 p/l. The milk production support for milk produced throughout the country is about 5 p/l (1976). A subsidy is paid on the basis of the number of milk cows in the four northernmost areas listed above and in the outer archipelago area as follows:

Area	Per-cow payment	
	mk/cow for each cow	mk/cow for a max. of 7 cows
I a	300	300
I b	200	200
II a	130	130
II b	90	90
Outer archipelago	90	90

A special subsidy of 250 mk/cow is paid in the inner archipelago.

The production subsidy for beef is paid in approximately the same areas as for milk production. This production subsidy is divided into six areas. There are five production subsidy areas for pork and sheep meat. The meat production support in different areas in p/kg and the percentage of the target price covered by the subsidy are given below.

Area	Production subsidy					
	Beef		Pork		Sheep meat	
	p/kg (over 130 kg)	% of target price 13.65	p/kg	% of target price 9.11	p/kg	% of target price 15.94
I a	330	24	55	6	525	33
I b	310	23	45	5	475	30
II	230	17	35	4	400	25
III	150 <sup>1)</sup>	11	25	3	300	19
IV	50	4				
Outer archipelago	150	11	25	3	300	19

<sup>1)</sup> for an animal in excess of 160 kg

The meat production subsidy is also used in an attempt to control beef production as well. The subsidy paid on beef cattle under 130 kg is about half that paid on animals of more than 130 kg. Production subsidies are paid on animals of less than 80 kilos only in the two northernmost subsidy areas. The regional subsidy for pork production is small. The significance of sheep raising in the agriculture of the entire country and also in the developing



areas is very limited, so that the subsidy for sheep meat production has a very small effect on the agriculture of the developing areas.

The subsidy to small farms on the basis of area and the number of animals is paid in southern Finland for a maximum of 14 field hectares, in central Finland for a maximum of 17 field hectares and in northern Finland for a maximum of 22 field hectares. This arable area subsidy is greatest for 7 hectare farms and half of this maximum sum for farms of 14 or more field hectares. The number of animals tends to increase the amount of the subsidy. The extra area subsidy paid in central and northern Finland is 10-40 % higher than that paid in southern Finland. The subsidy is paid on the condition that the farmer's income does not exceed certain limits. In the developing areas farms are smaller and incomes lower than in southern Finland. This, together with the regional support adjustments, makes the effect of the extra area subsidy greater in the developing areas than elsewhere in the country.

A fee of 9 p/kg is paid for rye production in central and northern Finland (figure 3). A subsidy is also paid for the production of sugar beets and potatoes for the starch industry in central and northern Finland.

Purchased of feed account for more than half of the costs of agricultural supplies in northern Finland. Price reduction compensation is paid to farmers in northern and eastern Finland in order to reduce purchased feed costs. It is adjusted in accordance with four areas as follows:

Area	Percentage compensation of feed cost	Max. compensation mk/farm
I a (northernmost area)	33	2,475
I b	24	1,800
II	15	1,125
III and archipelago	10	750

Due to sparse settlement, milk transport costs are high in the developing areas. For this reason a milk transport subsidy is paid to dairies. In 1977 this subsidy was about 26 % of the transport costs reported by dairies in northern Finland (figure 3), i.e. about 2.8 p/litre of milk. In central Finland the subsidy was about 13 % of the transport costs, i.e. 0.9 p/l. The subsidy in question raises the price received by farmers for milk directly. In order to lower freight costs, a subsidy is paid in the northern parts of Finland for the transport of certain agricultural supplies such as fertilizers and feeds. This aims at reducing the effects of transport costs on the retail price of supplies.

### 3.2. Credits and direct subsidies for investments

The regional differences in the structure of Finnish agriculture are large indeed. The average arable area of farms in southern Finland is 16-20 hectares, in central and eastern Finland 8-9 hectares and in northern Finland 6-7 hectares. Farm size has grown most rapidly in recent years in southern Finland and the regional differences in agricultural structure have thus increased. In order to offset regional structural developments, all the direct State subsidies for investments and a large part of the low interest State loans are channelled to the developing areas. An attempt is being made to improve the agricultural structure of the developing areas by evening out the regional differences in the income of farmers and also by reducing the need for regional price supports in the future.

The Farm Act permits the granting of direct subsidies in northern Finland for road building and field draining and in the three northernmost municipalities for the construction of livestock buildings and clearing fields as well. Credit is granted on the basis of the Farm Act throughout Finland. Interest on the loans and the loan periods have been adjusted to favour the developing areas. The definition of a farm eligible for credit is not the same in the developing areas as it is in southern Finland. Credit from

State funds can be granted only for developing areas, and in southern Finland, with certain restrictions, to farms with under 10 hectares. The State can pay in interest subsidy for loans granted by banks anywhere in Finland.

Low-interest land purchased loans can be granted to farmers in the developing areas for purchasing a farm if the farmer and family can obtain a living from the farm when outside earnings are taken into account. In southern Finland a similar loan can be granted only in the event that the farm/<sup>family</sup>can obtain its entire living from the farm.

A developing area farmer can get credit for purchase of additional land and for purchase of a farm from other heirs on more advantageous terms than a farmer elsewhere in Finland. Likewise, loans for building a dwelling or production building, for renovation and for expansion are granted on more advantageous terms in the developing areas than elsewhere in Finland. The same applies to loans for basic improvements, draining fields, drainage, building roads, laying a water line or sewer, and for electrification. A loan for clearing a field can be granted in very northern parts of the country.

Depending on the type of loan, a low-interest loan accounting for a maximum of 30-85 % of the estimated expenditure can be granted. In northern Finland the amount can be 10 % percentage points greater than elsewhere in the country.

In the northern and eastern parts of the country the interest on State loans and interest subsidy loans ranges from 1-4 %, depending on the type of loan and the financial status of the borrower. In southern Finland the corresponding rate of interest is 3-5 % and in some cases below that. The normal interest rate on loans is about 10 %.

