

THE PROFITABILITY OF SEASONAL MOUNTAIN DAIRY FARMING IN NORWAY

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Outline

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Background

- Summer mountain dairy farming has a long tradition in Norway
- Important in the south and middle parts e.g. Valdres 74% of cows
- Feed value of outfield pasture, € 95.3 million in 2004
- The share taken by cattle declined from 58% (1939) to 29% (2004)
- Larger dairy herds and shorter grazing period
- Grazing pressure on plants and forest vegetation is reduced
- Use of firewood for cheese-making has ceased
- Biodiversity in semi-natural grasslands is threatened

Background

- Are some consumers becoming more health conscious ?

- Characteristics of milk from species rich pastures:
- More polyunsaturated fatty acids and conjugated linoleic acid (CLA),
- Less saturated fatty acids,
- Higher in various antioxidants,
- Improved processing properties,
- Chemical content and possible flavor of dairy products is affected.

- Mountain products: Consumer expectations (Euromontana, 2010):
- Produced from raw mountain materials,
- Have a link to the cultural identity of local communities,
- Connected to specific cultural areas,
- Produced with traditional methods by small-scale producers.

The production system

- Farms at 400-700 m altitude, summer pasture 200-400 m higher
- Mountain grazing about 70 days from end of June
- Supplementary feeding and fertilized pastures during nights
- Farmland grazing 3-4 weeks before and after the mountain period
- Higher milk price during the summer +0.7-1.0 NOK/l (+€ 0.1-0.12/l)
- Agr. policy support for seasonal mountain dairying, ca € 4,000/year
- Milk quota with exemption for milk processed at the farm

Objective

- «to compare economically different ways of organizing the production, in particular time of calving, on smaller family operated dairy farms in mountainous areas»

Material and methods

A family farm Linear Programming (LP) model comparing :

1) *Retaining the cows on farmland pasture* (FP),

2) *Seasonal mountain farm dairy business* (MF) by

a) Deliver all the milk directly or,
b) Process 5 tons into 500 kg sour cream or butter or
c) Process 20 tons into 2,000 kg of white cheese and 1,000 kg of "brown" cheese out of whey and 500 kg of cream

3) Common pasture (CP) with two neighboring farms

4) Farming co-operative (FC) with three neighboring farms

Material and methods

- Farm LP model: Max $Z = c'x$ subject to $Ax \leq b,\ x \geq 0$.
- Z is the objective function i.e. total gross margin (TGM), return from livestock, government payments, minus variable costs;
- x is a vector of activity levels;
- c' the vector of marginal net returns per unit of each activity;
- A is the matrix of coefficients of resource requirements by activity;
- b is the vector of right-hand side values of resources (land, labour quota) and balances e.g. feed requirements
- Fixed costs subtracted from the solution and changes in work accounted for

Material and methods

- Data from dairy farms with seasonal mountain farming, and a control group without, from the official farm account statistics
- Limited area, 25 ha of which 6 ha is in the mountain (10 km distance), all to be used for medows (baled) or pasture or both
- Milk quota of about 99,000 kg
- Family work + hire of work

Table 1. DM yields (MJ/kg DM), N-applications, and AAT (g/kg DM) of silage, hay and pasture according to fertilization.

