Production Systems for the Muslim Goat's Meat Market

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Abstract

This paper investigates economic feasible production systems in agriculture to meet the off-seasonal demand for fresh goat's meat in particular for Islamic religious celebrations. A goat's meat production system based on suckling cashmere goats might also be used for preventing bush encroachment of farm pastures, meadows and mountain ranges in Norway. A market segment for goat's meat has been identified in the growing Muslim communities in Scandinavia where people originate from countries with traditions and preferences for goat's meat. The meat, however, has to be produced in accordance with Muslim traditions (Halal) as well as local veterinary regulations, when targeting this market segment. Marketing of modern Halal products such as pizzas, sausages and hamburgers, takes place through a separate company "Alfathi Ltd." and the meat industry is also interesting in enhancing the production of fresh goat's meat, in particular for Islamic religious celebrations. In the study, the economy of specialized sheep farming has been compared with that of cashmere goats using a linear programming (LP) model adapted to six sheep farms from the fjord and mountain areas of Norway. The profit in sheep farming varies considerably among the farms from about zero to € 16,000. Replacing half the sheep with cashmere goats resulted in a slightly improved profit on two of the six farms while it was not profitable on the others. The demand for goat's meat is high when sold at equal price of lamb's meat, but currently the market can not sustain prices necessary to make goats an interesting supplementary production on sheep farms. The number of cashmere goats kept in extensive production systems is increasing, but future development will depend on the development of the market for goat's meat. In particular farmers with a low meat production per ewe caused by encroachment of pastures should consider goats. Unilateral sheep grazing may not be sufficient to prevent further encroachment of outfield pastures while browsing goats are more efficient. It is concluded that goat farmers should be paid a premium when keeping goats for "landscaping" purposes. Feeding the goat kids to a higher age is another measure to encourage the production system further. Problems due to EU veterinary regulations regarding removal of the spinal cord when slaughtering sheep and goats older than one year are discussed. Norwegian dairy goat production is well established and production of Halal meat on surplus dairy goat kids is also discussed.

Key words: Goat's meat; Norway; Production systems; Halal meat; Muslims; Mountain range pastures; Farm economy

Introduction

Goat's meat has traditionally been a by-product from dairy goat farms and the actual consumption of goat's meat has been negligible in Norway. Meat from culled dairy goats has been sold at a price below € 1 a kilo while most goat kids not needed for replacement of the dairy herds, are culled just after birth. On the other hand the annual per capita consumption of mutton is five kg and the sheep meat industry in the country comprises one million ewes. Sheep farming combined with forestry,

fishing or work outside the farm is a common activity on smaller rural farms and is supported by political measures to enhance rural settlement.

Traditionally summer grazing on open mountain ranges and forested areas by cattle, sheep and goats has been a prevalent farming system in the country. The natural grassland and open mountain range pastures produced by this system contain a substantial proportion of the indigenous flora and fauna. They are also important for recreational activities taking place at all seasons. However, in post war times outfield grazing by cattle has decreased substantially (Asheim and Hegrenes, 2006) and over a long period the process has led to a loss in the extent, species and amenity of the pastures and diminished the social values of agriculture. Today about 68 percent of the outfield pasture feed intake is by sheep and 29 percent by cattle. Sheep, grazing may be important to enhance biodiversity of plants, but it may not be sufficient to prevent further encroachment of outfield pastures, expected to follow increasing three lines and climate change. An appropriate mixture of grazers (i.e. sheep) and mixed feeders (i.e. goats) would be most efficient in reducing encroachment and ensuring good pasture utilisation (Osoro *et al.,* 1999; Haumann, 1999; Aharon, *et al.*, 2007). However, on Norwegian ranges goats are currently present in insignificant numbers and only 2.1 percent of the outfield feed intake is by goats. Most of the cows and goats are also kept for the milk which, except in the dry period, necessitates concentrating the grazing by these animals to areas close to a summer milking stall. The sheep however, can disperse widely into the range pastures and are found in very low numbers per square kilometre.

A production system with suckling cashmere goats, quite similar to that of sheep, is currently being investigated. Small amounts of meat and lack of a uniform meat quality are likely major obstacles to successful marketing of goat's meat in the country. A new classification system of goat's meat has recently been introduced and the producer price for meat from cashmere goats and kids has been raised through opportunity for contract production. The price of the cashmere fibre is also satisfactorily. For the farming system either a pure cashmere goat, or its cross with the Norwegian Dairy Goat, seems most promising.

