# ANIMAL FEED AND PRODUCTION COSTS ON A MILK FARM

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**Abstract**. In the research the influence of the structure of cow feed and milk production elements on milk production cost are analysed. It has been stated that with the increase of cow productivity the proportion of concentrated feed increases in the structure of animal feed that makes the animal feed costs higher. Nevertheless, these costs are compensated by the increase of productivity, therefore the costs of animal feed used for production of 1 kg of milk decrease. The average animal feed costs in the country depending on the milk yield have been stated. The milk production data on the research and training farm of the Latvia University of Agriculture "Vecauce" in the period of time from 2003 to 2006 are analysed.

Applying software developed by the authors the milk production cost on the mentioned farm has been calculated starting milk production in the new cow barn where the cows will be handled loose and milked in a side by side milking equipment as well as in two milking robots. It has been clarified that in this case the milk production cost can possibly increase till 0,18 Ls/kg. But filling the barn with animals as well as decreasing the animal feed costs till the average costs in Latvia (at the corresponding milk yield) the decrease of milk production cost till the present level is prognosticated. If applying the new technology the milk yields increase the milk production cost will decrease more by 10 – 15%.

**Key words**: cows, animal feed, technology, milk, costs.

## Introduction

Animal breeding is one of the leading branches of agriculture in Latvia. But with the increase of the costs for machinery, energetic and labour force resources it is more and more difficult to maintain the necessary level of profitability in the production of milk.

In accordance with the data of the Latvian Association of Milk Farmers in December, 2006 the average purchasing price of milk in the country reached 17 santims per kilogram [1]. It means that this milk price already exceeds the average price in the European Union. Therefore, the experts forecast [1, 2] that at present there is no economic substantiation for further rise in prices.

In this situation for increase or at least maintenance of the milk production profitability level it is necessary to increase the amount of milk yield (productivity of cows) and to decrease the production costs through more rational usage of animal feed and development of the production technology.

The analysis of milk production costs carried out by us [3] proves that the main factors influencing the milk production cost are animal feed and expenses related to handling of cows (45% and 25% from the total milk production cost correspondingly).

Consumption of animal feed calculating on a production unit to a great extent depends on the full value of feeding cows – the energetic level of the feed ratios and supply of nutrients. As investigations of many scientists and also our research show [3] the main risk factor in supply of nutrients at present is the deficit of protein that in feeding of cows in winter period often exceeds 15% of the necessary and therefore creates unnecessary consumption of animal feed. According to our calculations in Latvia in the recent 10 years the allowed consumption of feed in feeding cows has been 5000 – 6000 MJ NEL (15 – 20%) that in terms of money has caused losses by Ls 36 in the average calculating per cow per tear or 6,5 million lats for the whole herd of milk cows in the country.

In turn, the costs related to the production technology essentially depend on the expenses for electroenergy, gas, fuel, renovation of machines and buildings.

In recent years milk production on the research and training farm of the Latvia University of Agriculture "Vecauce" has considerably developed: the animal feed has improved, milk yield has increased, separate changes of technological character have been implemented.

This year, in 2007, also a new barn for 530 milk cows will start to operate in which loose handling of cows in boxes, milking in side by side equipment with parallel location of animals (according to the principle side by side) and in two milking robots VMS 2005 will be introduced, animal feed will be

distributed by a mobile mixer distributor, manure will be removed by delta type conveyors and transverse conveyors but after that brought to the main storage by a pressing pump. In turn, the old barn will be adapted for handling of calves and dry cows.

Therefore, the aim of this research is to analyse the present situation of milk production on the research and training farm "Vecauce" as well as to forecast the possible economic profitability of milk production after the new barn starts to operate.

**Materials and methods**

In order to evaluate the suitability of the animal feed for coverage of the necessity of protein and energy in dairy farming its chemical composition and costs were compared.

For determination of the average indices of dry matter, total protein and net content of energy in animal feed the data of the Scientific Laboratory of Agrochemical Analyses of the Latvia University of Agriculture (S. Strikauska) were used in separate cases interpreting them by the average indices shown in special literature [4, 5].