The funds available for low-interest agricultural loans have been insufficient compared with the need. In recent years the loans obtained from banks without a State interest subsidy have amounted to about half the total agricultural loans. However, most of the loans obtained by developing area farmers have been low-interest loans. For example, nearly 80 % of the loans granted to farms in developing areas in 1975 came from State funds. The repayment period for low-interest loans is clearly longer than that for normal bank loans.

On the basis of results from bookkeeping farms, farmer indebtedness in northern Finland was slightly higher than in southern and central Finland. However, the low interest on State loans and the longer repayment period reduce the annual costs incurred from debts on developing area farms.

### 3.3. Other measures

Regional agricultural differences have been taken into account in certain social policy measures. The arable area of a farm owned by a recipient of a generation shift pension must be at least 8 ha in southern Finland and at least 4 ha in the developing areas. Proceeds from the farm's forest are also taken into account.

The average age of farmers in the developing areas is higher than that for the country as a whole. According to some reports, the incidence of illness among farmers in the developing areas is above average. On the basis of the number of pensions granted, no large regional differences can be observed in payment of pensions. Presumably, pension and other social policy legislation will in future affect developing area farmers in particular.

Some measures taken by government have tended to increase the problems of the developing areas. An example is the temporary soil bank system introduced in 1969. A farmer making an agreement for a fixed period gave up agricultural production and the government

paid him a fee per arable hectare. The objective was to alleviate the problems of agricultural overproduction by cutting back on arable area. A great many farms in the developing areas were included in this system. 30 % of the total arable area in the system is in northern Finland, which in turn accounts for 16 % of the total arable area in the country. In some years more than 15 % of the arable hectares in the area in question have been in the soil bank. The corresponding figure for the entire country has been less than 8 %. This system has hindered efforts to improve the agricultural structure of the developing areas.

The problems of agriculture in the developing areas are closely connected with general regional problems. Support for other occupations and agriculture as well has been implemented primarily through financial and transport subsidies. State-owned industry has also been located to some extent in the developing areas. Efforts to upgrade the service level in economically weak municipalities have been made by granting the most State aid in relation to expenditure to the weakest municipalities.

#### 4. Obstacles encountered in the implementation of the policies

Price systems based on proceeds and cost calculations for agriculture as a whole have been carried out. Funds directed to regional subsidies in principle reduce the income of farmers in southern Finland. However, the share of regional subsidies in total agricultural proceeds is small, for example in 1976 regional price supports accounted for 195.8 million mk, i.e. 2.2 % of agricultural proceeds. The sum in question does not include the regional effect of the subsidy paid on the basis of cultivated area.

Capital formation by Finnish agriculture is weak, and farmers in the developing areas in particular have only limited opportunities to use money of their own for investments. The general shortage of capital for investments in Finland is the main obstacle to the arrangements of credit for the agriculture of the developing areas and of the country as a whole. The channelling of State credit to

the developing areas increases the availability of capital there. Regional subsidies presumably tend to increase production. As production of some products exceeds domestic consumption, the growth in production tends to increase the funds necessary for export. For this reason part of the regional subsidy is paid on the basis of arable area.

Forestry is closely related to agriculture in Finland as a whole and in the developing areas. Farmers finance a part of their investments with income obtained from their forests. Many farmers obtained incidental earnings from work done in forests outside their own farms. As logging has become mechanized the opportunities for farmers to obtain incidental earnings have decreased. Business cycle fluctuations connected with forestry also affect the incomes of farmers.

The determination of just regional boundaries is one difficulty in regional subsidy policy. Regional borders determined by municipality are not always fair to individual farms located near these borders. Farmers living south of the subsidy border often make strong demands to have the border moved further south.

The improvement of agriculture in the developing areas is very dependent on general economic trends and on the general developing area policy being pursued. The slow-down in economic development in the last few years has also had a detrimental effect in the developing areas. High unemployment throughout the country may have slowed migration from the countryside. However, improvement of the agricultural structure has also slowed.

##### 5. Evaluation of the results of these policies

Regional agricultural policy has succeeded in reducing the detrimental effects of natural conditions on developing area agriculture. Steps have been taken both to lower production costs and to raise return. Without these measures it would be impossible to

pursue agriculture in the developing areas on the present scale. If regional agricultural subsidies were smaller, migration from the developing areas to the southern parts of the country and emigration from Finland would obviously have been greater. Despite the regional policy pursued, the countryside in some areas has been abandoned to the extent that the arrangements of services for residents causes difficulties.

Statutory developing area policy, which concerns occupations other than agriculture, dates back to the mid 1960s. Thus far the development area policy pursued has not succeeded in creating enough jobs for the population leaving agriculture and forestry. The general development area policy pursued alongside regional agricultural policy has also proved important for agricultural development. In future it will probably be necessary to make regional agricultural policy more a part of general developing area policy.

Defining the subsidy area borders is one of the most difficult problems in area agricultural policy. The way in which subsidies are adjusted between areas has often proved excessively abrupt. Efforts to alleviate this situation have been made by increasing the number of subsidy zones. The problems caused by the subsidy area borders have also resulted in a need to expand the area receiving subsidies.

Table 1. Distribution of crop production between regions in Finland (see figure 1).