Since the number of cashmere goats is likely to increase, new markets for the meat have to be developed. Increased tourism and health consciousness has resulted in a growing interest for Mediterranean cuisine in which lamb and kid's meat play an important role. The number of in particular Muslims from Mediterranean countries is also increasing. Currently only about 1-2 percent of the Norwegians, or 50-100 thousand people, are Muslims but there are larger communities in nearby Sweden and Denmark. In Europe the Muslim population is about 7 percent (http://www.islamicpopulation.com/europe_islam.html), ranging from about 3.1 in Switzerland to 10 percent in France. According to Bonne and Verbeke (2007) the total number of Muslims worldwide is 1.4 billion. Islam is the fastest growing religion on earth and as such Muslims constitute a considerable market segment in today's food market.

The process by which immigrants adapts new eating habits is referred to as dietary acculturation. Park *et al.,* (2003) argues that food habits may change more slowly than other more visible aspects of culture such as language or clothing, because many meals are eaten in the privacy of one's home and food habits are unique and fundamental to most cultures. For Muslims, additionally only meat from animals slaughtered according to Islamic practise (Halal) can be consumed. Halal is a credence quality attribute of the product referring to the nature, origin and the processing method of the product and entailing similarities with organic foods and foods produced taking animal welfare or sustainability issues into account (Bonne and Verbeke, 2007). Meat products in Norway are labelled Halal when slaughtered in accordance with Islamic practice and marketed to Muslims or other consumer groups in the country.

The demand for goat's meat is high from restaurants and from immigrants with traditions for goat's meat. Since free ranging sheep and goats are important in Islamic countries especially the older generation of immigrants, may be well accustomed to such meat, applying special or traditional recipes. The market opportunities for Halal produced goat's meat, both in the US or in Europe, may not have been fully recognized. However, it may require special efforts to develop products satisfying the demand of the

younger generations.

In order to meet the growing demand for Halal meat, Alfathi Ltd. (i. e. opportunity) was established in 2001 with Norwegian Meat Ltd, the Islamic Council of Norway and University of Life Sciences (UMB) as stakeholders. So far Alfathi Ltd. has been quite successful in introducing new products such as pizzas, hamburgers and different sausages based on mutton. The company also sells whole lamb and kid carcasses, especially for the two important celebrations for Muslims, "id al-fitr" that takes place after Ramadan and "Id al-adha" that takes place after the pilgrimage. Satisfying demand for fresh meat of lambs and especially kids for these holidays requires that the meat production systems are flexible enough to meet the specific consumer requirements and fluctuating seasonal demand. The paper looks at the economy of introducing cashmere goats on sheep farms located in the fjord and mountain areas replacing some of the sheep. A linear programming model developed and adapted to sheep farms in the fjord and mountain areas is briefly described in section 2. In section 3 six production systems with slaughtering of goat kids at ages from five to 15 months in either of the areas are compared economically for the farms. The sections 4 and 5 conclude the discussion by drawing attention to opportunities and some challenges that need to be addressed before economic production systems can be established.

Materials and Method

Study farms

The records of six sheep farms from the farm statistics of the Norwegian Agricultural Economics Research Institute (NILF, 2005a) was selected for the study. The farms are located in counties neighbouring Gol, two in municipalities in the fjord area and four in the mountainous area. The farm records hold data on farm size, yields, animal production and variable and fixed costs. The dates for first and last day on spring, summer and autumn pastures are also recorded for each farm. Generally the grazing period is the longest for the farms along the fjords, starting earlier and finishing later than at the inland farms. The grazing period on mountain pasture may, however, be the same. Most farmers prefer a short in-door feeding period after lambing thus adjusting the lambing period to the availability of spring pastures on the farm. If farmers started with suckling goats, they would likely have kidding and lambing at the same time.

Farm LP-model

The recorded farm data for 2003 and 2004 have been used in a linear programming (LP) model, maximizing gross margins. The recorded fixed costs of each farm are subtracted from the gross margins to arrive at farm profit and compute farm profit per h of family labour input. The model is built in Excel in the price level of 2005-06 and is described and documented in Asheim (2007), exemplified with data from a sheep farm. The model also makes use of standard data for feed requirements, fodder production, prices and labour cost (NILF, 2005b). The standard yields of different crops were modified to match the average for each farm, i.e. keeping the relative yields of different crops the same, considering farm roughage production, and farmer's purchase of concentrate and other feed. Lambs are normally slaughtered from September to November either directly from the outfield pastures or after a short period of grazing on farmland. Smaller lambs may also be fattened in-doors for a period. We have assumed lambing in the spring and normal growth rates for lambs and for each farm the exact lambing and slaughter dates of lambs have been fine tuned to make the production of meat per ewe equal to the recorded values.

