

## ORGANIC BEEF PRODUCTION WITH EMPHASIS ON WELFARE, HEALTH AND PRODUCT QUALITY

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### *Introduction*

Cattle husbandry is an important production on many organic farms (Graf and Wilier, 2000). Whereas beef cattle only produce beef, dairy cattle produce milk and beef. In Denmark, cast cows from dairy production constitute the larger part of the organic beef production, and only 26% of the bull calves born on the organic farms in Denmark are slaughtered as organic typically as steers (Nielsen and Thamsborg, 2002). Organic beef production is based on grazing in the summertime, feeding of minimum 60% of roughage during whole the year and the ban of GMO and hormones. However, problems with parasites and periodically feeding with high amounts of cereals results in reduced welfare and health problems.

A survey in Denmark showed that the number of households buying organic meat has doubled from 1996 to 1998 (Borgen, 1999). However the market share of organic beef in most countries is very low - only 2% in Denmark, whereas other organic products as milk has a market share of more than 20% (Anon., 1999). Consumer prices for organic beef possibly exceed consumers' willingness to pay, as premiums for organic meat in several countries in the EU result in a price of 52% above the conventional products (Schmid and Richter, 2000). Product quality is an important issue concerning organic products and the focus should be increased in organic production.

This paper gives an overview of organic beef production in Denmark with emphasis on welfare, health and product quality of organic dairy breed steers.

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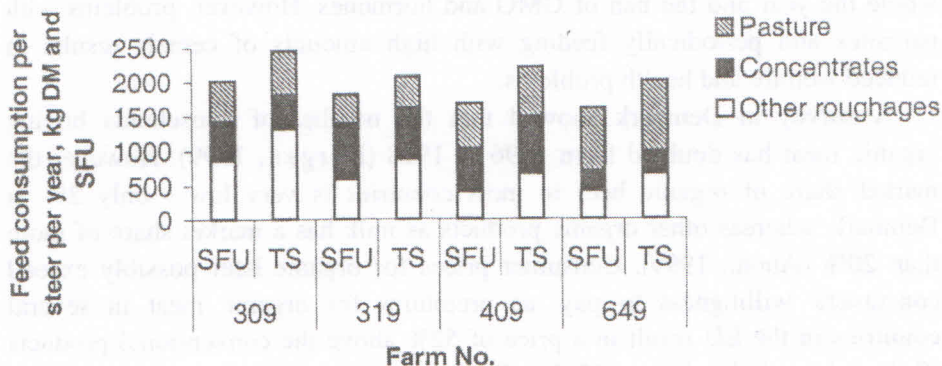
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## 2. Health and welfare

### Feeding aspects

The intensive feeding of bulls and calves increases the risk of metabolic or feed-related disorders. Thus feeding with large amounts of roughages generally has positive impact on health and welfare. A farm study in Denmark including 6 organic farms with steer production showed that feed consumption in summer accounted 0.47 to 0.57 of total feed consumption per year (Figure 1) (Nielsen et al., 2003). Pasture accounts for 0.22 to 0.56 and concentrates for 0.16 to 0.37 of the total dry matter (DM) consumption per year. These results confirm, that organic steer production is based on high amounts of roughages, and only small amounts of cereals are used compared to a conventional production of bulls and calves.

Figure 1. - FEEDSTUFFS USED IN ORGANIC STEER PRODUCTION PER STEER PER YEAR (Nielsen et al. 2003a)



Steers are typically finished in a period of about 3 months before slaughter to improve slaughter quality. In this period feeding is based on 1.3 to 4.7 kg concentrates (Nielsen et al., 2003a). If high amounts of cereals are given in a period following grazing the risk of metabolic disorders is increased. Also during summer if finishing is done on pasture there is a risk of health problems. A trial with finishing steers on pasture with 4 kg barley/animal /day resulted in liver abscesses in 4 out of 11 steers in one out of two years (Andersen et al., 2003). It is possible that the combination of restricted amounts of barley fed two times a day and easily digestible clovergrass may have resulted in large fluctuations in rumen pH.