The costs of animal feed are borrowed from the issue "Calculation of gross coverage for farms" for the years 2001, 2003 and 2005 respectively [6, 7, 8] as well from the research and training farm "Vecauce" yearly reports for the years 2005 and 2006 [9].

For calculation of the milk production cost a corresponding software has been developed [10] in which the costs for the technological equipment of the farm and usage of the buildings, salaries for the workers, transport costs, general household costs, taxes and other costs related to production of milk are included. This software has been tested comparing the data of the research and training farm "Vecauce" accountancy with the particular results of calculations.

By help of the software the approximate milk production cost in the research and training farm "Vecauce" new milk production farm "Līgotnes" has been calculated. The prices and costs necessary for the calculation come from the informative materials [7, 8, 11].

**Results of the research**

Using the available information on the animal feed fed to the cows with milk yield 3500, 4000, 6000, 6800, 8500 kg of milk per year in the average in Latvia and on the research and training farm "Vecauce" we have modeled the possible consumption of animal feed and costs for cows with different productivity the milk yield of which is 4000 kg to 10000 kg milk per year.

The figures of the Table 1 show several correlations. If the cow productivity increases from 4000 to 10000 kg of milk per year the proportion of concentrated feed in the structure of animal feed increases (from 23,92% to 38,92% according to the content of NEL) and the concentration of energy in dry matter from 6,21 MJ to 6,60 MJ NEL/kg of dry matter. Correspondingly the feed costs increase – from Ls 234,55 to Ls 540,00 calculating per cow per year. Nevertheless, these costs are compensated with the increase in productivity and the cost of feed for production of 1 kg of milk for the productivity groups shown in the table even decreases (from 5,86 sant. to 5,40 sant.).

In all versions considerable protein deficit is observed (5 – 15%) that causes increase in consumption of animal feed (6 – 26%). The situation could be improved increasing the proportion of grass feed as partial substitution of concentrated feed with good quality papilionaceous plant silage and green mass would increase the content of protein in the dry matter of feed and reduce the expenses for animal feed.

Nevertheless, it must be taken into consideration that the amounts and expenses for animal feed for cows with different productivity shown in Table 1 are modeled as the average in the country from a large number of cows. On different farms depending on the existing structure of animal feed and mechanization of work there can be quite considerable deviations from these average indices. Besides, these indices can be considerably influenced by the meteorological conditions during the period of plant vegetation. The data on the research and training farm "Vecauce" on consumption of animal feed in 2006 can serve as an example.

On the described farm a tendency can be observed that with the increase of the productivity of cows the proportion of concentrated feed increases and the total as well as calculating for 1 MJ NEL

costs of feed and consumption of feed for production of 1 kg of milk increase. It has been influenced to some extent by the extreme meteorological conditions as in the summer of 2006 due to the continuous dry and hot weather the grass plants dried up and it was necessary to compensate them in the feed for cows by combined concentrated feed as well as by cakes and oil meal.