Region	Areas of field cereals in 1976											
	Spring wheat		Bread grain		Fodder grain		Mixed grain		Arable land area,			
	1000 ha	%	1000 ha	%	1000 ha	%	1000 ha	%	1000 ha	%		
South Finland	136.6	89.2	48.7	74.7	267.9	52.9	314.6	57.1	7.7	39.3	1254.5	48.0
Central Finland	6.1	4.0	8.7	13.3	89.5	17.7	92.0	16.7	2.4	12.2	535.1	20.5
South Ostrobothnia	10.0	6.5	5.9	9.1	93.4	18.4	111.4	20.2	4.0	25.5	403.7	15.5
North Finland	0.4	0.3	1.9	2.9	55.9	11.0	33.1	6.0	4.5	23.0	419.6	16.0
Whole country	153.1	100.0	65.2	100.0	506.7	100.0	551.1	100.0	19.6	100.0	2612.9	100.0

Region	The average yields of some certain crops in 1973-1977											
	Average Size of farms of 2 ha or more (1975)	Spring wheat	Rye	Barley	Hay	Potato						
	100 kg	Index	100 kg	Index	100 kg	Index	100 kg	Index	100 kg	Index		
South Finland	13.7	101	25.9	101	22.2	103	27.4	109	38.9	104	144.2	98
Central Finland	8.6	92	23.5	92	19.3	89	22.7	90	39.7	103	143.6	98
South Ostrobothnia	11.1	98	25.1	98	19.3	89	23.7	94	38.0	99	161.4	110
North Finland	8.6	72	18.5	72	17.1	79	20.9	83	36.2	94	132.6	90
Whole country	11.0	100	25.6	100	21.6	100	25.2	100	38.4	100	147.1	100



Table 2. Distribution of animal production by regions in 1976 (see figure 1).

Region	Cows		pcs/100 ha arable land	Pigs		Hens		Milk production mill.ltr. %	Total meat production		
	1000 pcs	%		1000 pcs	%	1000 pcs	%		mill.kg	%	
South Finland	274.2	35.9	21.9	369.9	68.5	4691.3	74.1	1183.8	37.3	141.53	53.7
Central Finland	226.0	29.6	42.2	47.7	8.8	380.7	6.0	920.0	29.0	44.46	16.9
South Ostrobothnia	112.8	14.8	27.9	104.2	19.3	1104.9	17.4	457.3	14.4	52.35	19.8
North Finland	150.1	19.7	35.8	18.1	3.4	156.3	2.5	614.9	19.3	25.43	9.6
Whole country	763.1	100.0	29.2	539.9	100.0	6333.2	100.0	3176.0	100.0	263.77	100.0

Milk production by different subsidy regions in 1976, per cent of total production (see figure 2)

Subsidy region	I a	I b	II a	II b	III a	III b	IV	V
- " -		1.1 %						
- " -			4.2 "					
- " -			3.2 "					
- " -			8.1 "					
- " -			22.5 "					
- " -			21.2 "					
- " -			0.3 "					
Other regions <sup>1)</sup>	39.4 "							
Whole country	100.0							

<sup>1)</sup> In these regions no regional subsidies are paid

Table 3. Some results of bookkeeping farms by regions in 1975  
(see figure 1).

Region	Farm size class	Total return mk/ha	Return of animal husbandry % of total return	Production cost <sup>1)</sup> mk/ha	Labour cost % of prod. cost	Net return <sup>2)</sup> mk/ha	Coefficient of profitability
South Finland	Under 10 ha	4 732	69.4	5 910	52.5	1 854	0.53
	10-20 "	4 608	72.9	4 593	41.5	1 884	0.79
	20-30 "	4 960	70.3	4 480	30.1	1 691	0.97
	30-50 "	3 835	61.3	3 227	27.8	1 327	1.09
	Over 50 "	3 273	33.2	2 460	26.2	1 074	1.50
	Average	4 028	57.9	3 524	32.2	1 412	1.01
Central Finland	Under 10 ha	4 241	86.9	6 015	56.3	1 587	0.42
	10-20 "	4 646	84.4	5 126	43.5	1 608	0.63
	20-30 "	6 290	82.0	5 579	29.3	2 038	1.14
	Over 30 "	4 831	59.0	3 821	26.6	1 607	1.58
	Average	5 178	76.5	4 915	35.4	1 736	0.91
South Ostrobothnia	Under 10 ha	4 930	82.6	5 908	47.6	1 793	0.56
	10-20 "	4 241	84.6	5 002	47.1	1 540	0.56
	20-30 "	4 956	74.9	4 401	31.8	1 903	1.07
	Over 30 "	3 397	49.0	2 584	25.0	1 409	1.49
	Average	4 150	69.8	3 954	36.9	1 604	0.89
North Finland	Under 10 ha	4 610	82.8	6 213	54.2	1 654	0.45
	10-20 "	4 781	85.7	5 605	44.3	1 570	0.56
	20-30 "	3 873	87.7	4 251	40.0	1 231	0.63
	Over 30 "	3 678	79.9	3 325	32.4	1 318	1.01
	Average	4 285	84.9	4 832	43.0	1 432	0.61
Bookkeeping farms, average		4 294	75.5	4 026	35.4	1 496	0.89
Whole country, weighted average		4 502	67.4	5 003	45.1	1 645	0.63

<sup>1)</sup> Production cost except taxes and interest claim for total capital

<sup>2)</sup> Net return to total capital plus imputed wage of operator and family