LP model parameters

Standard coefficients for marginal labour input requirement in feeding and management during the barn-feeding, lambing and grazing periods were assessed based on a study by Brattgjerd (1993). Daily labour input is higher during indoor feeding and hence farmers in areas with a long grazing season use less time managing the sheep. Four of the farmers used more time than the standard values and two of the farmers used considerably less time. The labour requirement coefficients were modified so that total farm labour input would match the recorded average labour input for each farm, keeping relative labour input for different activities equal on all farms.

Indoor labour with goats will depend on their feed requirement relative to that of sheep since feeding is the main activity indoors. Goats require considerably less supervision at kidding compared

to lambing, but combing cashmere fibre can be more time consuming than shearing of wool. Supervision of ewes or does during the grazing period were assumed to be equal. Although kids and lambs are borne at the same time kids have to be fed longer to reach optimum slaughter weights. The extra time per day is assessed to 0.1 minutes per animal on the basis of studies at two farms; one located in the fjord and the other in the mountain region.

Farmers obtained an extra payment of € 2.3 per kilo for meat of goat kids delivered before December 31 and € 2.9 for kids delivered after that date. Premiums were the same for suckler goats and sheep, € 75.6 for the first 75 animals older than one year on December 31 and € 14.3 for the remaining. Farmers also obtained relief payment of € 44.5 for the first 142 breeding stock animals. Veterinary costs are assumed to be equal for sheep and goats, however, male goats have to be castrated thus incurring an extra cost of € 6.3 per male kid. The wool price has been considered for sheep and cashmere fibre prices for goats and kids.

Results

Goat production systems

Since the Islamic year is 354 days the time of the religious celebrations will come about 11 days earlier each year. The kidding takes place in the spring, following the pasture growth, and is not to be altered. So the question will be whether the kids can be slaughtered in the current year or need to be fed for the next celebration. This depends on the kid's age and size when the celebrations occur. The economic analyses assume the following ages of kids when slaughtered:

- About five months old in September-October, all farms,
- About seven months old in November-December, mountain farms,
- From 9 to 11 months in January-March after a barn-feeding period, fjord farms,
- From 13 to 14 months in May-June after a barn-feeding period, fjord farms,
- From 15 to 16 months in June-July, directly from pasture, mountain farms.

Farm profit

Table 1 depicts the results of the LP analysis with the current system i.e. sheep only compared to 50 percent of each animal and goats only in the farm breeding stock. In this alternative the kids are assumed to be fed to about five months of age occurring in September.

The table reveals that profit in sheep farming varies considerably among the farms from about zero on the mountain farm M1 to € 15,959 on farm M4. One reason for the result is differences in fixed costs. Differences in production results per ewe are also of importance. Measured on an hourly basis, farm M2 had the highest profit, around € 25. Obviously this

Table 1. Farm profit 2005-06 and profit per h for six farms with sheep only, equal number of sheep and goats, and goats only producing five months old kids

	Fjord farms		Mountain farms			
	F1	F2	M1	M2	M3	M4
Farm area, hectare	6,2	9,4	15,3	10,5	11,6	12,6
Family labour input h/year	1115	1919	1250	502	1359	1987
Breeding stock, sheep only	65	99	77	73	111	110
Farm profit, 2005-06, Euro	5630	14451	1	12706	8485	15959
Profit per hour, Euro	2,9	7,5	0,0	25,3	6,2	7,0
Breeding sheep and goats	77	126	88	104	142	125
Farm profit, 2005-06, Euro	6019	14253	-1703	14085	6971	14869
Profit per hour, Euro	3,1	7,4	-1,0	34,0	5,4	7,0
Breeding stock, goats only	94	142	91	106	142	138
Farm profit, 2005-06, Euro	6182	11387	-3865	12494	2480	13184
Profit per hour, Euro	3,2	6,6	-2,6	60,5	3,0	7,0

Table 2. Farm profit 2005-06 and profit per h for six farms with sheep only, equal number of sheep and goats, and goats only and 7 or 9 months old kids