### *Aspects related to the system*

A Danish questionnaire showed, that 94% of the farmers used deep bedding for rearing calves, bulls and steers, 11% used a shelter on pasture and 7% used free stalls with individual bedding (Nielsen and Thamsborg, 2002). The mean area used for the animals in the stable, calculated as a mean for all weight intervals, was in accordance with the new EU-rules. However, great variations can possibly be seen.

Farm studies on 6 organic farms in Denmark with steer production showed a general good welfare and are described in detail in Nielsen et al. (2003a). A welfare scheme was developed to describe welfare during winter when stabled in the barn and during summer on pasture. Registrations were measured on the system as well on the animals and were done on group level per box or pasture. The majority of steers had a dry hair coat when stabled in the barn and the hair coat was either nice or not nice nor ruffled on the majority of steers observed. Most of the steers had a normal condition score. Most of the steers were completely dehorned, however about 10% of the observed steers were not dehorned at time of the registration. Faeces consistence was higher when stabled in the barn. Distinct swelling or lack of hair on hock, distinct swelling, abscess or skin lesions, ringworm (dermatomycosis), inappropriate long claws and sore feet was almost not observed on the farms whether during the summer nor the winter period. Respiratory symptoms (frequent or laboured respiration) were not observed and coughing was observed in less than 10% of animals.

### *Pasture related issues*

Grazing permanent pastures leads to an increased risk of parasite infections. Cattle grazing for the first season do not have any immunity against parasites. Stocking rate influence the internal parasitism under extensive grazing conditions, as it was found, that a lower stocking rate with 0.5 first-year grazing steers/ha, resulted in a lower epg of *Ostertagia* spp. than at high stocking rate (1.55 steers/ha) (Thamsborg et al., 1998). It was concluded, that feed on offer was a limiting factor especially in late season. Similar results were found with gastrointestinal nematodes in another trial where steers were grazing on wet meadows, whereas lungworm disease was a problem irrespective stocking rate (Thamsborg, 2000).

On organic farms with steer production, the problems mainly mentioned in a questionnaire were coccidiosis, intestinal worms and lungworm (Nielsen and Thamsborg, 2002). A questionnaire among organic dairy farmers in Sweden showed several management factors to prevent parasite infections used

by the farmers (Svensson et al., 2000). Calves turned-out on pastures not grazed by cattle in the previous season, changing of pasture within the grazing season and nutritional supplementation in the autumn and in the spring were used by 50-60% of the farmers. Other used management strategies were delayed turn-out, use of aftermath and mixed or alternate grazing with older cattle or other species. Older, more resistant cattle have a low egg excretion, resulting in a "diluting" effect. First-season cattle benefited from mixed grazing with second-season cattle by having a higher weight gain during the entire grazing season (Nansen et al., 1990). Epg in feces was higher and serum pepsinogen lower for the mixed-grazing cattle (first season) compared to first-season cattle grazing alone. Additionally pasture infectivity at the end of the grazing season was much lower on the pasture with mixed-grazing.

An experiment on 2 private farms with young calves grazing ryegrass/white clover pastures showed no clinical signs of coccidiosis, but markedly higher levels of oocysts per gram faeces (opg) were observed on Farm II, using pastures previously grazed by cattle compared to Farm I (Figure 2) (Nielsen et al., 2003b). Calves having a maximum oocyst count above 5000 opg were subclinically affected by coccidiosis, as indicated by low faecal dry matter and reduction in daily gain of 222 g/day ( $P < 0.05$ ). Thus, more focus should be on subclinical coccidiosis in calves in the time following turn-out pastures.