FIGURE 1.  
FINLAND  
REGIONS USED IN TABLES 1-3

- 1. SOUTH FINLAND
- 2. CENTRAL FINLAND
- 3. SOUTH OSTROBOTHNIA
- 4. NORTH FINLAND

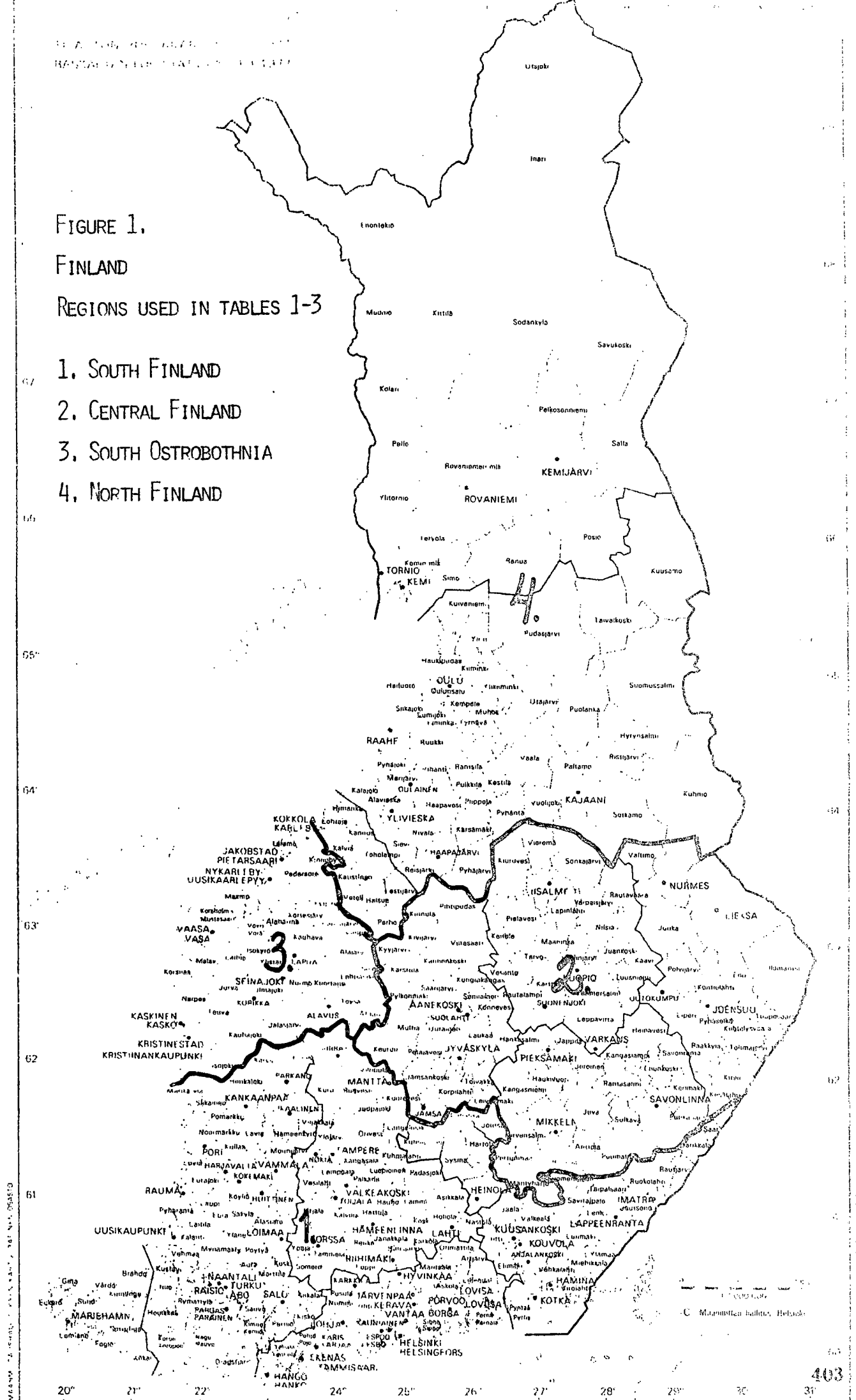
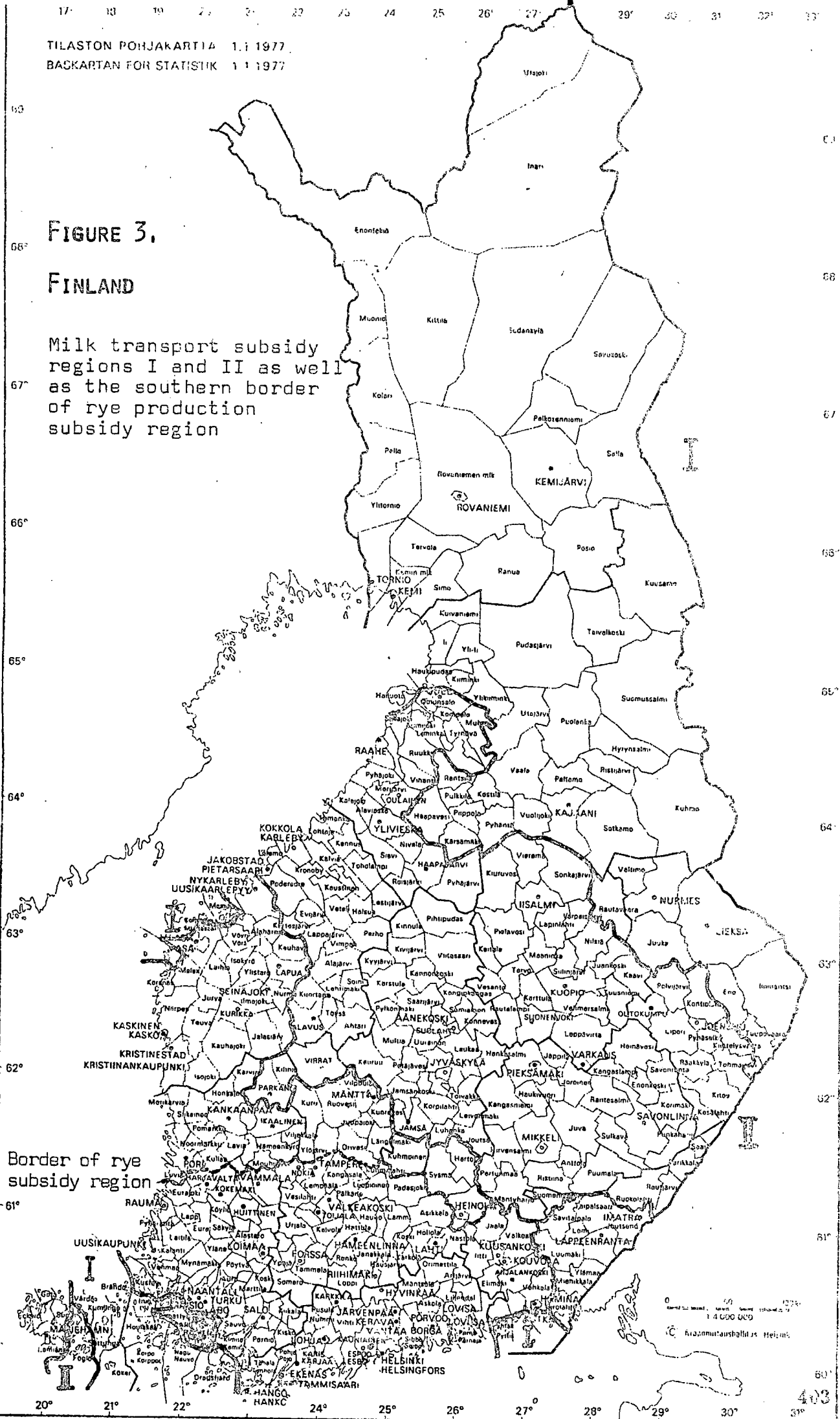




