



TRUEFOOD

Traditional United Europe Food

Contract no. FOOD-CT-2006-016264

Instrument: Integrated Project

Thematic Priority: Food Quality and Safety (# 5)

D4.1.2 -1

Interim Report describing the group of farms chosen in each country

Due date of deliverable: December 2007

Actual submission date : December 2007

Start date of project: 1 May 2006

Duration: 48 months

Organisation name of lead contractor for this deliverable: IRTA – P10

Revision: final

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
PU	Public	x
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	



D4.1.2-1 Interim Report describing the group of farms chosen in each country.

Authors:

Bruno MARTIN ✉, Jaroslav GOLECKÝ, Ole TAUGBØL, Jože VERBIČ

✉bmartin@clermont.inra.fr

ABSTRACT

The aims of subtask 4.1.2 are (i) to describe the variability in the nutritional composition of tanker milks sampled in diversified situations in Europe and (ii) to link the variability in the milk composition to the production conditions. The purpose of this deliverable is to describe the groups of farms chosen in France, Norway, Slovenia and Slovakia.

In **France**, the milk samples will be collected in 20 'virtual collecting tours' corresponding to a mixture of the milks collected in 5 homogenous farms located in the same area. The 20 tours consist in 10 tours located in plain using both maize (n=5) or grass (n=5) based diets and 10 tours located in mountain using both maize (n=5) or grass (n=5) based diets. The groups of farms using maize correspond to intensive farms rearing high productive cows (Holstein breed) fed all year round with important quantities of maize silage. The group of farms using only grass based diets are more extensive farms rearing local breeds grazing during summer and fed grass silage or hay during winter.

In **Norway**, the milk samples will be collected in 20 'real' collecting tours located in different parts of the country. They will be made of 3 organic and 3 conventional milk productions systems (South-east, South, and Mid- Norway), 4 inland districts from the south-east of Norway (2 of them from mountain area), 3 coastal districts in the south-west of Norway and respectively 3, 2 and 2 districts in the North, Mid and South of Norway. As in Norway, all the milk production is based on grass / grass-silage and concentrate, the farms will differ mainly according to the proportion of these different feeds given to the cows.

In **Slovakia**, the milk samples will be collected directly in 20 large farms constituted of 100 to 520 cows. They are made of 10 farms located in plain using both intensive (maize silage diets all year round, n=5) or semi intensive systems (pasture during summer and maize silage based diets during the indoor period, n=5) and 10 farms located in mountain using both intensive (maize silage diets all year round, n=5) or semi intensive (n=5) systems based on grass.

Lastly, in **Slovenia**, the milk samples will be collected in 15 'virtual' collecting tours corresponding to the mixture of 9-10 homogenous farms located in the same area. Nine tours have been selected in a continental area where cows from different breeds (Simmental, Brown or Holstein) are fed different basal diets (maize silage, grass silage or hay). Five tours have been selected in an Alpine area where cows from different breeds (Simmental, Brown, or Holstein) are fed different basal diets (maize silage or grass silage) and 1 tour is located in a Sub-Mediterranean area where Brown cows are fed hay.

This experiment will permit to analyze the nutritional composition of tanker milks produced by cows reared over a very large variety of local conditions in Europe.

INTERIM REPORT DESCRIBING THE GROUP OF FARMS CHOSEN IN EACH COUNTRY

Bruno MARTIN[□], Jaroslav GOLECKÝ, Ole TAUGBØL, Jože VERBIČ

INTRODUCTION

The nutritional composition of dairy foods depends on a number of factors linked both to the composition of the raw material used and the subsequent processing. Milk nutritional composition is itself dependent on the milk production conditions that have increasingly been the focus of consumers' concern. In the case of Traditional Dairy Foods, milk nutritional composition is of special importance since any raw material modification during processing is restricted or prohibited. In Europe, the milk used by the dairy industry for traditional dairy foods is produced by cows reared over a very large variety of local conditions that can be responsible for a wide variability of the milk components with nutritional interest. Under experimental conditions, the latter have been shown to be dependant on the upstream factors like genetic (breeds), physiological (stage of lactation) and overall dietary factors. The 'natural' variability of the composition of the milks used by the dairies over Europe is not well known though it could be used by the dairies to sell dairy products that differ in components with a nutritional interest.

