

Current Status and Possibilities for the Development of the Cattle Breeding in the Primorsko-Goranska County, Croatia

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Abstract: At the beginning of 2007 the milk producers from the Primorsko-Goranska County, Croatia were surveyed through the questionnaire in order to determine the current status and to highlight the obstacles and the possibilities of development and improvement of the modern cattle breeding in the observed county. The questionnaire spanned 2001-2006 period and all together 260 families were surveyed. The survey aimed to get as much as possible useful information's that would indicate the problems concerning the cattle breeding in this area, and based on these results to give certain guidelines for the improvement of current status. Older age of milk producers, significant number of family farms with small number of cattle and difficult implementation of selective measures due to the small number of cows that were included in milk recording were determined as the main obstacles for cattle breeding development in the surveyed county. It is emphasized that development of cattle breeding in this area should be based upon the increased number of family farms with larger herds. To achieve this it is necessary to retain existing cattle fund, and then gradually increase the number of cattle in the mentioned county through the import of breeding heifers of dairy and combined breeds from neighboring European countries with highly developed cattle breeding. Besides that, it is also necessary to create conditions for the production of organic (ecological) products, which represents the future of agriculture, livestock production, bearing in mind that demanding European market has recognized the value of organic agricultural products that were produced through environment friendly production, which Primorsko-Goranska County, due to its significant natural resources, could easily assure.

Key words: Cattle, Primorsko-Goranska County, status, perspective, Croatia.

1. Introduction

The intensity of a cattle breeding production development, which is reflected in the quantity of produced milk and meat per conditional cattle has been often shown by many countries as a factor of their overall development. This means that through these indicators one can show not only the status of the livestock breeding, but also the status of the entire agriculture in one country [1, 2]. In Croatia, the overall livestock breeding accounts for 43% of the

overall agricultural production, while cattle breeding production accounts for 34% of the overall livestock production [3].

The importance of cattle breeding is reflected primarily through the introduction of high quality and nutritionally valuable foodstuffs such as milk and meat in the nutrition of the population [4-7] but also in the cattle usage of less valuable feeds that these animals can then easily convert into above mentioned high-quality animal foods because of their specific digestive system [8]. This also represents significant comparative advantage of cattle as ruminant animals during meals preparation because within the food

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chain these animals are not competitors to other animals or humans [8].

When comparing the cattle breeding with other livestock productions, it is well known that cattle production requires relatively large amount of labor [9]. This further means that with the development of cattle production one directly contributes to the greater employment of younger working-age population, which has been proven in other countries such as Turkey [10]. This is particularly important for the Primorsko-Goranska County, Croatia where the employment opportunities in the other economic sectors have been reduced to a minimum. All of that will ultimately have a positive impact on the biological revitalization of the rural areas in this county and will also prevent further depopulation of rural areas [11].

Primorsko-Goranska County is located in the southwestern part of Croatia and it covers three specific agro-ecological areas, but only the area of Gorski Kotar has real technical and technological prerequisites for intensive cattle production. This is predominantly hilly and mountainous area with the prevailing mountain-type of climate that is characterized by low mean annual air temperature and high amount of rainfall [12].

The aim of this study was to determine the current status and to point to the obstacles but also to the possibilities of development and improvement of the modern cattle breeding in the Primorsko-Goranska County.

2. Materials and Methods

At the beginning of 2007 the milk producers from the Primorsko-Goranska County, Croatia were surveyed with the questionnaire dealing with the problems of the cattle production in this county and in order to get their opinions concerning the possibilities of a further development and improvement of the modern cattle breeding in their county. The survey included a total of 260 families with all together 940

household members who were in some way related to the cattle production. Among the surveyed families there were 132 families that had up to three household members and 128 families with four or more household members. The average number of household members per family was quite small (3.6 household members).

3. Results and Discussion

According to the survey, at the beginning of 2007 there were a total of 1,079 cattle in the all cattle categories in Primorsko-Goranska County. Over a third of the total number of the cattle (344) was located at the farms of milk producers with a small number of household members (up to three household members or singles). In the same year, families with four or more household members had owned a total of 735 cattle, among which there were 510 dairy cows (Table 1).