	Fjord farms		Mountain farms			
	F1	F2	M1	M2	M3	M4
Farm area, hectare	6,2	9,4	15,3	10,5	11,6	12,6
Family labour input h/year	1115	1919	1250	502	1359	1987
Breeding stock, sheep	65	99	77	73	111	110
Farm profit, 2005-06, Euro	5630	14451	1	12706	8485	15959
Profit per hour, Euro	2,9	7,5	0,0	25,3	6,2	7,0
Breeding sheep and goats	75	124	84	104	142	119
Farm profit, 2005-06, Euro	6608	14282	-1996	13509	6330	14594
Profit per hour, Euro	3,4	7,4	-1,2	32,2	4,9	7,0
Breeding stock, goats	90	142	85	104	142	123
Farm profit, 2005-06, Euro	6133	11149	-4323	11445	1627	12746
Profit per hour, Euro	3,2	6,3	-2,9	52,5	2,0	7,0

farmer was able to get the work done in considerably less time than the others. All farms have around ten breeding sheep per hectare of farmland apart from the farm M1 that only have five. Farm profit is about zero on this farm due to high investments and hire of farmland that has not yet been fully utilized.

On farm F1 profit increased slightly by changing to goats, and on farm M2 a mixture of sheep and goats was most profitable. On the farm F2 a mixture of sheep and goats were about as profitable as sheep only. However, goat farming was unable to compete with sheep on the other farms, partly due to a limit on premiums for relief which is only granted to the first 142 animals of sheep or goats in the breeding stock.

The results when kids are fed until December or the following February reaching an age from seven (mountain farms) to nine (fjord farms) months are shown in Table 2. The same farms (F1 and M2) were able to increase profit with a mixture of sheep and goats compared with sheep only. But the difference in profit was small on farm F1 and only the M2 farm was able to increase profit per h considerably. This result was due to lower labour requirement for goats than sheep. For the other farms profit was lower for goats than sheep; however the farms F2 and M4 were able to obtain about the same profit per h with the mixture as with sheep only. In general the two fjord farms seemed somewhat better off by producing 9 months rather than five months old kids in mixed sheep and goat system whereas on the mountain farms five months old kids were better than seven months. This result is likely due to the different resource situation on the farms particularly the lack of good farmland pastures in the fall on the mountain farms.

Table 3 shows the results with the longer feeding period of 13-14 months for the fjord farms and 15 months for the mountain farms, i.e. until May or June the next year. The table reveals that feeding the kids this long generally gives a slightly better result than the five or nine month's alternatives in the tables 1 and 2. But in most cases the differences are small as much of the extra income due to higher price and slaughter weights are offset by higher costs. The same farmers F1 and M2 seem able to obtain a higher profit with a mixture of sheep and cashmere goats than with sheep alone, but changing to goats only was profitable only on the F1 farm.

Selling the goat kids in May or June may not be optimal since the quality of the mountain pastures are at their best this time of the year. Most farmers with ample resources of outfield pastures would prefer to wait until the pasture quality deteriorates in late August or September. Since most of the costs are incurred before the kids are released on the pasture postponing deliveries until the fall would normally be the best, otherwise extra payment is needed to encourage farmers to deliver the goat kids in the early summer months.

Table 3: Farm profit 2005-06 and profit per h for six farms with equal number of sheep and goats and with goats only and 13 or 15 months old kids

	Fjord farms		Mountain farms			
	F1	F2	M1	M2	M3	M4
Farm area, hectare	6,2	9,4	15,3	10,5	11,6	12,6
Family labour input h/year	1115	1919	1250	502	1359	1987
Breeding stock, sheep	65	99	77	73	111	110
Farm profit, 2005-06, Euro	5630	14451	1	12706	8485	15959
Profit per hour, Euro	2,9	7,5	0,0	25,3	6,2	7,0
Breeding sheep and goats	73	122	79	104	142	118
Farm profit, 2005-06, Euro	6577	14360	-1166	14076	7651	15498
Profit per hour, Euro	3,4	7,4	-0,7	31,8	5,8	7,3
Breeding stock, goats	89	142	74	104	142	125
Farm profit, 2005-06, Euro	6308	11518	-2697	12579	3979	14632
Profit per hour, Euro	3,2	6,4	-1,9	47,9	4,5	7,7