Fertilizers, tons manure or NPK	Farm yield kg DM/ha	NEL[a] MJ/kg DM	N-application Kg N/ha	AAT[a] g/kg DM
Silage 2 cuts				
Spring: 30 t + 25-2-6 or 18-3-15	2840	5.66	115	0.077
Summer: 20 t + 25-2-6 or 18-3-15	2100	5.93	80	0.080
Silage and pasture				
Spring: 30 t, + 25-2-6 or 18-3-15	2840	5.66	115	0.077
Summer: 20 t + 25-2-6 or 22-2-12	1080	6.42	70	0.085
Hay and pasture				
Spring: 30 t + 25-2-6	3550	5.24	125	0.073
Summer: 22-2-12	650	6.42	60	0.085
Ryegrass pasture				
Spring, summer: 50 t + 25-2-6	4260	6.76	99	0.088
Establishment				
Spring: 50 t	2570	5.93	81	0.080
Farmland pasture				
Spring, summer, fall: 22-2-12	3330	6.42	170	0.085
Permanent pasture				
Spring, summer, fall: 22-2-12	2290	6.42	140	0.085
Mountain silage/pasture				
Spring: 18-3-15	3430	5.66	140	0.077
Pasture regrowth	200	6.42	20	0.085
Mountain permanent pasture				
Spring: 18-3-15	1880	6.42	110	0.085
Mountain natural pasture[c]				
Summer	-	5.93	0	0.077

[a]NEL = Net energy lactation,[b]AAT = amino acids absorbed in the small intestine [c]Yield/ha is not considered

Table 2. Requirement for energy, protein and DM for cows, baby-calves, heifers and bulls. Milk yield 6656 kg per cow.

Animal	Calving time October 15		Calving time March 15	
	Indoors	Pasture	Indoors	Pasture
Cows, live-weight 550 kg				
Energy, NEL	27 896	8 313	23 815	12 934
Protein, kg AAT	410	117	345	182
Roughage $DM_{Max,}$ kg	2 540	1110	2 540	1110
Roughage $DM_{Min,}$ kg	1 972	518	1 684	773
Calves, live–weight 56 kg				
Energy, NEL	48	-	48	-
Protein, kg AAT	0.3	-	0.3	-
Roughage DM, kg	4	-	4	-
Heifers, live-weight 485 kg				
Energy, NEL	12 686	8 847	14 711	6 822
Protein, kg AAT	168	116	192	93
Roughage $DM_{Max,}$ kg	3 374	1 860	3 374	1 860
Roughage $DM_{Min,}$ kg	1 121	689	1 300	532
Bulls, live-weight 590 kg				
Energy, NEL	15 228	4 700	17 012	2 915
Protein, kg AAT	199	61	219	42
Roughage DM_{Max}, kg	3 089	744	3 089	744
Roughage $DM_{Min,}$ kg	807	220	902	136

Table 3. Economic parameters, prices, and government farm payments.

Parameter	Value (NOK)	Parameter	Value (NOK)
Receipts		***Other expenses***	
Milk price[a]	5.06/l	Seeds and herbicides	359/ha
White cheese, net price	200/kg	Fertiliser 22-2-12	3.15/kg
"Brown" cheese, net price	159/kg	Fertilizer 25-2-6	2.82/kg
Sour cream, net price	80/l	Fertilizer 18-3-15	3.40/kg
Bulls, 18 months	13,361/bull	Lime[f]	1,630/ton
Selling heifers[b]	12,406/heifer	Diesel	10.92/l
Baby calves	1,659/calf	Cost of labour	124/h
Bulls, 18 months	13,361/bull	Custom baling, incl. wrapping and transport	180/bale
Livestock expenses[c]			
F-Elite 90 (6.69, 116)[d]	3.22/kg	***Governmental payments***	
F-Calf conc. (6.35, 101)[d]	3,35/kg	Grassland, 1-20 ha	3,990/ha
F-Protein 45 (6.90, 230)[d]	4.89/kg	Grassland, > 20 ha	2,410/ha
F-Favør 80 (6.69, 107)[d]	3.03/kg	Dairy cows, 1-16	3,500/cow
F-Elite 90 (6.69, 116)[d]	3.22/kg	Dairy cows, 16-25	1,744/cow
Other costs for cows[e]	3211/cow	Dairy cows, > 25	556/cow
Other costs baby calves[e]	354/calf	Other cattle	787/head
Other costs bulls[e]	1,645/bull	Relief payment cows[g]	2,413/cow
Other costs heifers[e]	1,365/heifer	Relief payment, other cattle	513/head
		Cattle, grazing	350/head
Fixed costs		Cattle, mountain grazing	300/head
Mountain stall and hut	9,470/year	Basic milk production	84,800/year
Farm buildings	240,475/year	Mountain milk production	32,000/year