Table 1. **Characterisation of feed for cows (2006)**

| Kind of animal feed and characterisation | In the average in Latvia if the milk yield is, kg/cow per year | | | | Research and training farm "Vecauce" |
|---|---|---|---|---|---|
| | 4000 | 6000 | 8000 | 10000 | 6660 |
| Consumption of animal feed, kg/cow per year | | | | | |
| Grain feed | 800 | 1300 | 2000 | 2600 | 2016 |
| Cake, oil meal | 120 | 240 | 390 | 520 | 624 |
| Green forage, herbage | 7650 | 9300 | 10400 | 11500 | 7173 |
| Silage | 2500 | 4000 | 6300 | 9000 | 7053 |
| Hay | 1400 | 1200 | 1100 | 1000 | 303 |
| Other feed | 1010 | 1050 | 1100 | 1100 | 358 |
| Feed structure, % according to NEL | | | | | |
| Concentrated feed | 23,92 | 30,90 | 36,86 | 38,92 | 43,28 |
| Grass feed | 68,24 | 62,70 | 58,52 | 57,65 | 54,20 |
| Other feed | 7,84 | 6,40 | 4,62 | 3,43 | 2,52 |
| Content of nutrients | | | | | |
| Dry matter, kg | 4674 | 5853 | 7418 | 9105 | 6515 |
| Total protein, kg | 683,8 | 872,9 | 1125,7 | 1382,3 | 1978,3 |
| NEL, MJ | 29132 | 37501 | 48682 | 60144 | 41389 |
| Costs | | | | | |
| Total, Ls/cow | 234,55 | 332,90 | 432,50 | 540,00 | 449,61 |
| 1 MJ NEL, sant. | 0,81 | 0, 85 | 0,89 | 0,90 | 1,09 |
| Feed calculating per i kg of milk, sant. | 5,86 | 5,55 | 5,41 | 5,40 | 6,71 |

On the research and training farm "Vecauce" as well as everywhere else in Latvia all kinds of animal feed have become expensive rapidly. During the last four years green forage, silage and hay have become 1,8 times more expensive, but haylage has become 2 times more expensive; cakes and oil meal – almost three times, combined concentrated feed and mineral additives – one and a half times. This increase in prices for animal feed could not be compensated even by the increase in the cow productivity from 5220 to 6660 in that year as the expenses for animal feed calculating per one kg of milk in this time have increased from 3,54 to 6,71 santims, that is, 1,9 times.

At the same time (Figure 1) the average milk yield (by 27,6%), expenses for salaries for workers in milk production (by 35,1%), animal feed costs (2,4 times), the milk production cost (1,77 times) have increased. The same also the milk sales price has increased (by 40%) that was in the average 1,4 Ls/t in 2006. Therefore, it is possible to draw a conclusion that in the last four years significant changes have taken place in the milk production indices. Nevertheless, they are different for every index and it is not possible to forecast precisely what these changes will be after one or two years. Therefore, also for comparison of the new milk production technologies that will be introduced in 2007 with the present existing ones we have used the indices of 2006.

The figure shows also the dynamics of the produced milk production cost that has been obtained in two ways: according to the research and training farm "Vecauce" accountancy data as well as calculating according to the software developed by us where also the machinery costs and barn exploitation costs are included. Carrying out this production cost two – factor dispersion analysis it has been stated that the difference of the results obtained in different ways is not essential ($F = 0,2534$ un $F_{crit} = 10,1279$). It means that for evaluation of milk production in the new barn we can apply the methods and calculation software developed by us.