FIGURE 3.

FINLAND

Milk transport subsidy regions I and II as well as the southern border of rye production subsidy region



Border of rye subsidy region

MAANMITTAUSHALLITUKSEN KARTTOGRAFINEN OSASTO

1:1 000 000  
Kilopainutaushallitus Helsinki

Maatalouden taloudellisen  
tutkimuslaitoksen

TIEDONANTOJA N:o 53,3

The Agricultural Economics  
Research Institute, Finland

RESEARCH REPORTS, No. 53,3

THE PROFITABILITY OF DAIRY FARMING  
ON FINNISH BOOKKEEPING FARMS

HEIKKI JÄRVELÄ

# THE PROFITABILITY OF DAIRY FARMING ON FINNISH BOOKKEEPING FARMS

Heikki Järvelä

Agricultural Economics Research Institute, Finland

## 1. Measurement of the financial result

The profitability of agricultural production can be measured in several ways. On a farm-by-farm basis agricultural production can be examined as a whole, in which case the financial result bears jointly on all the products produced by the farm during the year. A second approach involved determining the financial result separately for each product. This naturally calls for information on the costs incurred for each product separately in addition to information on the return. Determination of the costs per product calls for relatively detailed records. The profitability of the various products produced on the same farm has therefore not been studied in Finland to any great extent. The small size of the production units has also been a disadvantage in this respect. As relatively small quantities of various products are produced on one and the same farm, the reliability of calculations on their profitability has not always been satisfactory. As it has recently become increasingly important to obtain information on the profitability of producing various products, studies into the profitability of agriculture have sought to deal with this question by grouping farms producing primarily the same product or group of products together under their own separate groups, i.e. with grouping being based on the principal lines of production of the farm, and the average operating results for the different farm groups then being calculated. In what follows an attempt is made to apply this approach to an examination of the profitability of dairy farming on bookkeeping farms during the 1976 financial year.

The profitability of production can be measured in various ways. It can be examined as a capital investment, in which case the interest obtained on capital invested in the operations is deter-

mined. Here, the net return is usually calculated and this is obtained by deducting operating costs from overall returns. The net return, which thus indicates the interest on capital, was formerly used rather frequently to measure profitability in Finland. Considering that the vast majority of Finnish farms are relatively small production units run primarily on the farming family's own input of labour, the net return cannot be considered a particularly good indicator of the financial result. More often than not the wage for their own labour is more important for the farmer's family than interest on capital. An alternative approach to measuring profitability is the "farming family income". This indicates the part of gross return that the farming family is left with as a wage for their labour and interest on invested capital, and is obtained by deducting from gross return all production cost items apart from the imputed wage of the farming family for their own labour, and interest claim on total capital. When farming family income is used to measure profitability, fluctuations in financial result can be seen in both production factors - farming family's own labour and invested capital - and not just as a variation of the latter, as is the case when net return on total capital is used. Another indicator of profitability that can be used is the ratio obtained by dividing farming family income by the total of the farming family's imputed wage and the interest claim on capital. This compares the results achieved - the farming family income - with the target set. A moderate target here would be for the farming family to be paid the current wage for their work and interest on invested capital at the current rate. This ratio is here called the coefficient of profitability.<sup>1)</sup>

Groups were formed from farms mainly engaged in dairy farming, including farms which get at least 80 % of their gross return from cattle farming. As mentioned above, this grouping was carried out according to total return from cattle, so it includes meat as well as milk. However, the former is rather minor and usually only includes meat production accompanying milk production, for the material does not really include any farms raising purely beef cattle.

---

<sup>1)</sup> Coefficient of profitability = 
$$\frac{\text{Farming family income}}{\text{imputed wage + interest claim on total capital}}$$



2. The data used

The farms chosen for study are milk producing units in the survey areas of South and North Finland. The former area has far greater potential for producing different products than other parts of the country. The North Finland area has much less natural potential. In fact, milk production is by far the most important sector of agriculture in this area. Milk is produced on the vast majority of farms. Production relies largely on home-produced silage, which has been used more and more widely in recent years. Some barley is also produced for fodder and in the areas with the most favourable conditions, also oats. In North Finland milk production is of vital importance for farmers because of the lack of alternative products. It is far more important to farmers than in South Finland, where there are much better opportunities for other products.

The following table gives some data of the farm groups surveyed. They include bookkeeping farms in the survey areas of North and South Finland on which cattle return accounts for over 80 % of the gross. Farms with 10-20 ha and over 30 ha are given separately for South Finland, in addition to the averages.

