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STUDY ON BASIC CRITERIA OF A GRADE OF DAIRY FARMS WITH DIFFERENT HERD SIZE

N. RUSEV[1], S. BACHVAROVA[1], V. GAIDARSKA[1], Ts. HARIZANOVA[1], P. STOYKOV[2] and T. IVANOVA[3]
[1] *Institute of Animal Science, BG – 2232 Kostinbrod, Bulgaria*
[2] *Complex Experimental Station, BG – 3700 Vidin, Bulgaria*
[3] *Agricultural Institute, BG - 9700 Shumen, Bulgaria*

Abstract

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In the present study a comprehensive assessment according to basic criteria of cattle farms with different capacities was made. The study is carried out through visits and personal interviews with farmers according to the certain methodology. Farms were divided according to their capacity into three groups. The following parameters were monitored: status of the herd, milk production, reproduction, service period, health status, feeding, milking, cleaning and recycling of manure, microclimate, management and economics of the farms. The result of the study showed that herd size had no significant effect on milk production. There is a clear trend for higher milk production with increasing number of cows in the herd. Farms with more than 50 cows have 13.11% higher average milk yield compared to the group up to 25 cows and 6.12% higher than the farms with herd size from 26 to 50 cows. Length of service period in the investigated dairy farms range from 60 to 140 days, the shortest service period is reached in small and medium-sized farms - 82.5 and 81.5 days, where the cows raised stable-pasture during the summer period. The selection mainly in large farms is in a better level compared to that in small farms. In larger farms first class bulls with high reliability and inheritance of the type and milk production were used. Only 10% of investigated farms apply modern system of feeding TMR. Farms with 51 to 460 cows have significantly higher grade for the quality of milking process and they use milking equipment, which directly influence over the better quality of milk than in small farms. With increasing of the farm size, the grade is higher in management, economics and development prospects, which indicates higher competitiveness of these farms.

Key words: cattle – breeding, estimation, cow milk, management, economics

Introduction

Modernization and consolidation of the dairy industry over the last 25 years pose new challenges. One of them is the concentration of dairy herds, which results in constantly increasing intensification of dairy cattle breeding, competitiveness and efficiency of milk production. Concentration of dairy herds is carried out objectively and is influenced mainly by the degree of development of productive forces (Bade et al., 2007).

Among the main factors (Russ et al., 2006, Rusev et al., 2008, Rusev et al., 2009) that influence over the concentration of the production are the size of the dairy herds are: productivity of cows, capacity of buildings, technology of animal housing, degree of mechanization of production processes, the intensity of forage production, availability of water and energy resources, qualification and availability of labour, public policy, which promote or retain these processes.

According to studies of Fricke (2002), Brannstrom et al. (2006), Reinemann et al. (2006), the concentration

E-mail: ts_harizanova@abv.bg

of dairy herds in Western Europe, USA, Canada, Latin America, Australia and New Zealand marks a significant growth. The average of farms in many countries has doubled.

The globalization of world trade led to remarkable changes in the dairy business. Achievements in the field of population genetics and breeding, embryos transfer and technology of milk production (Lusy, 2001; Hoffmann, 2005; Russ et al., 2006; Gaidarska, 2009) are impressive. There were substantial structural and qualitative changes in the dairy sector of the developed countries. The average size of dairy herds in the last 15 years in the EU increased from 35 to 70 cows in Denmark -130 cows (Nygard, 2007), UK - 90 cows, Netherlands - 84 in Northern Ireland - 80 cows and in U.S., where currently 60% of cows are bred in farms with more than 500 cows, the average size of dairy herd is 160 cows (Fricke, 2002; Kononoff et al., 2006; Russ et al., 2006; Rusev et al., 2008). In Hungary, the Czech Republic and Slovakia, large farms with more than 200 cows, provide 80% of total milk production. Steady trend of decreasing number of farms, increasement of the size of dairy herds and increasement of the competitiveness of farms exists all around the world (Pursley et al., 1998; Fricke, 2002). Over the last 3-4 years a trend for consolidation of farms in our country also exists and farms with capacity more than 50 cows are built through adoption of new and reconstruction of the existing facilities. The larger capacity of dairy farms allows the application of modern technologies and higher competitiveness of the production. Complex assessment of dairy farms is needed to establish their competitiveness in a market economy. It includes the most important parameters affecting the efficiency of the production (milk production, reproduction, health, breeding, feeding, milking, farm hygiene, farm management).