The results do not contrast findings in a study by Asheim *et al.* (2004) in which it was concluded that a change from sheep to cashmere goats would not be profitable unless labour input was at least 15 percent lower for goats than sheep. Obviously comparing sheep and goats economy on a farm level is difficult as the results depend much on the farm in question. Farmers that are clever with sheep may also do well with goats and vice versa. Our results can thus only indicate that in some situations the farmer should try goats as a supplementary production. In particular farms with a low production per sheep should consider trying goats. But it will depend on the reason for the low production, one of the farms had a low production per ewe due to large losses of lambs, probably due to predators, and it is likely that this would also be the case if he changed to goats. The decision could depend on whether pasture encroachment is becoming so importunate that it affects sheep productivity.

The study shows that it is possible for some farmers to achieve an economic return for cashmere goats in line with that of sheep. Increased interest for lamb's and kid's meat, perhaps due to the special taste of outfield pasture, is also observed for other consumer groups indicating that the price level may be maintained in spite of the increase in production currently taking place (Ådnøy *et al.,* 2005). However, a more dramatic shift in production pattern on Norwegian sheep farms remains unlikely before the market demand for such meat is increasing and that may take some time. To achieve a stronger growth in the production the governmental payments for such meat have to be increased further - one way or another. Except for one farmer in our study, income in all production systems was low compared with off farm work and thus goat meat production, like sheep, competes best in areas with few alternative employment opportunities.

Discussion

At the "Id al-adha" celebration Muslims across the world present an animal as a sacrifice. The animal must either be a cow, sheep, goat, buffalo or camel satisfying certain requirements such as not pregnant and in good condition (A.A. Abood, personal communication). In Islamic countries, such as Turkey, the slaughtering are made in accordance with Islamic rules requiring that the animals are conscious, slaughtered with minimum torture and the body should be drained for blood. In addition it is recommended that animals to be slaughtered are laid down on the left side and heading towards Mecca. Furthermore, the person who is slaughtering should preferably be a Muslim, however Jews and Christians are also accepted. Halal meat labelling is uncommon in Turkey. The rules have been somewhat relaxed in non-Islamic countries like Norway where it has been agreed with the Norwegian veterinary regulation authorities that the animals must be tranquilised (usually with electricity) before cutting the throat. Meat from animals younger than one

year is also accepted, however goat kids and lambs for the Id celebrations should be of a certain size and slaughtering must take place just before start of the holidays. Hence the operation of bringing the meat from the producers located in rural areas to the customers normally found in the Oslo fjord area needs to be carefully planned. A facility for Halal slaughtering has been established at Gol and slaughtering is supervised and regularly inspected by respected imams from the largest mosques. Gol is a municipality in the central mountain areas of southern Norway about 200 km to the northwest of Oslo. Much of sheep farms in the inner fjord areas in the west and in the mountain range are located within the maximum allowed time limit of 8 h drive from the slaughter house.

Halal meat is sometimes referred to as a socially constructed quality criterion, incorporating not only properties of the product but also the conditions under which it is produced, distributed and retailed. A Halal goat's meat production system should be sufficiently flexible to meet fluctuating seasonal demand for fresh meat over time. The flexibility can be enhanced by altering kid's age at slaughtering, feeding intensity, and by using outfield pastures or semi-intensive feeding systems. The proposed system for producing meat for religious celebrations works by changing slaughter date for kids each year. The kids will be older than one year when slaughtered in the months from May to July, but when the celebrations occur from September to March one may have to consider extra costs and gains from feeding the kids for another year. So far our analyses do not indicate that this will make much of a difference, a mixed production system with sheep and goats will still be less profitable than sheep on most sheep farms and extra payments are required if this production system is to be enhanced further. However, such kids would be more efficient in fighting pasture encroachment due to the second year pasturing.

Feeding the kids that long also may incur problems with the EU scrapie regulations, i.e. removal of spinal cord for kids older than one year. Carcasses for the Id al-adha celebration must be intact. Curtailed products are still useful for barbeque and also for Id al fitr. To meet this requirement the time of kidding has to be moved and that can become impractical. One part of the solution might be to feed surplus kids from dairy goat farms. Normal time of kidding on dairy goat farms is from January to April. Cashmere goat farmers may purchase two months old kids and keep them with the other goats. In addition the options are that Muslims accept meat from kids younger than one year or older kids that have had the spinal cord removed. The one year requirement is equal for all kinds of animals and it could be considered set a little higher for goats than other animals.