[a] The basic price is NOK 4.67 plus rural support 0.39. The price is lowered by NOK 0.26/l for deliveries in October to May and increased by 0.7/l in June and July and by 1.0/l in August and September.
[b] Value when surplus heifers are sold. Herd replacement is 0.35 heifers per cow.
[c] Price for commercially available concentrate mixtures Felleskjøpet, 2010 (adding 10% for freight etc.)
[d] In parentheses: NEL in MJ/kg and AAT g/kg.
[e] Consist in milk replacer for young cattle, minerals, veterinary costs medicine, insemination, etc.
[f] Limestone is applied at a rate of 4 t/ha in the meadow replacement year.
[g] In addition NOK 1,142 for the first 8 cows in total 9,136.

Results – Farm pasture

Table 4. Model solutions for the farm pasture (FP) alternative according to time of calving assuming no farm milk processing.

Calving time	October	March	Year round
Land use			
Sward establishment, ha	2,0	2,0	2,0
Leys for silage, ha	7,7	7,1	7,4
Infield pasture, ha	9,4	9,9	9,7
Silage or hay and pasture, ha	0,1	0,1	0,1
Silage, mountain area, ha	6,0	6,0	6,0
Pasture, mountain area, ha	0,0	0,0	0,0
Sum	25,2	25,2	25,2
Average yield, MJ/ha	20746	20570	20655
Concentrate use (% of energy)	35,8	37,5	36,6
Livestock			
Dairy cows (heads)	14,9	14,9	14,9
Selling cattle > 1 year	9,7	9,7	9,7
Selling baby calves	0,0	0,0	0,0
Financial results (NOK)			
Gross output, farming	814550	835207	826780
Government area payments	90799	90799	90799
Other payments	141552	134333	134333
Variable costs			
Forages	180538	176499	178451
Concentrates	147035	157728	152354
Miscellaneous, livestock	71495	71495	71495
Gross margin	506282	520284	515279
Hired work	75809	75063	75424
Fixed costs	149539	149539	149539
Farm profit	280934	295683	290317
Farm profit per h	100	106	104

- Can have ca 15 cows on the quota
- Raising the young stock is profitable
- Profit is higher with calving in March due to seasonal milk price in spite of subsidy payments on January 1

Results - Seasonal mountain pasture

Table 5. Model solutions for the mountain pasture (MP) alternative according to time of calving with and without farm milk processing.

	No milk processing		5 tons	25 tons
Calving time	October	March	March	March
Land use				
Sward establishment, ha	2,0	2,0	2,0	2,0
Leys for silage, ha	14,5	13,4	13,2	12,6
Infield pasture, ha	2,5	3,7	3,8	4,5
Silage or hay and pasture, ha	0,1	0,1	0,1	0,1
Silage, mountain area, ha	0,0	0,0	0,0	1,6
Pasture, mountain area, ha	6,0	6,0	6,0	4,4
Sum	25,2	25,2	25,2	25,2
Average yield, MJ/ha	21686	21322	21266	21400
Concentrate use (% of energy)	29,1	31,3	34,7	31,4
Livestock				
Dairy cows (heads)	14,9	14,9	15,7	18,7
Selling cattle > 1 year	9,7	9,7	10,2	2,6
Selling baby calves	0,0	0,0	0,0	9,5
Financial results (NOK)				
Gross output, farming	819020	839677	882008	917480
Government area payments	90799	90799	90799	90799
Other payments	141552	134333	141105	152495
Variable costs				
Forages	208254	199931	198097	200128
Concentrates	114171	125337	145471	126008
Miscellaneous, livestock	71495	71495	75099	77240
Gross margin	515899	533714	563397	966689
Hired work	79917	78379	88682	162835
Fixed costs	127009	127009	127009	127009
Farm profit	308974	328326	347706	676846
Farm profit	100	104	110	215

- Delivering the milk from the mountain is about as profitable as retaining the cows at the farm
- A small processing of sour cream raises profit slightly
- Larger processing is considerably more profitable. Farm profit per h increase from NOK 104 to 215
- Exemption from the quota and a high price for mountain products are important for the result.