The aim of this study is to make a complex assessment of cattle farms with different herd size.

Material and Methods

Sixty dairy farms from different regions of the country with 5368 cows were assessed and evaluated. The complex assessment is made through personal interviews of farmers according to the surveyed indicators included in the questionnaires and allowing rating assessment according to the methodology of Rusev (2003). Farms are distributed according to their capacity as follows: from 11 to 25 cows - 13 farms, from 26 to 50 cows - 16 farms, from 51 to 460 cows - 31 farms. The following factors were studied: status of the herd, milk production, reproductive traits - service period, health status, nutrition, milking, cleaning and using of manure, hygiene and farm management. All information is processed statistically by ANOVA method with SPSS 9.

Results and Discussion

Status of herds - The results of the study of the status of dairy herds have shown that in most small farms to 30-40 cows, the number of cows – with more than 3 lactations was greater. Unfavourable status of these herds is a result of poor production of replacement heifers, which can be explained by the fact that it is not economically profitable for farmers to produce heifers and many of them do not have the necessary facilities for breeding them. In large farms with more than 100 cows, the status of the herds is well balanced. The average daily gain in rearing of calves and heifers for breeding in the investigated farms varies quite widely, which reflects over the age of insemination of the heifers - from 15 to 20 months of age.

Milk production - data on milk production of cows included in the study are presented in Figure 1. The results of Figure 1 show that the average milk yield of cows in farms from 11 to 25 cows is 5492 kg varies

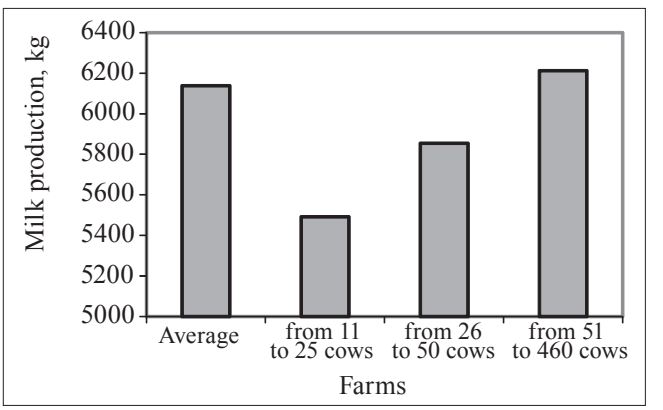

Fig. 1. Milk production

from 3800 to 6500 kg; from 26 to 50 cows, average milk yield is 5854 kg and farms the size of herds over 50 cows have realized an average milk yield of 6212 kg. Survey results show that farms with a capacity of herds over 50 cows achieved the highest average milk yield (13.11 % higher than the average milk yield in the farms with 11 - 25 cows and 6.12 % higher than farms 26-50 cows). In the investigated groups of farms are showed that the achievement of good milk production is possible both in small, medium, and large farms, although the genetic potential of cattle in dairy farms is with a wide range of varying according to used bulls. The correlation coefficient between the number of cows in the farm and average milk yield is 0.317 (there was a positive correlation between the two indicators in favour of large farms). Analysis of the results of Table 1 shows that cows under investigation have achieved a high milk yield and average milk production of the surveyed farms was 6138 kg (Figure 1). In farms with a herd size of 11 to 25 cows, except milking, the other operations are manual, which shows that the technological level of milk production is very low and this is the main reason for the low efficiency of these farms.