The aims of subtask 4.1.2 are to 1/ characterize the nutritional composition of tanker milk used by the dairy in France, Norway, Slovakia and Slovenia and 2/ identify the milk production conditions leading to milk naturally rich in interesting compounds that could provide added value to breeders and industry.

In particular, we will (i) describe the variability in the composition for fatty acids, carotenoids, vitamins A and E of tanker milks (corresponding to the mixture of several herds) sampled in diversified situations in Europe (Mediterranean, Continental, Alpine, Oceanic and Arctic conditions), (ii) link the variability in the milk composition to the production conditions on the farms (mainly cow management and feeding).

In addition, the experimental device will also be used to focus on the sensory properties of milks (taste, flavour, texture and colour) and on other components with nutritional (phenolic compounds) or "anti-nutritional" interest (volatile organic compounds including pollutants like benzene derivatives or halogenated compounds) for a selection of milk samples.

The aim of this deliverable is to describe the groups of farms chosen in each country.

EXPERIMENTAL DESIGN IN EACH COUNTRY

The work planned in this on-farm experiment will be achieved in parallel in Slovenia, Slovakia, Norway and France. In each country, from 15 to 20 farms or groups of farms have been selected in different locations with specific natural agro-climatic conditions and localization (distance from important human activities). The aim is to cover a wide range of situations that can be encountered in Europe. The milk samples will be collected in each farm or group of farms, 5 times in the course of year 2008.

France:

In France, the milk samples will be collected in 20 'virtual collecting tours' corresponding to a mixture of the milks collected in 5 homogenous farms located in the same area. In the 5 farms of each 'virtual collecting tours', the milk samples will be collected and conserved separately: the mixture of the 5 samples collected in the 5 homogenous farms will be achieved just before the analyses.

The samples will be collected 5 times during 2008 (2 samples when cows are housed and 3 samples when cows graze outside). The sample collection will be achieved both directly by INRA and also in collaboration with the different local technicians in charge of the 'Contrôle Laitier'. The total number of samples that will be analysed is 100.

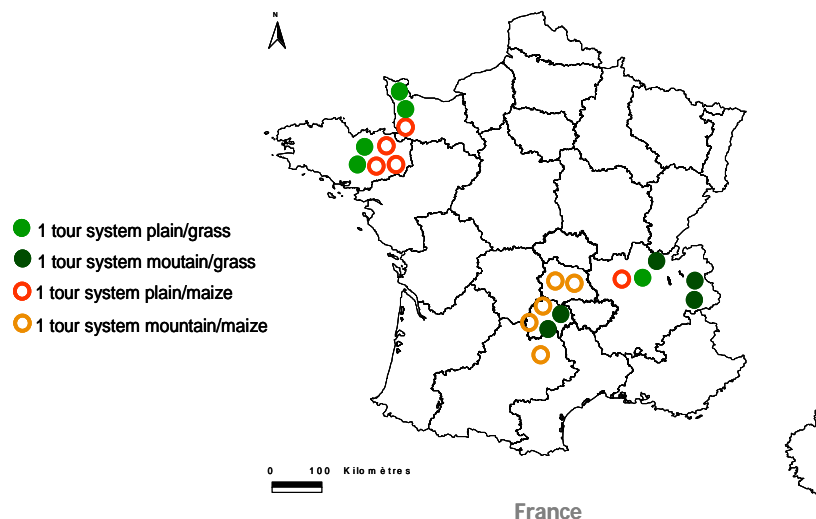
The 100 farms concerned have been selected on the basis of a first detailed survey achieved in October 2007. In this survey, questions were asked about 1) farm characteristics (area, altitude, stable and milking equipment, milk quota); 2) herd characteristics (dairy cow number, breed); 3) forage management (forage characteristics, forage harvesting and conservation, cutting and grazing periods, cropping pattern during 2007); and 4) feeding the herd during winter (types of feed). Special attention was paid to the forage (maize, grass), the grassland (permanent or temporary grassland), the preservation mode (pasture, hay, silage and wrapped forage), and the rank of the grass (first or higher use rank) and the estimated respective levels of each of these feeds. Calving distribution information was collected from the 'Contrôle Laitier' results.