	Farms producing milk			
	10-20 ha	South Finland over 30 ha	average	North Finland average
No. of farms	40	16	106	141
Arable ha/farm	14.9	37.8	20.0	17.9
Use of arable land % of total:				
rye + wheat	2.9	1.5	2.4	0.4
barley	16.6	16.4	14.4	13.8
oats	20.6	22.4	22.6	7.9
potato + root veg.	2.3	0.7	1.7	1.6
grass	55.7	57.1	56.8	73.7
other arable land	1.9	1.9	2.1	2.6
Yields 100 kg/ha				
barley	34.3	36.1	35.6	28.1
oats	34.7	33.5	34.2	21.6
hay	53.5	48.3	50.7	44.7
Average 100 f.u./ha	29.3	29.4	29.4	24.7
At beg. of year				
cows/farm	9.9	20.9	12.4	10.5
Milk yield kg/cow	5486	5794	5585	5174

The surveyed farms in South Finland are on average c. 2 ha larger than those in North Finland. The figures showing relative areas

under different plants show that rather little rye and wheat and potato and root vegetables are grown on dairy farms. The extent of barley cultivation is roughly the same in the different groups, i.e. 10-15 % of arable area. Much more oats are grown in South Finland than in North Finland, where grass accounts for a much larger proportion, mainly because of natural conditions. A large proportion of the grass crop is turned into silage, especially in North Finland. Thus arable farming on dairy farms mainly concentrates on fodder production. There are clear differences between areas in the crop level for cultivated plants. The oats crop in particular is much lower in North Finland, where relatively little land is used for it. The average crop level in South Finland is around 3,000 feed units per hectare, and around 500 f.u. lower in North Finland. The f.u. crop also includes the second grass crop. The grain crop calculated does not include straw. The average do not include pasture crops either.

The number of cows is given per farm at the beginning of the year. It may diverge somewhat from the average over the year, but not to any major degree. An average of some 10 cows are kept per farm in South Finland on 10-20 ha farms and the same figure is the general average for North Finland. In other groups the average is somewhat higher. The main milk yield in South Finland is close on 5,600 kg a year, and 5,200 kg in North Finland. It is around 5,800 kg on farms with over 30 ha in South Finland.

### 3. Gross return

The gross return from agriculture and its breakdown in the various groups are indicated by the following figures:

	South Finland			North Finland
	10-20 ha	over 30 ha mk/ha	average	average
Gross return from agriculture:				
milk	4142	3718	3961	3796
beef	922	1105	968	1091
other domestic animals	32	49	31	7
return from domestic animals				
total	5096	4872	4960	4894
return from cultivated plants	333	423	356	140
Other return	208	147	200	300
Gross return, total	5637	5442	5516	5334

The milk return per unit of area is highest - around 4,100 mk - on 10-20 ha farms in South Finland, the group in which farm size is also smallest. The lowest return per hectare is in the over 30 ha group in South Finland, where arable land per cow is also largest on average. Farms in North Finland achieve a relatively high dairy return on average, with c. 3,800 mk/ha. The relatively high domestic animal return in North Finland is due to the price subsidy paid by the government, which averages 0.17-0.18 mk/kg in the area. The beef return ranges between 900 - 1,100 mk/ha, which can be considered the level of meat production usually accompanying milk production. The return from other domestic animals is of no great significance. Return from cultivated plants and other return are relatively minor compared with return from milk.

#### 4. Costs

The following figures show the cost of agriculture per hectare in the various groups.

	10-20 ha	South Finland over 30 ha	average	North Finland average
Cost mk/ha:				
Paid wages	103	311	195	94
Bought fodder	663	965	795	1215
Bought fertilizers	427	375	399	401
Other supplies	494	395	433	376
Total costs of supplies	1564	1726	1627	1992
Machinery and equipment	847	857	835	770
Buildings	362	306	346	321
Other costs	449	404	425	329
Total costs	3325	3604	3428	3506

The figure for paid wages shows that these farms use very little hired labour. The highest figure for this item - c. 300 mk/ha - is on farms with over 30 ha in South Finland and the lowest - c. 90 mk - on farms in North Finland. By far the highest figure for bought fodder - 1,215 mk/ha - is on farms in North Finland. This shows that these farmers had to buy extra fodder from outside to supplement their home-grown feed much more than in South Finland. The cost of bought fodder in the latter area average some 23 % of

total costs. The corresponding percentage in North Finland is 35 %. Fertilizers account for roughly 400 mk/ha in all groups. The item "other supplies", which includes fuels and lubricants and electricity, does not reveal any very great differences between the various groups, ranging from 400 - 500 mk/ha. Machinery and equipment costs average 770 mk/ha in North Finland, which is slightly lower than in other groups. Total costs range between 3,300 - 3,600 mk per hectare, being highest on farms with over 30 ha in South Finland. This is partly because of the high wage costs and also because the cost of bought fodder is relatively high. It should be noted here that yield per cow is also higher, at around 5,800 kg, which in turn explains the need to buy supplementary feed. The second highest cost figure - c. 3,500 mk - is on North Finland farms, due mainly to the high figure for bought feed.

#### 5. Financial result

When the above costs, which do not include interest on loans or taxes, are deducted from gross return, we get the net return, which is as follows for the various groups.

