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COMPARISON OF THE PROFITABILITY OF ORGANIC AND CONVENTIONAL DAIRY HERDS

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Il est difficile d'évaluer la productivité et la rentabilité des divers types de production laitière sur le terrain à cause de la complexité des paramètres et de leur relation. La comparaison de systèmes alternatifs est encore compliquée du fait de l'usage d'aliments produits sur place ou de mesures de subvention.
Dans cette étude, les données ont été collectées sur 31 troupeaux laitiers privés (13 biologiques, et 18 conventionnels) par des techniciens de 1990 à 1993, qui sont passés en moyenne 2 fois par mois dans les fermes. Les troupeaux sont décrits et plusieurs ajustements et mesures de rentabilité sont utilisés. L'étude montre que les comparaisons de rentabilité des systèmes de production sont très sensibles aux hypothèses et aux ajustements retenus. Tous ces ajustements se justifient. Cependant, on ne peut dire lequel est le meilleur. Donc, on peut dire qu'une comparaison empirique de la rentabilité de ce système de production est discutable. Une autre approche, probablement meilleure, serait la simulation par modélisation pour analyser les effets économiques marginaux des modifications possibles sur un large spectre de systèmes de production, et d'appuyer ces simulations sur des données vraies. Ensuite, ces résultats pourraient être quantifiés.

INTRODUCTION

The final goal of many field studies is to evaluate productivity and profitability of different production systems. However, productivity and profitability is a consequence of a complex relation between animals, land/soil type, production system, prices, management etc. Futhermore, factors as legislation, rules, climate, input and output prices etc. are un-controllable factors that affect management decisions. That is, if actual prices are replaced by standard prices when comparing different herds or production systems, conclusions from the study may be wrong. When alternative production systems depends on home grown feed or are subsidized or regulated in some way, such comparisons are complicated futher. Especially because: 1) Valid and precise data related to production and input are difficult to obtain and 2) It is difficult to decide which monetary values are most appropriate to assign to feed, other input factors, and outputs. Those values may be specific for different production systems.
In this paper the problems related to various choices of profitability measures and to adjustment of management type will be discussed together with the potentials of alternative approaches like simulation modeling to assess the profitability of alternative production systems with emphasis on important and typical differences between Danish dairy herds with conventional (CDH) or organic (ODH) production systems.

PRODUCTION SYSTEMS

Dairy farms in Denmark, especially ODH, typically use a lot of home grown feed, grown in competition with cash crops, which can have highly different values between farms even with the same production system. Milk quota constraints are valid for all Danish milk producers. That obviously affect management strategies. ODH are in Denmark subsidiced in relation to ha (about 850 Danish Crowns per ha on average equal to 740 FFR). ODH is regulated by supplemental rules, which for instance, prohibit use of mineral fertilizers, artificically produced pesticides, and preventive drug treatment. Input of non-organically produced fodder is limited to 15%, and purchased fodder must be grown in Denmark. All animals must be allowed at least 1 hour exercise daily and grazing at least 150 days of year. Withdrawal time for milk and meat following treatment with antibiotics and chemoterapeutics is prolonged 3 times compared with conventional farms.

DATA QUALITY FROM PRIVATE FARMS

Actual milk production on herd level and for individual cows in DK are readily accessible (monthly milk test on cow-level). Actual production of meat on herd level and live weight gain for individual cows are difficult to obtain, because cows rarely are weighed (neither to balance-sheet) except when delivered to the slaughter house.
Input of feed are rarely measured measured precisely because of the practical diffeculties associated with specification of feed type and animal categories such as cows, heifers, bulls, pigs, etc. Yield of crops per ha are also complicated to obtain, especially the net yield. The yield of feed per ha must then be estimated, often without previous results, which is why standard data have to be used.
The health status is difficult to describe objectively and is often assessed from information about treatments of diseases and bills from the veterinarians, but the specification and information about animal identification are often insufficient. Futhermore, information about treatments carried out by the herdsman is rarely available.

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MONETARY VALUES FOR IN- AND OUTPUT

Accounting is mandatory for all farms in Denmark, but the claim for specifications does not necessarily fulfill the demand for proper economical analysis. The milk price is 20 - 25 percent higher in ODH compared with CDH, which is a result of the demand and supply relations. The actual milk price can be complicated to handle because of variation over the year due to delivery profile, milk quality, and detained payment from the dairy. Home grown feeds require land, seed, fertilizer, machinery, man-power, stores, management etc.. Consequently, monetary values are very complex to estimate and allocate to different crops. Futhermore, there is a large variation in yield potential even between fields on a farm. For long term evaluations, expected future monetary values must be used despite the uncertainty. For short term evaluations, the alternative value for feeds currently grown can be used, which is less complicated.

It shall be underlined, that calculating the total profit per year is relatively easy for systems with specialized production and simple and steady production during the year (minimal problems with allocation and balance-sheet), but it is difficult to analyze and compare with other complex (normal) systems.

STUDY FARMS

Data were collected from 31 private dairy herds (13 ODH and 18 CDH) by research technicians from DIAS in 1990 - 1993. The technicians visited the herds approximately twice per month. Information about each animal were obtained from milk recording, veterinarian, and breeding society via a data base at The Danish Agricultural Advisory Center. The technicians verified the data by comparison with other data sources like accounting files. Complete data related to feed consumption, disease treatments, reproduction, replacement, and milk production became available for all 31 herds. The group CDH is reprecentative for Danish conventional dairy herds and include only few farms with low emphasis on home grown roughages.