The 20 tours consist in:

- 10 tours located in plain using both maize (n=5) or grass (n=5) based diets.
- 10 tours located in mountain using both maize (n=5) or grass (n=5) based diets.

The localization of the tours is given in figure 1.

Figure 1: sites of the study



A detailed description of the farms is given in Table 1.

The farms chosen correspond to a wide variety of the milk production conditions encountered in France. Both in plain and in mountain, the groups of farms using maize correspond to intensive systems; they use high productive cows (Holstein breed) fed all year round with important quantities of maize silage and their stocking rate is the higher. The groups of farms using only grass based diets are smaller farms, using local breeds (mainly Normande or

Montbeliarde breeds) with a lower milk production. Cows are grazing during summer and are fed grass silage or hay during winter. The stocking rate of those farms is lower.

Table 1: Main characteristics of the farms selected in plain or mountain that use grass or maize based diets

	grass	maize	
plain	Altitude (m)	132	120
	Agricultural area (ha)	75	113
	Forage nature (% MFA*)	66% PG – 32% TG	19% PG – 42% TG – 34% M
	Dairy quota (1000 l)	275	490
	Milk production (kg/cow/y)	5561	9019
	Breed	Normande (Holstein-Montbéliarde)	Holstein
	Stocking rate (LU/ha MFA)	1,2	1,9
mountain	Altitude (m)	1056	720
	Agricultural area (ha)	85	78
	Forage nature (% MFA*)	90% PG – 7% TG	37% PG – 50% TG – 13% M
	Dairy quota (1000 l)	242	298
	Milk production (kg/cow/y)	5767	7753
	Breed	Montbéliarde (Tarine -Holstein)	Holstein
	Stocking rate (LU/ha MFA)	0,9	1,3

* without highland pasture (Mean Fodder Area), PG: permanent grassland; TG: Temporary Grassland, M: Maize

Norway:

In Norway, the milk samples will be collected in 20 collecting tours located in different parts of the country. The national dairy company will be involved in the collection of the milks so that it will be possible to collect real bulk milk directly into the collecting tanker trucks. In each tour, the sampling will be made 5 times during 2008 (3 samples when cows are housed and 2 samples when cows graze outside).

The selection of the tours has been made on the basis of the information contained in a national database concerning both the milk production and composition and the main practices of the farmers. For the choice, the most important criterias considered were 1) the homogeneity of farms and their representativity for the district, 2) the localisation of the districts in the whole country (South, North, East and West) and 3) the farming systems (mainly organic and conventional farms).

The complete surveys and the details regarding the farms and also weather conditions will be collected during the sampling period.

The 20 tanker tours will be made of:

- 3 organic milk productions (South-east, South, and Mid- Norway)
- 3 conventional from the same district
- 4 inland, south-east of Norway (2 of them from mountain area)
- 3 coastal district, south-west of Norway
- 3 North-Norway
- 2 Mid-Norway
- 2 from South-Norway

All milk production in Norway is based on grass / grass-silage and concentrate. The average output 6586 kg/cow/year, the average delivery per producer is 85 000 l/year and the dairy cows per herd is 17.6. The description of the farms characteristics in each tour is given Table

2. The farms constituting the different collecting tours differ mainly according to the proportion of pasture, grass silage and concentrate in the diet.