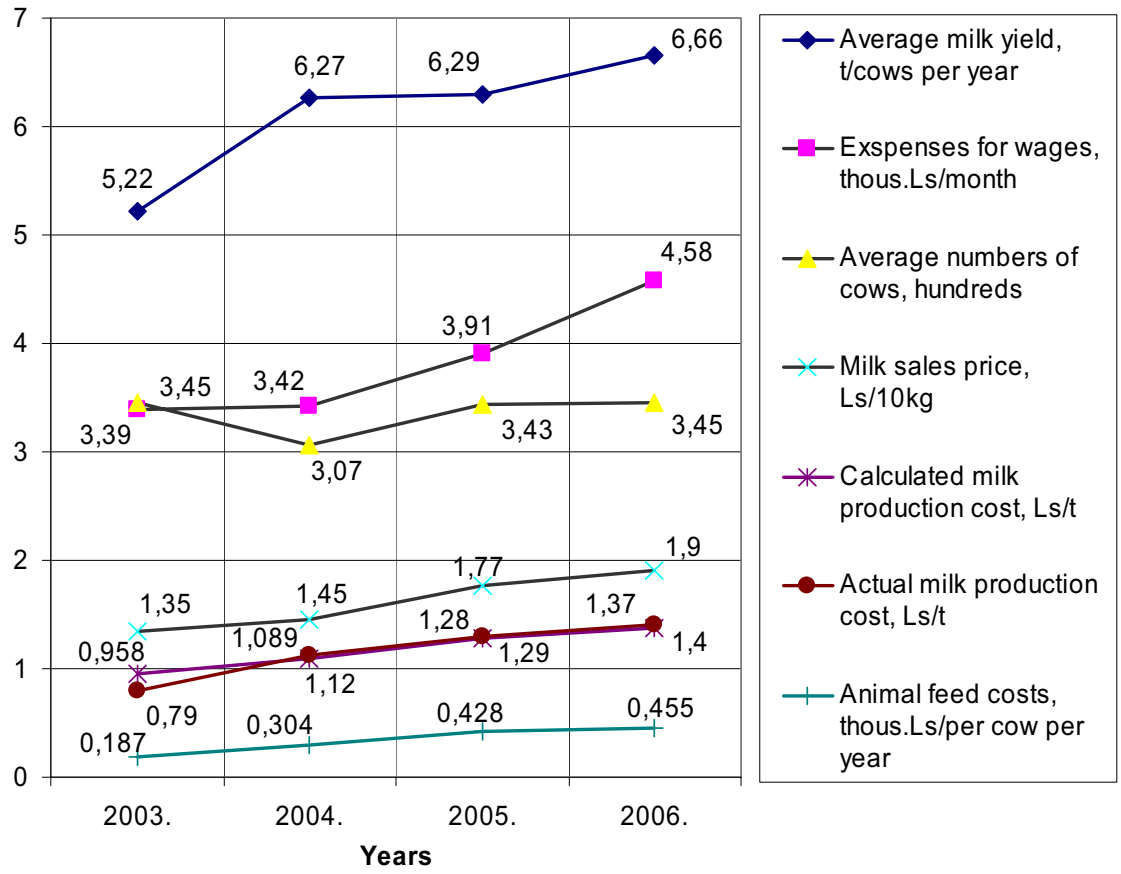


Fig. 1. **Dynamics of milk production indices on the research and training farm "Vecauce" in the last four years and the comparison of the milk production cost calculated by a computer with its actual production cost**

By means of this software we have compared six different technological versions. The first is the present version when the cows are handled in the old barn, milked in boxes with automatic milking equipment, but for removal of manure scrape type transporters are used.

In the second version it has been envisaged that the cows are kept in the new barn using loose handling and they are milked in a separate parlour in a specially installed stand type equipment (Side by side type), as well as in two milking robots. But in the barn the number of cows has remained the same.

In the third version, unlike from the second one, for calculation of the milk production cost the average animal feed costs existing in Latvia (See the table) that have been adjusted in accordance with the milk yield level existing in Vecauce have been used.

In the fourth, fifth and sixth versions it has been considered that the new barn will be filled with animals (530 milk cows). Besides, in the fourth version the present existing animal feed costs in Vecauce are included, in the fifth – animal feed average costs in Latvia adjusting them in accordance with the present milk yield level (6660 kg/year), but in the sixth – the possible increase in the milk yield up to 8000 kg/year that will be achieved by application of the new technology and the corresponding animal feed costs with their average prices in Latvia.

The results of the calculations show that transferring from production of milk in the old barn to the new one and ensuring that the new barn is filled with animals the milk production cost will increase from 0,137 to 0,144 Ls/kg, that is, by approximately 5%.

Nevertheless, it must be taken into consideration that at the beginning the new barn will not be full with animals. Therefore, we can assume that at the beginning there will be the same number of cows as in the old barn and therefore the milk production cost could increase even up to 0,18 Ls/kg, that is, by 31%.

the milk sales price – 0,19 Ls/kg, but filling the barn with the planned number of cows (530 cows) as well as reducing the animal feed production costs to the average level in Latvia (at the corresponding milk yield) this milk production price could reduce and become as it is at present. If in the result of introduction of the new technology the milk yields increase, this decrease will be even bigger.

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