### 3. Product quality

#### *Meat from steers versus bulls*

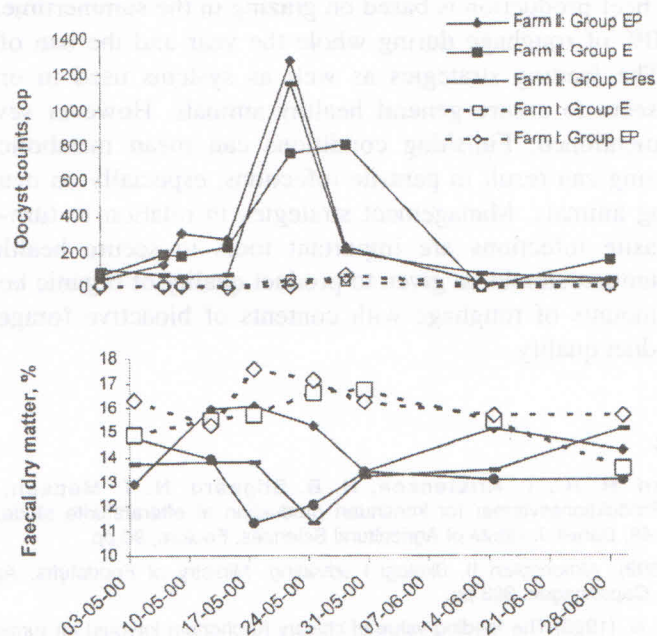
Steers generally have a better eating quality than bulls that means a better tenderness, juiciness and taste (Steen and Kilpatrick, 1995). Reasons for the better eating quality are higher degree of marbling (intramuscular fat, IMF), lower collagen content and higher collagen solubility in steers compared to bulls (Temisan, 1989). Bulls often have a content of IMF below 2%, whereas steers have minimum 3% IMF (Temisan, 1989).

#### *CLA*

Beef and milk from cattle fed high amounts of roughage or on pasture have a higher content of conjugated linoleic acid (CLA). CLA is produced in the rumen by bacteria (*Butyrivibrio fibrisolvens*), and are expected to have anticarcinogenic and antiatherogenic properties. Grazing on marginal areas raised the CLA-content in milk with 500% compared to dairy cattle fed with

TMR (Dhiman et al., 1999). Organic cows on pasture had higher content of CLA (0.80% of total methyl esters) compared to conventional cows on pasture (0.61% of total methyl esters), probably due to a high amount of roughage in the organic feed ration, having a positive effect on rumen flora (Jahreis et al., 1997).

Figure 2. - MEAN FAECAL DRY MATTER AND OOCYST COUNTS (GEOMETRIC MEANS) IN CALVES GRAZING CLOVER GRASS PASTURES AND SUPPLEMENTED WITH DIFFERENT LEVELS OF ENERGY (E AND ERES) OR ENERGY AND PROTEIN (EP) FOR 8 WEEKS FOLLOWING TURN-OUT (Nielsen et al., 2003b).



### Bioactive forages

Secondary metabolites are found in a large range of forage crops. Chicory (*Cichorium intybus*) and Jerusalem artichoke (*Helianthus tuberosus*) contain substances that may positively affect meat and eating quality in pigs and steers and have for that reason been selected for research projects in Denmark. Chicory contains sesquiterpene lactones (bitter compounds), primarily in the roots, bitter coumarins and tannins (with astringent taste) that primarily are present in the leaves. Sesquiterpene lactones or coumarins may be responsible

for an anthelmintic effect in ruminants (Hoskins *et al*, 1999). Feeding of chicory leaves to ruminants up to a certain level may positively affect meat and eating quality (Barry, 1998). Cows are capable of consuming large amounts of chicory, but excessive amounts (above 25% on DM basis) will give a bitter taste in milk.

#### 4. Conclusion

Organic beef production is based on grazing in the summertime, feeding of minimum 60% of roughage during whole the year and the ban of GMO and hormones. The feeding strategies as well as systems used in organic steer production seem to assure general healthy animals. However several issues should be mentioned. Finishing conditions can mean metabolic disorders, summer grazing can result in parasite infections, especially on marginal areas and in young animals. Management strategies in relation to turn-out, and to prevent parasite infections are important tools to secure healthy animals. Increased attention should be given to product quality of organic beef. Feeding with high amounts of roughage with contents of bioactive forages seems to improve product quality.