Table 2: Main characteristics of the farms in the different tours

Region	Milk production (kg/cow/year)	Number of cows	Feeding (% of Energy requirement)		
			Concentrate	Grass silage	Pasture
Hedmark (organic)	6472	19.1	35.8	44.8	13.9
Hedmark					
Oppland	6270	17.4	37	45.8	14
Oppland					
Buskerud	6784	15.6	37.2	43.7	14.5
Hordaland	6602	14.1	42.4	41.9	13
Hordaland					
Sogn og Fjordane	6329	13.3	42.7	44.5	11.1
Møre og Romsdal	6657	17.5	39.8	46.1	12.3
Sør-Trøndelag (organic)	6492	18.2	38.4	44.4	15.5
Sør-Trøndelag					
Nord-Trøndelag	6527	19.7	37.7	40.6	19.6
Rogaland	6828	20.9	37.3	39.4	20.2
Rogaland					
Vest-Agder (organic)	6529	15.3	34.9	43.5	20.1
Vest-Agder					
Nordland	6578	16.6	40.3	44.4	13.7
Troms	7031	15.7	44.3	40.1	14.1
Finmark	6963	17.3	44.3	41.9	13

Slovakia:

In Slovakia, an important proportion of the milk production is achieved in the ex-national collective farms so that the tanker milk collected by the dairy industry is the milk produced by only one farm. The milk samples will be collected directly in 20 important farms constituted of 100 to 520 cows by GMARI, 5 times during 2008 (2 samples when cows are housed and 3 samples when cows graze outside). Some forages samples for additional analyses will also be collected.

The 20 farms have selected on the basis of a general survey achieved in December 2007. Questions were asked about farm characteristics (area, altitude) herd characteristics (dairy cow number, breed) and forage system (indoor feeding all-round-year or pasture during summer).

The 20 farms are made of:

- 10 farms located in plain using both intensive (maize silage diets all year round, n=5) or semi intensive systems (pasture during summer and maize silage based diets during the indoor period, n=5) based diets.
- 10 farms located in mountain using both intensive (maize silage diets all year round, n=5) or semi intensive (n=5) systems based on grass diets.

The characteristics of the farms are described in Table 3.

Both in plain and in mountain, the groups of farms using an indoor-feeding system all-year-round are more intensive, in particular regarding the average milk production per cow and the stocking rate of the grassland area. The Slovak Spotted breed is used both in lowland and mountain areas.

Table 3: Main characteristics of the farms selected in Slovakia

System	Farm	Altitude	Area (ha)	Grassland (ha)	Num. cows	Breed	Milk yield (kg)
Mountain-pasture	1	500 - 800	1 500	1 323	110	Slovak Spotted	4 200
	2	300 – 1 000	792	488	100	Holstein	7 000
	3	600 – 1 000	1 577	1 441	240	Slovak Spotted	6 100
	4	400 - 700	1 444	821	220	Slovak Spotted	4 000
	5	500 - 900	958	706	300	Slovak Spotted	5 500
	total		690	1 254	956	194	
Mountain – indoor feeding	1	500 – 1 000	510	402	110	Slovak Spotted	5 300
	2	350 - 700	846	305	200	Holstein	8 000
	3	350 - 600	882	557	200	Slovak Spotted	4 250
	4	350 - 700	300	300	225	Holstein	8 900
	5	400 - 700	457	352	200	Slovak Spotted	7 500
	total		565	599	383	187	
Lowland - pasture	1	250 - 290	349	120	150	Slovak Spotted	6 036
	2	250	1 760	928	300	Slovak Spotted	4 800
	3	180 - 290	1 200	400	270	Holstein	6 000
	4	120 - 150	3 460	509	200	Hostein	6 000
	5	200 - 280	2 582	523	300	Holstein	5 800
	total		226	1 870	486	244	
Lowland – indoor feeding	1	100 - 200	2 000	670	150	Slovak Spotted	5 400
	2	100 - 300	1 061	13	300	Slovak Spotted	6 500
	3	100 - 300	2 128	45	520	Holstein	7 600
	4	150 - 250	1 786	101	150	Holstein	6 900
	5	120 - 150	3 460	509	200	Hostein	7 555
	total		177	2 087	268	264	

The dairy farms in lowland are located in the south and south-west of Slovakia while the dairy farms in mountain are located in the north and centre of Slovakia (Figure 2).

Figure 2: Localisation of the farms selected in Slovakia. (the red dots are the mountains locations and the orange ones are the plain locations).