Reproduction - high milk production is assumed to be the main factor that affects negatively the reproduction of cows. According to Pursley et al. (1998), Roxstton (2001), Lusy (2001), Lusy et al. (2004), the causes of declining reproductive performance are not only high milk yield, but also longer intervals of first ovulation and lower concentrations of progesterone in the blood of cows. High expressions of anoestrus (abnormal development of the corpus luteum) according to Nebel and McGilliard (1993) together with the increasing size of dairy herds, decreasing number of staff, systems of animal breeding and steady increase of the degree of inbreeding (according to data of Hansen, 2000; Roche et al., 2000) may also be the reason for declining reproductive performance in dairy herds. The length of

Table 1
Average Grade assessment of farms according to investigated indicators

№	Number of cows	Milk production / L /		Status	Service period /days/	Growth	Reproduction
		kg	score				
	1	2	3	4	5	6	7
from 11 to 25 cows – 13 farms							
Average:	18.4	5492	7.1	8.5	82.5	7	8.7
from 26 to 50 cows – 16 farms							
Average:	38.6	5854	8.3	8.4	81.5	7.2	9.4
from 51 to 460 cows – 31 farms							
Average:	142.6	6212	7.4	9.4	95.7	7.8	8.5
Average for 60 farms	87.9	6138	7.6	8.9	89.1	7.5	8.8

continue:

№	Health	Feeding	Milking	Hygiene	Microclimate	Economics	Management	Average grade assessment
	8	9	10	11	12	13	14	15
from 11 to 25 cows – 13 farms								
Average:	9.9	7.3	7.7	7.5	5.6	7.0	5.2	7.3
from 26 to 50 cows – 16 farms								
Average:	9.6	7.1	8.0	7.8	5.9	7.9	5.5	7.7
from 51 to 460 cows – 31 farms								
Average:	9.0	7.7	8.9	8.2	6.7	8	6.2	7.9
Average for 60 farms	9.3	7.5	8.4	7.9	6.3	7.7	5.8	7.7

service period in the investigated herds is a key indicator for the reproductive status. It varies widely: for instance in the farms with the capacity of herds of 11 to 25 cows the service period is 82.5 days and varies from 60 to 97 days; in farms with herd size from 26 to 50 cows this index is 81.5 days with range from 60 to 120 days and in farms with 51 to 460 cows its value is 95.7 and ranges from 60 to 140 days.

The established service period of the surveyed dairy farms is 89.1 days as an average. It may be considered as an optimal, which indicates that there are no serious reproductive problems in the studied farms. In farms with service period, more than 120 days are observed deficiencies in the due detection of oestrus cows, in feeding and retaining placenta.

It is noteworthy that in the study, the shortest period of service period was reached in small farms where the cows during the summer are reared stable-pastured.

Selection - The results of the data show that in the studied farms the selection is not on the proper level: for instance in one of the small farms, cows are not artificially inseminated, which is a serious deficiency, in more than 90% of farms a competent selection of bulls - enhancers with high reliability for inheritance of milk production, assessment of udder type, limbs and hooves, etc. is not made. The main reason is the incompetence of farmers and unfairness of merchants who offer semen. In recent years, mainly in large farms, cows are inseminated with semen from high quality bulls from USA, Holland, Germany. In these herds is observed visible improvement in the type of animals and their production performance. Particularly vivid it is expressed in improvement of the udder in cows at first lactation.

Health - results of research on health status of dairy herds has shown that the health is good. The dropping of calves up to 6 - month old is 1-2% and from 6-12 months of age is 0.5%. Venerable diseases, which result mainly from non-technological operations during milking of cows, milking equipment quality and general hygiene in the farm, ranging from 15 to 45%, clinical mastitis are from 1 to 5%. In farms using pasture during the summer period, hooves diseases are minimized by 1 to 2%, while in other farms - they reach 7 to 10%; Endometritis diseases that affect very negatively the service period are the result of a tie placenta and occur mainly in farms where feed quality is poor, conditions are unsatisfactory, the labour conditions are not comfortable and hygiene is low. In dairy herds, where endometritis diseases are registered, length of service period is more than 100 days.