#### REFERENCES

1. Andersen, H. R., T. Kristensen, H. B. Bligaard, N. T. Madsen, B. Nielsen (2003):. Produktionssystemer for kontinuert produktion af efterarsf0dte stude. Report from DIAS No. 48. Danish Institute of Agricultural Sciences, Foulum, 90 pp.
2. Anon. (1999): Aktionsplan II. Okologi i udvikling. Ministry of Foodstuffs, Agriculture and Fisheries, Copenhagen. 368 pp.
3. Barry, T. N. (1998) The feeding value of chicory (*Cichorium intybus*) for ruminant livestock. *J. Agric. Sci.*, 131(3): 251-257.
4. Borgen, M. Økoguide (1999): Økologisk Landscenter. Århus. 208 pp.
5. Dhiman, T. R., G. R. Anand, L. D. Satter, M. W. Pariza (1999): Conjugated linoleic acid content of milk from cows fed different diets. *Journal Dairy Science* 82: 2146-56.
6. Graf, S., H. Wilier (2000) Organic Agriculture in Europe - State and Perspectives of Organic Farming in 25 European Countries. SOL. Bad Durkheim. 400 pp.
7. Hoskin, S. O., T. N. Barry, P. R. Wilson, W. A. G. Charleston, P. D. Kemp (1999): Growth and carcass production of young farmed deer grazing sulla (*Hedysarum coronarium*), chicory (*Cichorium intybus*), or perennial ryegrass (*Lolium perenne*)/white clover (*Trifolium repens*) pasture in New Zealand. *New Zealand Journal of Agricultural Research* 42 (1): 83-92.
8. Jahreis, G., J. Fritsche, H. Steinhart (1997): Conjugated linoleic acid in milk fat: high variation depending on production system. *Nutrition Research* 17 (9): 1479-84.

9. Nansen, P., P. Steffan, J. Monrad, J. Grønvold, S. Aa. Henriksen (1990): Effects of separate and mixed grazing on Trichostrongylosis in first- and second season grazing calves. *Veterinary Parasitology* 36: 265-76.
10. Nielsen, B., T. Kristensen, S. M. Thamsborg (2003a): Organic steer production based on dairy breed bull calves - a farm study in Denmark. *Acta Agric. Scand. Section A*. Submitted.
11. Nielsen, B., S. M. Thamsborg (2002): Dairy bull calves as a resource for organic beef production: A farm survey in Denmark. *Livestock Production Science* 75, no. 3: 245-55.
12. Nielsen, B., S. M. Thamsborg, T. Kristensen (2003b): Feed supplement to young dairy calves after turn-out to pasture: effect on weight gain and subclinical coccidiosis in organic production systems. *Acta Agric. Scand. Animal Science* 53: 1-10
13. Schmid, O., T. Richter (2000): Marketing measures for selling organic food in European retail chains - Key factors of success. *Proceedings of the 13th International IFOAM Scientific Conference in Basel*. Hochschulverlag, Zurich. 519-522.
14. Steen, R. W. J., D. J. Kilpatrick (1995): Effects of plane of nutrition and slaughter weight on the carcass composition of serially slaughtered bulls, steers and heifers of three breed crosses. *Livestock Production Science* 43: 205-13.
15. Svensson, C., A. Hessele, J. Hoglund (2000): Parasite control methods in organic and conventional dairy herds in Sweden. *Livestock Production Science*.
16. Temisan, V. (1989): Bulls, steers or heifers - which should be fattened in future? *Tierzuchter* 41, no. 7: 286-89.
17. Thamsborg, S. M. (2000): Uptake of nematode infections in steers reared at different grazing intensities. In: *Grassland farming - balancing environmental and economic demands*. (Eds. SØegaard et al.), *Proceedings of the 18th EGF, Aalborg, Grassland Science in Europe*. 561-63.
18. Thamsborg, S. M., R. J. Jørgensen, P. Nansen (1998): Internal parasitism of steers grazing extensively at different stocking rates. *Acta Vet. Scand.* 39: 311-23.