Unimproved rangeland, kept open over centuries by grazing animals, notably sheep and cattle, is an important part of the Norwegian cultural heritage and important for recreation for local people and visiting tourists. However, due to reduced grazing and perhaps also climatic changes this landscape type is undergoing reforestation processes with detrimental consequences for its recreational value. In total, the harvest decrease in outlying pastures has been dramatic; 740 versus 303 million feed units were harvested in 1939 and in 1996 respectively (Asheim and Hegrenes, 2006). More profitable grazing is probably the most realistic solution to the problem; this will require the development of an efficient anti-encroachment management strategy.

An appropriate mixture of grazers and browsers may be the most promising way to enhance such a strategy. However, while free ranging sheep disperse widely into the range pastures where they tend to make small flocks of just a few animals per square kilometre goats are currently present in insignificant numbers on Norwegian ranges. Most of them are also kept for the milk and on areas close to a summer milking shed. A production system with suckling goats, quite similar to that of sheep might become a more efficient management tool for maintaining open and diversified landscapes. Cashmere goats, kept under extensive feeding systems, have proven to be a biological efficient tool for controlling bush encroachment of open rangeland under Norwegian condition (Berg and Kjellberg, 2004, Bjureke, 2001; Dahle, 2006; Bryn *et al.,* 2003). Norwegian dairy goats are kept under high level of feeding with subsequent less use of browse and shrubs. The surplus goat kids are either slaughtered for meat at a young age or culled after birth. Rearing such kids until the end of one or preferably two grazing

seasons, would allow for increased use of trees and browse.

Governmental policies are therefore changing, allowing for increased support for production systems utilizing rangeland. Sheep and goat farmers might take advantage of this. In Hordaland the county allocates extra support for farmers keeping non-milk-producing goats for landscaping purposes; this support amounts to €55 per animal between one and two years of age. Such extra support would require kids to be at 16-17 months when slaughtered, but would presumably make goat farming more profitable than sheep.

Cashmere goats were introduced in Norway in 1995 and today herds have been established in much of the country and the number of goats kept in extensive production systems is increasing rapidly. A Norwegian Cashmere Association has also been established and its main objective is an economical sound goat production system based on meat (Alfathi Halal Ltd.), landscaping, and cashmere products (Oleana Ltd.). The cashmere goats are quite small, however, due to the fibre they are well suited for long grazing periods under the Norwegian climatic conditions compared to e.g. Boer goats. The cashmere fibre is collected for dehairing in Scotland in co-operation with Scottish producers. Recent crossbreeding with Scottish bucks allows for a broader gene-pool and higher fibre yield (Clemetsen and Eik, 2002) which would improve profitability. The textile designer company Oleana currently buys 200 kg fibre per annum at prices somewhat above world market; £ 80 a kg, for production of scarves and wrist warmers. The cashmere fibre is following the world market more or less while national wool prices are well above world market prices.

Conclusion

Targeting special consumer groups such as Muslims, and seasons may be a viable path for improved farm income in the small ruminant sector. But currently the meat prices received in the Halal market seem insufficient to sustain a strong growth in Norwegian goat's meat production by targeting this market. In order to improve farm income, other sources of income such as fibre and control and maintenance of landscapes has to be promoted as part of the system. A system with several independent sources of income is also advantageous considering the price risks for the different products.

In the end the growth of the Halal meat production likely will be determined by the market demand. Driven by immigration and high birth rates the Muslims population in Europe has increased and is expected to continue doing so. Sheep and goat production is low in both Sweden and Denmark and the countries do not have access to mountain pastures. However, it may take some time before immigrants acquire an income comparable to other Norwegians and it remains to be seen whether they will be willing to pay the prices needed for this production system to develop in the country.

Under the proposed system the kids will be older than one year only when slaughtered in the months from May to July, but definitely the production costs will be high for five months old kids in September. If the one year requirement is not practised strictly by the Muslims one may consider extra costs and gains from feeding the kids for another year when the celebrations occur from September to March. Definitely this would require more pasturing and probably be interesting in order to enhance an anti encroachment strategy for Norwegian mountain pastures. Studies using older kids should be a priority in future research.

References

Ådnøy T., Haug A., Sørheim O., Thomassen M.S., Varszeg Z. and Eik L.O. (2005). Grazing on mountain pastures - does it affect meat quality in lambs? *Livestock Producion Sciences*, vol. 94, 1-2: 25-31.