Slovenia:

In Slovenia, the milk samples will be collected in 15 'virtual' collecting tours, 5 times during 2008 (2 samples when cows are housed and 3 samples when cows graze outside). Each 'virtual tour' corresponds to a mixture of milks collected in 9 to 10 homogenous farms located in the same area. The mixture of the 9 to 10 samples collected in the farms will be achieved before the conservation of the milks samples used for the analyses. The total number of samples that will be analysed is 75.

The farms concerned have been selected on the basis of the central cattle database containing both milk data (milk production and composition monitored once a month) and farm survey data (diet composition, forage conservation, housing system, manure management...). The 15 tours consist in (Table 4):

- 9 tours located in a continental area, using different breeds (Simmental n=4, Brown n=2 or Holstein n=1) fed different basal diets (maize silage n=5, grass silage n=1 or hay n=1) and high (n=4) or low (n=3) amount of concentrates.
- 5 tours located in an Alpine area, using different breeds (Simmental n=2, Brown n=4 or Holstein n=1) fed different basal diets (maize silage n=3 or grass silage n=4) and high (n=4) or low (n=3) amount of concentrates.
- 1 tour located in a Sub-Mediterranean area that use brown cows fed hay.

The localisation of the tours is given in Figure 3.

Figure 3: Localisation of the 8 locations chosen in Slovenia (red circle)