## PROIZVODNJA ORGANSKE GOVEDINE S NAGLASKOM NA DOBROBIT, ZDRAVLJE I KAKVOĆU PROIZVODA

### Sažetak

Uzgoj goveda važna je proizvodnja na mnogim organskim farmama (Graf i Willer, 2000). Dok mesno govedo daje samo meso, mliječno govedo daje mlijeko i meso. U Danskoj krave izlučene iz proizvodnje mlijeka čine veći dio organske proizvodnje mesa i samo 26% muške teladi rođene na organskim farmama u Danskoj kolje se kao tipična organska junad (Nielsen i Thamsborg, 2002). Organska proizvodnja govedine temelji se na pasenju ljeti, davanju najmanje 60% grubog krmiva tijekom cijele godine te zabrani GMO-a i hormona. Međutim, problemi s parazitima i povremeno davanje velikih količina žitarica imaju za posljedicu smanjenje dobrobiti i zdravstvene probleme.

Istraživanje provedeno u Danskoj pokazalo je da se broj domaćinstava koja kupuju organsko meso povećao od 1996. do 1998. (Borgen, 1999). Međutim, udio organske govedine na tržištu u većini zemalja vrlo je nizak - samo 2% u Danskoj, dok drugi organski proizvodi, kao mlijeko, imaju tržišni udio od preko 20% (Anon., 1999). Prodajne cijene organske govedine vjerojatno nadilaze spremnost potrošača da ih plate jer premije za organsko meso u nekoliko zemalja EU-a daju cijenu od 52% iznad uobičajenih proizvoda (Schmid i Richter, 2000). Kakvoća proizvoda važno

je pitanje u vezi s organskim proizvodima i tržište treba usmjeriti na povećanje organske proizvodnje.

Ovaj rad daje pregled proizvodnje organske govedine u Danskoj s naglaskom na dobrobit, zdravlje i kakvoću proizvoda organske junadi mliječne pasmine.

Proizvodnja organske govedine temelji se na pasenju u ljetno doba, davanju najmanje 60% grubog krmiva tijekom cijele godine i zabrani GMO-a i hormona. Strategije hranidbe kao i sustavi primijenjeni u organskoj proizvodnji junadi čini se da osiguravaju općenito zdrave životinje. Međutim, treba spomenuti nekoliko problema. Finalni uvjeti mogu značiti poremećaje metabolizma, ljetno pasenje može dovesti do infekcija parazitima, osobito u rubnim područjima i mladim životinjama. Strategija upravljanja u vezi s proizvodnjom, te sprječavanje parazitskih infekcija važne su mjere za osiguranje zdravih životinja. Povećanu pozornost treba posvetiti kakvoći organske govedine. Hranjenje velikim količinama grubog krmiva sa sadržajem bioaktivne paše čini se da poboljšava kakvoću proizvoda.

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## PROIZVODNJA ORGANSKE GOVEDINE S NAGLASKOM NA DOROBIT I ZDRAVLJE I KAKVOĆU PROIZVODA

Sadržaj

U ovom radu opisane su proizvodne metode organske govedine u Danskoj. Ova proizvodnja temelji se na pasenju u ljetno doba, davanju najmanje 60% grubog krmiva tijekom cijele godine i zabrani GMO-a i hormona. Strategije hranidbe kao i sustavi primijenjeni u organskoj proizvodnji junadi čini se da osiguravaju općenito zdrave životinje. Međutim, treba spomenuti nekoliko problema. Finalni uvjeti mogu značiti poremećaje metabolizma, ljetno pasenje može dovesti do infekcija parazitima, osobito u rubnim područjima i mladim životinjama. Strategija upravljanja u vezi s proizvodnjom, te sprječavanje parazitskih infekcija važne su mjere za osiguranje zdravih životinja. Povećanu pozornost treba posvetiti kakvoći organske govedine. Hranjenje velikim količinama grubog krmiva sa sadržajem bioaktivne paše čini se da poboljšava kakvoću proizvoda.