	10-20 ha	South Finland over 30 ha	average mk/ha	North Finland average
Gross return	5637	5442	5516	5334
Costs	3325	3604	3428	3506
Farming family income	2312	1838	2088	1828
Coefficient of profitability	0.66	0.96	0.74	0.60
Agricultural property	13142	13528	13323	9487
Interest claim 5 %	657	676	666	474
Routine agricultural work hr/ha of this, by farming family	292	155	235	259
Imputed wage of farming family	275	117	209	249
	2863	1245	2170	2591

The highest farming family income - 2,300 mk/ha - is on 10-20 ha farms in South Finland. Farms with over 30 ha in North and South Finland have roughly as good a result, only some 10 % lower than the average result for South Finland. Thus the wage for the farming family's work and the interest on capital are together roughly the same per hectare on farms in North Finland and on farms with over 30 ha in South Finland. The result can be examined in relation

to the capital invested and the amount of work done by the farming family. It can be compared with a modern target, i.e. for the farming family to get a wage in line with the current rate for their work and interest according to the current rate on their capital. When the result obtained, farming family income, is divided by the target set (=imputed wage+interest claim on capital) we get the coefficient of profitability. The coefficients above show that farms with over 30 ha in South Finland produced the best result - 0.96 - that is, they achieve 96 % of the desired wage level and interest, the latter being 5 % on invested capital. Farms with 10-20 ha in South Finland achieve 65-75 % of the target, which is the same as the average, i.e. a wage of 6.5-7.5 mk/hour and an interest of 3.5 %. The result is almost the same - 60 % - in North Finland. Regarding the results for the various groups, we can point out that per hectare they are almost in the same class, but on smaller farms more of the farming family's own work has to be devoted to attaining the result and thus the wage level is lower than on bigger farms. It is noticeable that dairy farms in North Finland achieve almost the same results as farms of the same size in South Finland. Differences between operating potential in North and South Finland have been to some extent balanced out by governmental agricultural policy measures.

The relationship between the results on dairy farms and the various results on farms in another line of production are illustrated by the following figures, which only concern the survey area of South Finland. There are very few of the latter kind of farms in North Finland.

	South Finland					
	10-20 ha		over 30 ha		average	
	no.of farms	mk/ha	no.of farms	mk/ha	no.of farms	mk/ha
Farming family income:						
Farms producing milk	40	2312	16	1838	106	2088
Farms producing pork	15	3376	14	2507	51	2825
Farms producing grain	22	800	32	1180	103	1128
Coefficient of profitability:						
Farms producing milk		0.66		0.96		0.74
Farms producing pork		1.12		1.81		1.37
Farms producing grain		0.54		1.41		1.19

The highest farming family income figures in the various size classes are on pig farms, where the return averages about 65-75 % of the gross.

The lowest farming family income is on grain farms, where the return from grain averages some 70 % of the gross. The farming family income on dairy farms comes roughly midway between these two. When the result is measured by the coefficient of profitability, however, the order is quite different. This is due largely to the very low labour factor on grain farms, only 51 hr/ha on average, with the farming family accounting for 49 hours of this.

We can probably say that milk production, together with the related fodder production, achieves a relatively satisfactory gross return. However, as it ties up a great deal of human labour, the pay per hour is not as good as on pig farms, where production seems to be very good and the result is also very satisfactory, both per hour and per hectare. On grain farms the total result is low in spite of the relatively high rate of wages per hour. One important advantage of milk production is that income comes in fairly regularly, which makes it easier to run the farm in many ways. The risk factors are also often smaller than in certain other forms of production. When comparing the results achieved by farm groups engaged in different kinds of production, one should also take account of the fact that the costs did not include taxes and interest on loans, as mentioned already. When these two items are included, the results balance out somewhat.

When we study the findings above we must remember that they only apply to bookkeeping farms, where the average size is much higher than the national average. The average arable area of all farms in Finland is around 11 ha, and in North Finland 6-7 ha. The average size of herd on bookkeeping farms is also higher than the national average, which is around 6-7 cows (5-6 cows in the north). The bookkeeping farms differ in many other respects from the national average, often being above it. It should further be pointed out that the number of farms in the groups dealt with above is rather low and that the results only apply to the 1976 financial year, when the harvest was better than average.

Maatalouden taloudellisen  
tutkimuslaitoksen

TIEDONANTOJA N:o 53,4

---

The Agricultural Economics  
Research Institute, Finland

RESEARCH REPORTS, No. 53,4

THE PROBLEMS OF DAIRY PRODUCTION IN FINLAND

JUKKA HAUKKA

## THE PROBLEMS OF DAIRY PRODUCTION IN FINLAND

Jukka Haukka

VALIO, Finnish Co-operative Dairies' Association

Livestock farming, especially based on dairy herds, has been common in Finland from the very beginning. However, the first dairies were formed only 120 years ago and the real dairy industry started at the end of the last century, after the separator was invented.

Cooperative legislation was enacted in 1901 and since that time most new dairies have been cooperative. The central organisation for cooperative dairies, called Valio, was founded in 1905. The cooperative dairy industry has been successful and, nowadays, over 90 per cent of the milk received by dairies goes through Valio and its member dairies. The Swedish cooperative dairy organisation in Finland and the private dairies handle a mere ten per cent of the milk received. There have also been cooperative dairies owned by consumers, but Valio bought the last one this year. So we can realize that practically all of the dairy industry in this country is in the hands of milk producers.

The amount of milk received yearly in the dairies increased sharply after World War II, until the amount began to decrease about ten years ago. The amount of milk received by the dairies in 1969 was 2 949 million liters and last year it was 2 822 million liters. The number of milk producers nine years ago was 210 000 and last year 111 000. The number of cows was also decreasing. In 1969 it was 1 047 000 and last year 746 000. That means that the average size of herds increased from 4,9 to 6,7 cows per dairy farm. At the same time, the average yield of milk per year per cow increased from 3 406 liters to 4 197 liters.



The prognoses shows that milk production will also decrease in the future. In 1985 the number of milk producers is forecasted to be 57 000, the number of dairy cows 576 000, the average size of herds 10 and the average yield of milk 4 900 liters per cow per year. Although the amount of milk received in dairies, according to the forecasts, will be 2 646 million liters, which is in balance with the consumption of milk products in 1985, there will be difficulties because of the seasonal variation of milk production during the low production time. The seasonal changes are also harmful, as the dairy plants have to be built according to the increased production and thus they have to run at reduced capacity during most of the year.