Concerning production results and herd structure, Kristensen & Kristensen (1997) concluded the following:The area with grass or clover is larger in ODH and the crop yield 12 - 25 percent less per ha compared with CDH. There is only a marginal difference in milk production per cow per year between systems, but within systems large deviations occur between herds. The herd structure was unaffected by system. In general, udder health was best in organic herds. Lactation curves showed better persistency and lower peaks in ODH. That can be explained by differences in feed rations caused by system-based land use (less concentrate allocated).

Despite the intensive recording scheme, it was very difficult to assess which proportion of inputs and outputs should be assigned to the milk production. A production system has to be considered as a business with goals (for example high profitability, special emphasis on the environment as well as human and animal welfare), but also limited by natural resources, regulations etc. The farmers' motivation for providing detailed specifications of in- and output is often limited because they look on the farm as a whole. The labour input is virtually impossible to quantify, especially in relation to herd health management. Questionnaire to the farmer to get cheap information as a tool for distributing those complex inputs is often regarded as worthless.

RESULT TERMS

When comparing different production systems, different profitability measurements have been used. It is always of major interest to calculate payment per man-hour, but that requires too many standard conditions that it is doubtful if the result is valid. Therefore, more simple profitability measures are recommended. Economists often use the «gross margin», which means the difference between income and variable costs (that variate in the short run depending on production; for example number of ha and cows). The Gross margin is used for paying fixed cost such as land, housing, machinery, labor input, management, and profit. The fixed costs can be quite different between different production systems, and in such cases it is of no interest to compare the gross margin without ajustment. Standard prices can be used and some of the fixed costs ajusted to improve the possibilities for valid evaluation of the profitability. The Gross margin can be corrected for machinery and labor needed for growing a feed by using the payment-rate for machinery pools for all functions. When comparing gross margin per cow in CDH and ODH in the same housing system, it is unnecessary to estimate fixed cost to housing. Generally, it is relevant to maximize the gross margin per cow if the production is limited by the barn capacity for number of cows. When the milk quota is the limitation, it is relevant to maximize the gross margin per kg of milk.

The gross margin per cow and per kg milk was calculated for all study herds with actual technical data combined with standard prices per unit as well as actual prices per unit. «Actual prices» for home grown roughages are corrected by using machinery pools and actual yield per ha. The most extreme profitability measures were based on assigning standard or actual monetary values to all input and output variables.

Finally, it can be hypothesized that responses of the cows are due to skills of the owner. Based on individual animal data, management types were identified by Enevoldsen et al. (1996) with a second order factor analysis. Scores from this analysis were then used to adjust the profitability measures to the same type of management (including health) by means of multiple regression.

Table I shows the assumptions for calculating the profitability measures and the estimated differences between ODH and CDH with different adjustments. The results clearly shows that the price corrections all reduced the estimated difference between ODH and CDH both on a per cow basis and per kg milk basis. Correction for management type systematically increased the difference for all profitability measures although non-significantly at standard prices. Positive differences between ODH and CDH equals better results for Organic. The general level of Gross margin in Danish CDH with standard prices is in Danish Crowns about 12000 per MPE and 1.70 per ECM.

The complex relations between production systems, rules, farm conditions, technical results, prices etc. were demonstrared in the ODH, where the feed rations were influenced by restrictive use of fertilizers and chemicals but also requirements to promote animal welfare (e.g. daily exercise). Clower grazing is, therefore, popular also

because of attractive interactions with economically attractive cash crops in the crop-rotation. In the total system there are a lot of advantages with growing grass despite a high price per feed-unit because of high alternative value of the land and lower yield, than in CDH. Feed rations, especially purchased supplemental feeds, are more expensive than in CDH, which are compensated for by higher milk prices in ODH.

Table I

Differences in gross margin between Conventional and Organic Dairy Herds with standard, actual or corrected prices per unit and correction for management. DKR per cow-year and kg ECM.

System		Prices units*	Standard CDH/ODH	Actual CDH/ODH	Aktual/Corr CDH	Aktual/Corr ODH
Purchased	Oilcakes	SFU	1.30	A	A	A
	Concentrates	SFU	1.00	A	A	A
	Milk prod.	SFU	1.50	A	A	A
Home grown	Fodder beets	SFU	1.03	A	1.03	1.75
	Grass/Bedding	SFU	0.72	A	0.72	0.83
	Silage	SFU	0.95	A	0.95	1.10
	Straw	SFU	1.00	A	1.00	1.20
Mich. costs	Bed,Vet,Breed. Herd-interest	MPE	2000	A	A	A
Sale	Milk	Kg ECM	2.50	A	A	A
	Beef/ calves	MPE	A	A	A	A

Gross margin: ODH - CDH (P-value)

		Standard	*Actual*	*Actual/Corr*
- Managem cor	MPE	*- 807 (.26)*	*2986 (.0009)*	*1768 (.02)*
+Managem cor	MPE	*787 (.25)*	*5021 (.0001)*	*3350 (.0006)*
- Managem cor	Kg ECM	*0.02 (.64)*	*0.60 (.0001)*	*0.39 (.0001)*
+Managem cor	Kg ECM	*0.04 (.51)*	*0.68 (.0001)*	*0.44 (.0001)*

*SFU : Scandinavian Feed Unit. Equivalent to the energy in 1 kg barley.
MPE: MilkProductionUnit. 1 cow year incl. heifers. ECM: Energy Corrected Milk, about 4 percent fat.

DISCUSSIONS

This study showed that comparisons of the profitability of production systems were very sensitive to the assumptions and the adjustments that were performed. The adjustments were all relevant in one or another aspect. However, there is no objective way to decide which is the best. Consequently, it can be argued that empirical comparison of the profitability of production systems is highly questionable. Another and perhaps more valid approach would be to use simulation modeling to analyze marginal economic effects of practically relevant changes in a broad spectrum of production systems and base these simulations on actual data (Sørensen et al, 1996). Subsequently, these simulated results could be analyzed quantitatively.

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