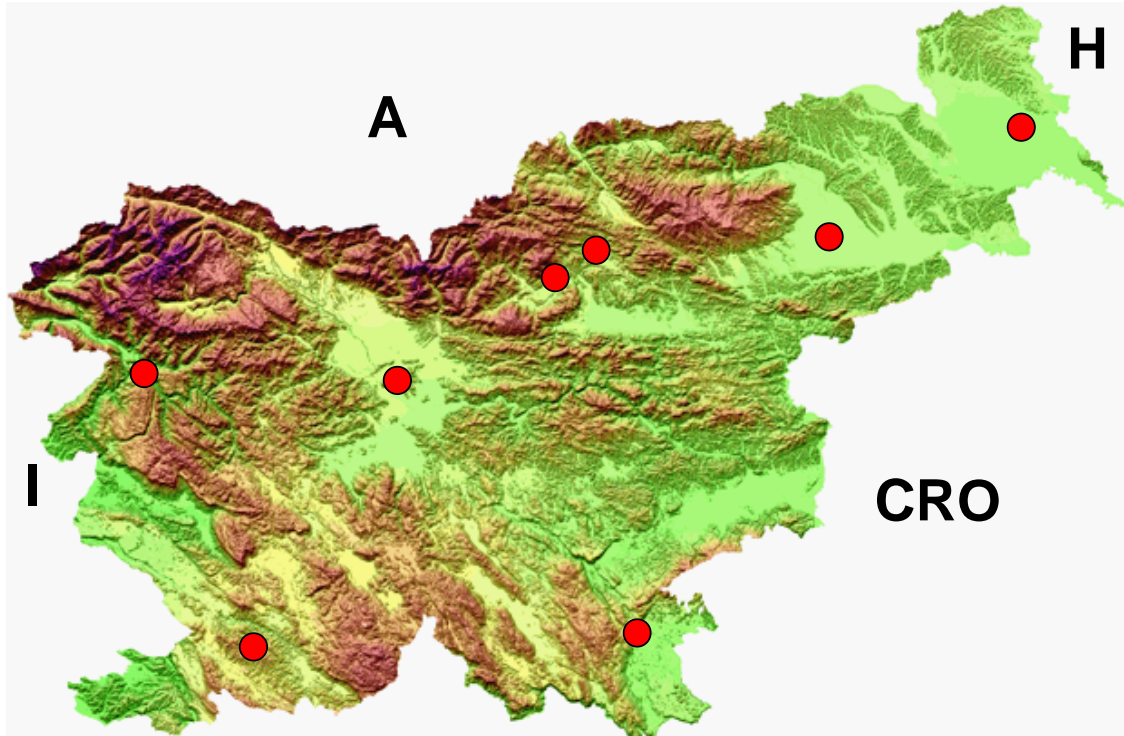


Table 4: Main characteristics of the farms selected in Slovenia

Group	Location	Breed	basal diet	Conc.	Nb farms	Nb cows / farm	Milk production. (kg/cow/lact.)	Util. Agric. Area (ha)	Maize Area (ha)	Stocking rate (LU/haUAA)
1	Continental 1	Simmental: 100 %	Maize	High	10	15.0 ± 8.8	5504 ± 465	16.0 ± 4.9	3.7 ± 2.2	1.6 ± 0.4
2	Continental 1	Simmental: 100 %	Maize	Low	10	9.4 ± 4.3	3529 ± 171	11.7 ± 5.8	3.2 ± 2.2	1.5 ± 0.4
3	Continental 1	Holstein: 97 %	Maize	High	10	54.3 ± 21.2	7937 ± 308	46.3 ± 19.7	16.8 ± 7.6	1.9 ± 0.4
4	Continental 2	Simmental: 100 %	Maize	High	10	8.5 ± 3.3	5635 ± 520	14.9 ± 11.8	3.7 ± 2.8	1.2 ± 0.5
5	Continental 2	Simmental: 100 %	Maize	Low	10	5.6 ± 1.4	3058 ± 220	8.8 ± 4.3	3.0 ± 1.8	1.1 ± 0.4
6	Continental 3	Simmental: 100 %	Maize	High	10	15.4 ± 8.8	5181 ± 356	16.2 ± 7.7	1.6 ± 1.6	1.4 ± 0.5
7	Continental 3	Holstein: 94 %	Maize	Low	10	23.2 ± 7.7	5942 ± 647	18.5 ± 7.0	3.9 ± 1.5	1.9 ± 0.5
8	Continental 3	Holstein: 96 %	Maize	High	10	71.7 ± 73.3	7974 ± 598	114.8 ± 162.9	26.8 ± 37.9	1.7 ± 0.9
9	Alpine 1	Brown: 99 %	Grass ¹	High/low	10	8.8 ± 8.8	5395 ± 799	13.8 ± 9.5	0.4 ± 0.6	1.2 ± 0.4
10	Alpine 1	na	Grass	High/low	10	na	na	na	na	na
11	Alpine 2	Brown: 98 %	Grass	High	10	11.8 ± 4.5	6118 ± 426	12.0 ± 3.9	0.0 ± 0.0	1.3 ± 0.3
12	Alpine 2	Brown: 94 %	Grass	Low	10	9.0 ± 3.5	4214 ± 283	8.8 ± 2.7	0.0 ± 0.0	1.4 ± 0.2
13	Sub – Med.	Brown: 95 %	Grass	High/low	10	5.5 ± 2.0	4279 ± 676	16.0 ± 14.1	0.0 ± 0.0	0.7 ± 0.3
14	Continental 4	Brown: 63 % Simmental: 23 %	Grass maize	Low	10	10.7 ± 5.7	4627 ± 237	14.5 ± 5.1	2.9 ± 1.5	1.1 ± 0.3
15	Alpine 3	Simmental: 43 % Brown: 39 %	Grass	High/low	9	18.9 ± 9.0	6069 ± 9.25	16.9 ± 4.8	0.3 ± 0.7	1.5 ± 0.3

¹Alpine grazing during summer time ; UAA : Utilised Agricultural Area ; LU: Livestock Unit ; na: data not available yet.

CONCLUSIONS

In the 4 countries involved in this experiment, the farms have been chosen using existing data and specific surveys achieved between October and December 2007. The different farms and groups of farms have been selected in different locations with specific natural agro-climatic conditions that vary from Arctic, Oceanic, Continental, Alpine and sub-Mediterranean climates. The experimental design will permit, in each location to compare the nutritional composition of milk produced by intensive and extensive dairy farms.

In each farm or group of farms, the milk will be sampled 5 times in the course of year 2008. The samples collected will correspond to real or virtual tanker milks used by the dairy industry. In all cases, it is the milk produced by about 100 to 1000 dairy cows reared in homogenous conditions. This experiment will permit to analyze the nutritional composition of tanker milks produced by cows reared over a very large variety of local conditions in Europe.