Aharon, H., Z. Henkin, E.D. Unger, D. Kibabya, H. Baram & Petrovolotsky, (2007). Foraging behavioural of newly introduced Boer goat breed in a Mediterranean woodland: *A research observation. Small Rumin. Res.* 69: 74-78.

Asheim, L. J., (2007). The economy of alternative grazing regimes in Setesdal Vesthei and south-western Hardangervidda. Norwegian Agricultural Economics Research Institute. Discussion paper No. 2007–3. Oslo. (http://www.nilf.no/Publikasjoner/DP/En/2007/DP-2007-03.pdf).

Asheim, L. J. and A. Hegrenes, (2006). Verdi av fôr frå utmarksbeite og sysselsetting i beite-baserte næringar. (Value of feed from outfield pastures and employment in pasture based industries). Notat Nr. 2006-15. *Norsk institutt for landbruksøkonomisk forskning,* Oslo. ISBN 82-7077-657-2. ISSN 0805-9691. (In Norwegian).

Asheim, L. J.; Eik L. O., and I. Mysterud (2004): Linear Programming Analysis of Sheep and Cashmere Goat Production Systems. Evolutions of sheep and goat production systems: Future of Extensive Systems and Changes in Society. OPTIONS méditerranéennes. SERIE A: Séminaires Méditerranéens Numero A-61, pp 49-55.

Berg, I. and Kjellberg, K.H. (2004). Effekter av landskapspleie med geit - på beite i sterk gjengroing (Effects of grazing goats on encroahed pastures). MSc.- thesis, University of Uife Sciences. Aas. (In Norwegian).

Bjureke, K. (2001). Effekten av beite på vegetasjonen på Hovedøya (Effects of grazing on vegetation at Hovedøya). Oslo kommune. Oslo. (In Norwegian).

Bonne, K. and Verbeke W. (2007). Religious values informing halal meat production and the control and delivery of halal credence quality. Agriculture and Human Values 25: 35-47

Brattgjerd, S. (1990). Arbeidsforbruket i saueholdet. (Labour input in sheep farming). Melding A-011-90. Norwegian agricultural economics research institute, Oslo. (In Norwegian, English summary).

Bryn, A., L.O. Eik and O. Rygg, (2003). Beiting med kasjmirgeit på Golsfjellet (Grazing with Cashmere Goats on Golsfjellet). Sau og Geit (56) 2. Oslo. (In Norwegian).

Clemetsen, M. and L.O. Eik, (2002). Kasmirgeit. Ny produktutvikling og verdiskaping basert på kjøt, ull og landskapspleie (Cashmere Goat, rural development based on meat, fire, and vegetation control). Aurland Naturverkstad BA - University of Life Sciences. (In Norwegian)

Dahle, G. (2006). Bruk av styrt beiting med kasjmirgeit til vegetasjonskontroll langs jernbanelinjer (Intensive grazing by cashmere goats to control bush and shrub vegetation along railroads). MSc.-thesis, University of Life Sciences. Aas. (In Norwegian).

Haumann, P., (1999). Biotope conservation with ruminants in Germany: the example of goats on shrub-infested slopes. In: Laker J.P., J.A. Milne (Eds.), Livestock Production in the European Less Favoured Areas. Macaulay Land Use Research Institute, Craigiebuckler, Aberdeen, 155-161.

NILF (2005a). Norwegian Agricultural Economics Research Institute: Account results in agriculture and forestry 2004. Annual publication. Oslo. (In Norwegian, English summary).

NILF (2005b) Norwegian Agricultural Economics Research Institute: The Farm Management Handbook 2005/2006. Oslo. (In Norwegian).

Osoro, K., Vassallo J.M., Celaya R. and A. Martinez, (1999). Livestock production systems and the vegetation dynamics of Less Favoured areas (LFAs): developing viable systems to manage semi-natural vegetation in temperate LFAs in Spain. In: Laker J.P., J.A. Milne (Eds.), Livestock Production in the European Less Favoured Areas. Macaulay Land Use Research Institute, Craigiebuckler, Aberdeen, 133-144.

Park, S., Paik H.Y., Skinner J, Ok S.W. and Spindler A.A. (2003). Mother's acculturation and eating behaviour of Korean American Families in California. *Journal of Nutrition Education and Behaviour* 35(3): 142-147.