Table 2 represents a reliable effect of group of farms is established on the variation of the trait "Health condition" ($F = 3.43$, $P < 0.05$) in favour of smaller farms (first and second group). Farms with 51 to 460 cows showed a reliable poor general health compared to farms with 11 to 26 cows (Table 3).

Table 2
LS variance analysis on the effect of farm group on the variation of the trait "Health"

Parameter	Source of variation/	Sum of Squares	DF	Mean Square	F	Sig.
Health conditions	Between Groups	8.86	2	4.43	3.43	0.039
	Within Groups	73.71	57	1.29		
	Total	90.28	59			

Table 3
LS variance analysis on the effect of farm group on the variation of the trait "Health" /Multiple comparison/

Source of variation	Sum of Squares	DF	Mean Square	F	Sig.
Between 1 and 3 group					
Between Groups	7.86	1.000	7.86	5.34	0.026
Within Groups	61.77	42.000	1.47		
Total	69.63	43.000			

Feeding - with the exception of six of the surveyed farms, where the farmers practice modern system of feeding (TMR) - all other farmers practice traditional feeding system. Voluminous feed quality varies widely. It is in a satisfactory level in farms high milk production. Although feeding of cows with more than 5.5 tons average milk yield is abundant, the rations of cows are not optimally balanced in some nutrients. Feeding of the female calves and heifers for breeding is highly underestimated especially in less productive farms, which negatively affects the quality of heifers intended for reproduction. In all farms with a capacity of 25 cows during the summer period is practiced combined stable - grazing livestock. The quality of pastures in the different regions in the country varies widely. As a rule, farmers use the free municipal pastures, forests and abandoned farmlands.

Milking - In the surveyed farms up to 25 cows, mainly obsolete milking systems are used. About 20% of farms up to 50 cows have modern milking equipment from leading Western firms (De Laval and mainly Westfaliasurge), in farms up to 50 cows, the percentage of new milking equipment is 32%. About 80% of used equipment is obsolete with significantly lower technical parameters. The technology of milking cows as a major factor influencing the quality of milk is not strictly adhered to in most of the surveyed farms.

Table 4 represents a reliable effect of group of farms is established on the variation of the trait "Milking" ($F = 6.67$, $P < 0.01$). Farms with 51 to 460 cows showed a reliable higher values of the index "Milking" compared to smaller farms (Table 5).

Cleaning and use of manure - all farms practice dry cleaning of manure. In two of them, the manure is cleaned with a bulldozer board, in 5 of the farms - a chain conveyor plank is used and in the other farms hand cleaning is practiced. The storage of manure in small farms is in improvised small-heaps near the stables where animals are kept. In large farms, concreted manure storages are built. In summer, the manure is transported and dispersed in the field. About 70% of farmers do not have specialized manure dispersed trailers, and manure is not evenly distributed which affects the effect of fertilization. Majority of farmers do not comply with the requirements for composting the manure, which lowers its quality.

Farm hygiene - general hygiene of the buildings in which animals are kept is very diverse and ranges from 5 to 10. In small farms where the manure is cleaned manually the desire of farmers is to use less litter,

Table 4
LS variance analysis on the effect of farm group on the variation of the trait "Milking"

Source of variation	Sum of Squares	DF	Mean Square	F	Sig.
Between Groups	17.12	2	8.56	6.67	0.002
Within Groups	73.16	57	1.28		
Total	90.28	59			

Table 5
LS variance analysis on the effect of farm group on the variation of the trait "Milking" /Multiple comparison/

Source of variation	Sum of Squares	DF	Mean Square	F	Sig.
Between 1 and 3 group					
Between Groups	13.57	1.000	13.57	10.72	0.002
Within Groups	53.16	42.000	1.27		
Total/Общо	66.73	43.000			
Between 2 and 3 group					
Between Groups	8.73	1.000	8.73	6.51	0.014
Within Groups	60.39	45.000	1.34		
Total	69.12	46.000			

without considering that the hard beds do not provide enough comfort for the animals. In these farms, where manure cleaning is mechanized, farmers use bedding to maintain the good condition of the beds. In winter, the manure is cleaned twice a day and in summer - once when animals are on the pasture. The results of the study and the evaluation of farms according to general hygiene show that the grade is not affected by the system of manure cleaning but by criteria of the farmer.