Most countries try to be self-sufficient in milk production, since the world prices are so low that export is possible only with subsidies from the Government. If self requirements are set according to a low production level, the milk products manufactured during a high production period must be exported and, thereby, sacrifice public funds.

In this decade the Finnish dairy industry has taken action in order to level the seasonal variation of milk production, and during the last two years, some progressive results have been observed. The most important procedures in the levelling of the seasonal variation of milk production are seasonal price fixing, free inseminations for cattle during the certain period of the year and active informing and advising of milk producers. The target price of the milk for producers is determined as a result of the negotiations between the Government and the Central Union of Agricultural Producers. The prices of most dairy products are under tight control. Thus the profit gained by rationalization and saving in costs very often goes to the consumers.

The fixing of the price of milk is based on the amount, composition and quality of the milk. The general valuation of different constituents of milk has changed during the last two decades. The value of milk fat has depreciated and that of milk has

increased. The high energy value of fat is the reason why its excessive use has not been considered beneficial. However, milk fat has been also subjected to undue criticism. It is natural that in fixing the price of milk for the producer the protein content is taken into consideration.

Since the beginning of this year, the protein content of milk, in addition to fat content, influences the price of milk. Before this year, the value of fat in fixing the price of milk was 0,6 pennies per 0,1 fat per cent. Now the value of fat is 0,8 pennies and the value of protein 0,6 pennies per 0,1 content per cent of one liter of milk. The milk samples are analysed in four regional laboratories of Valio. A few cooperative dairies have their own analysing laboratories.

Fixing the price of milk according to quality of the methylene blue reductase test is still used in Finland, but the test is not good anymore, as the effective chilling of milk has become widespread with the increased use of farm tanks. Lactic acid bacteria cannot grow in milk, when it is cold. However, the microbial flora of cooled milk changes so that it is the rich psychrotrophes which have lipolytic, proteolytic and oxidative properties. Therefore, these organisms can degrade the quality of milk. Since the psychrotrophes reduce methylene blue poorly, the significance of the reductase test has become negligible with regard to well-chilled milk. New methods for the quality determination for fixing the price of milk have been looked for, and the Finnish dairy industry has shown great interest in the catalase test. It determines the quality of milk for processing purposes well and is therefore, of great importance to the industry. The catalase activity is high, if the milk is enriched by catalase-active bacteria, and psychrotrophes are such organisms. Similarly, a high number of somatic cells raises the catalase activity and reveals the presence of mastitis. In either case high catalase activity shows the unsuitability of milk for processing. When the number of somatic cells is determined in milk,

it will be known whether it is due to psychrotrophic bacteria or mastitis. The catalase test also has more advantages. It is a simple and an inexpensive test, which can be started on the farm; and the sampling does not need sterile conditions. There is a Finnish method of making a catalase test, determining the milk composition and making a somatic cell count all on the same sample.

Besides the increase in the production of milk per producer, the amount of processing of milk in the dairy has also increased considerably. With the growth of the dairies, many insignificant factors have come under new light. An example can be given dealing with personal administration. The development of personnel administration is in fashion these days and, however, it is by no means unnecessary. Frequent change of employees decreases the efficiency of labour, since the skill and experience required even in the simplest operations, are not achieved quickly enough. Therefore great attention should be paid to all levels of education in personnel administration. This is also necessary because rapid development means that the knowledge acquired at the time of graduation soon is out of date. The shift to the management by objectives (MBO) has also resulted in an increase in education in several dairies. As mentioned above the Finnish dairy industry is almost entirely administered by the co-operative dairies owned by the producers, and as such, the education and advising of the milk producers is also necessary. The high quality of raw milk is the basis for better milk products and this requires effective advising at the beginning of production as well. Mention may be made here that Finland is probably the only country in the world where Emmental cheese is manufactured without additives from milk produced by silage fodder and to a great extent this is a reflection of the advisory services offered to milk producers.

As the turnover of the dairy increases, accountancy takes a new importance. The control of profit of different products, the checking of manufacturing costs and the control of the efficient use of raw materials in dairying have, from an economical point of view, an important place in relation to the size of the dairy.

Likewise, the arrangements for economically efficient transportation of material is important in a large dairy, as the transport distances increase and possibilities for organizing various alternative routes increases in proportion to the growth of the dairy. Especially in recent times, the organizing of transportation has been of great significance because of the rapid rise in the cost of energy.

Nowadays, "product development" in the food industry has become a fashionable phrase. If product development also means the improvement of the quality of raw milk and the improvement of the products already on the market, the dairy industry already has old traditions in product development, although it has not always been called by this name. Not only the development of new products, but also the judging of dairy products and the advising of technology are included essentially in product development. The traditional milk products such as market milk, cream, fermented milks, dried milk products, ice cream, butter and varieties of cheese will continue to be the main dairy products in the future. The so-called new recipe products will be developed, but their life will be short. They have, however, an important place as a stimulant for the marketing of the traditional dairy products.

The separation and fortification of different components of milk in the manufacture of dairy products have been carried out by the centrifugal separation of milk, by the churning of cream and by the coagulation of casein. New methods by which fractionation can be extensively applied are being developed and some of these methods are already in practice. These are, among others, ultrafiltration, ion exchange, gel filtration, crystallization, and so on. The new products manufactured by these methods have to find right ways and properties in usage, as the manufacturing may often be very expensive.

The improvement of the keeping quality of dairy products will continuously be an important feature in product development. The liquid products, which have a minor share of the market, will be manufactured more and more by using UHT heat treatment, and the keeping quality of pasteurized products will be improved by the addition of aseptic treatment after pasteurization. In the future aseptic packing machines may even be used for pasteurized products.