Results - Common Pasture or Farm Co-operative

CP, 45 cows: Milking stall etc. NOK 530,000.

FC, 60 cows: AMS etc.

NOK 110,000 per cow .

Work time saved 50 % during grazing (CP) and 50 percent whole year (FC).

Common pasture saves time during the summer

Farming co-operative unprofitable due to loss of subsidies

Table 6. Model solutions for the common pasture (CP) and farming co-operative (FC) alternatives according to time of calving, assuming no farm milk processing

	Common pasture		Farming co-operative		
Calving time	October	March	October	March	Year round
Land use					
Sward establishment, ha	2,0	2,0	2,0	2,0	2,0
Leys for silage, ha	10,7	9,3	1,9	1,4	1,6
Infield pasture, ha	1,5	2,5	7,8	8,4	8,1
Silage or hay and pasture, ha	5,0	5,3	7,4	7,4	7,4
Silage, mountain area, ha	0,0	0,0	6,0	6,0	6,0
Pasture, mountain area, ha	6,0	6,0	0,0	0,0	0,0
Sum	25,2	25,2	25,2	25,2	25,2
Average yield, MJ/ha	21094	20691	19860	19683	19769
Concentrate use (% of energy)	31,0	33,4	38,6	40,2	39,4
Livestock					
Dairy cows (heads)	14,9	14,9	14,9	14,9	14,9
Selling cattle > 1 year	9,7	9,7	9,7	9,7	9,7
Selling baby calves	0,0	0,0	0,0	0,0	0,0
Financial results (NOK)					
Gross output, farming	814550	835207	762399	783056	774630
Government area payments	90799	90799	90799	90799	90799
Other payments	141552	134333	141552	134333	134333
Variable costs					
Forages	197593	188572	164572	160533	162485
Concentrates	121589	133240	158144	168838	163464
Miscellaneous, livestock	71495	71495	71495	71495	71495
Gross margin	514672	532699	458987	472990	467985
Hired work	75084	71186	75084	71186	71186
Fixed costs	159784	159784	237198	237198	237198
Farm profit	279803	301729	146705	164606	159601
Farm profit	101	108	69	77	74

Discussion

- Moving the time of calving to take advantage of a higher milk price during the summer should be considered on dairy farms

- Seasonal dairy business without processing require more work but pays a similar wage per h as retaining the cows at the farm

- Mountain milk processing business profitable due to:

- The support for mountain farming
- Exemption for processed milk in the quota allows for more cows
- The higher prices obtained compared to industrial products
- A substantial part of the farm area is in the mountain

Discussion

More interest in seasonal mountain processing expected due to:

- Health aspects of mountain products may be important for demand
- Grazing is to be promoted due to animal welfare concerns

- The risks are probably related to product quality and authenticity of mountain products as well as over-expansion and declining prices

- Investing in a common pasture in the mountain will save time during summer and pays slightly higher earnings per h

- Investing in a dairy co-operative is unprofitable due to losses of subsidies unless the time saved have a substantial alternative value

Conclusion

- The economics of scale is counteracted with policy instruments aiming to preserve the farm structure

- Seasonal processing of the milk in the mountain may be a viable strategy on smaller family farms as the economy may be substantially better than any of the alternatives

However:

- Processing and sale of farm products requires skilled farming entrepreneurs
- Whether the price can be sustained in a longer run remains to be seen.

Questions?

Thank you!