Farm management - better management of the investigated technological elements in farms is a key indicator of their effectiveness and prospects for development. Qualification of farmers is different. Most of them do not have special education and they did not attend short-term specialized training courses. This determines the significant variation of the grade of farm management. The majority of young farmers, some of them with higher education in non-agricultural fields, increase their qualification with the help of consulting services and specialized literature. These farmers, who receive low scores, are very conservative and relatively elder. Figure 2 shows the grade of the groups of farms according to the index "Management".

Average grade assessment - the average grade assessment on all tested parameters of the 60 surveyed farms is 7.7 and for farms up to 25 cows that index is 7.3. For the categories of farms from 26 to 50 cows, a grade is 7.7 and for farms with more than 50 cows - 7.9, which indicates that large farms generally are more competitive and the production and management process is in a better level (Figure 3).

Conclusions

The capacity of the investigated farms had no significant effect on milk production. There is a tendency for higher milk yield with increasing average number of cows in the herd. In farms with a capacity of more than 50 cows the average milk yield was higher by 13.11% compared to the first group of 11- 25 cows and 6.12% of farms from 26 to 50 cows.

Length of service period in the investigated dairy farms range from 60 to 140 days, the shortest service period is reached in small and medium-sized farms - 82.5 and 81.5 days, where the cows raised stable-pasture during the summer period.

The selection mainly in farms from 11 to 50 cows do not meet contemporary criteria, and in large farms, over 50% of the selection is in a good level, which can be continuously monitored by increasing milk production. Only 10% of investigated farms apply modern system of feeding TMR.

Farms with 51 to 460 cows have significantly higher grade for the quality of milking process and they use milking equipment, which directly influence over the better quality of milk than in small farms.

With increasing of the farm size, the grade is higher in management, economics and development prospects, which indicates higher competitiveness of these farms.

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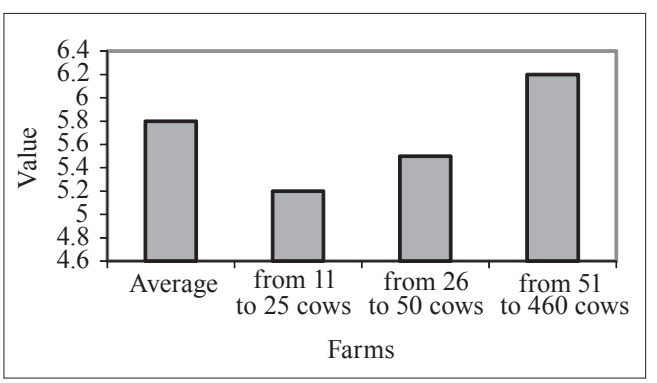

Fig. 2. Management of farms

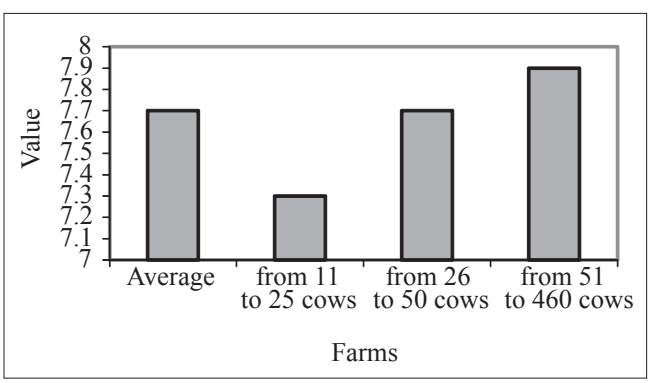

Fig. 3. Average grade assessment of farms

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