It is important to emphasize that among families with small number of household members there is evident and significant number of elderly families in which milk production is an additional or only source of income. In the near future one cannot be able to count on these families as milk producers which surely represent a serious problem for the cattle production in this area.

Among the total number of 260 surveyed families in the beginning of 2007, 52.7% (137/260) of them owned only one cow. In the same year, in the whole county area there were 81.6% (212/260) families that owned up to three cows, and the mean age of the heads of these families ranged from 54.9 to 61.3 years. In addition, during that time in the Primorsko-Goranska County there were 18.4% (48/260) family farms with four or more cows with the mean age of the heads of these families ranged from 44.5 to 50.7 years (Table 2).

The survey results point to the fact that the current situation regarding neither the development of cattle production, nor its future in the Primorsko-Goranska County is not satisfactory. Despite this, the encouraging

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Table 1 Different cattle categories according to the number of household members of families related to the cattle production in the Primorsko-Goranska County, Croatia at the beginning of the year 2007.

Number of household members	The number of cows	The number of heifers	The number of calves	The number of beef cattle	Total number of all cattle categories
Up to 3 members	236	67	41	0	344
4 or more members	510	160	57	8	735
Total	746	227	98	8	1,079

Source: Croatian Livestock Center, 2007.

Table 2 The number of families and the mean age of the head of the families related to the cattle production in the Primorsko-Goranska County, Croatia at the beginning of the year 2007, according to the number of dairy cows that they own.

The number of dairy cows per family	The number of the family	The share of the total number of families (%)	The mean age of the head of the family (years)
0 cows (they own only 1 heifer)	6	2.3	61.3
1 cow	137	52.7	58.6
2 cows	48	18.5	56.2
3 cows	21	8.1	54.9
4 cows	11	4.2	44.5
5 - 9 cows	23	8.8	50.7
10 or more cows	14	5.4	48.5
Total	260	100.0	53.5

Source: Croatian Livestock Center, 2007.

fact is that the age of the head of the family is lower in those families that own four or more dairy cows, which gives hope for the survival and further development of the cattle production in the area.

According to the reports of the Croatian Livestock Center and local veterinary stations the total number of cows in the Primorsko-Goranska County varied from 2001 to 2006 [13, 14]. The lowest number of cows was recorded in 2005 (1,252 cows) and the largest in 2002 (1,628 cows). In 2006, the total number of cows in the county once again began to grow, and in that year there was the largest number of cows under recording 91.38% (1,251/1,369). However, within this number of cows under recording, the larger part fell under parentage recording (80.90% or 1,012/1,251) while under milk recording there were only 19.10% (239/1,251) cows (Table 3).

For this small number of cows that were under milk recording (only 19.10% of them), it is very difficult to implement any selection measures and it is also very difficult to establish the monitoring of the genetic trend for milk production, which represents an

additional obstacle for the development of the cattle production in the Primorsko-Goranska County.

In the 2001-2006 period in the Primorsko-Goranska County, one can observe the increase in the number of family farms with a herd size of 11 or more dairy cows. The lowest number of such farms was recorded in 2003 (only 8 farms), and the largest number was found in 2006 (when a total number of 21 farms with a herd size of 11 or more dairy cows was recorded) (Fig. 1).

This growing trend of family farms with more cows (11 or more) is a positive development regarding the development of cattle production in the observed area since it was established that the introduction of a new regulations in evaluating the quality of milk, as well as the formation of the milk purchase price based on the level of proteins and milk fat in milk had most affected the milk producers with a small number of animals. In this sense, milk producers with a larger number of animals in their herds had remained relatively protected and were able to continue the development of their production.

Table 3 The total number of cows in the Primorsko-Goranska County during 2001-2006 periods along with their share under recording.

Year	The total number of cows	The number of cows under recording		
		The number of cows under milk recording	The number of cows under parentage recording	Total number of cows under recording (%)
2001	1,614	191	614	805 (49.88)
2002	1,628	178	549	727 (44.66)
2003	1,346	163	423	586 (43.54)
2004	1,402	191	763	954 (68.05)
2005	1,252	135	733	868 (69.33)
2006	1,369	239	1,012	1,251 (91.38)

Source: Croatian Livestock Center, 2007.

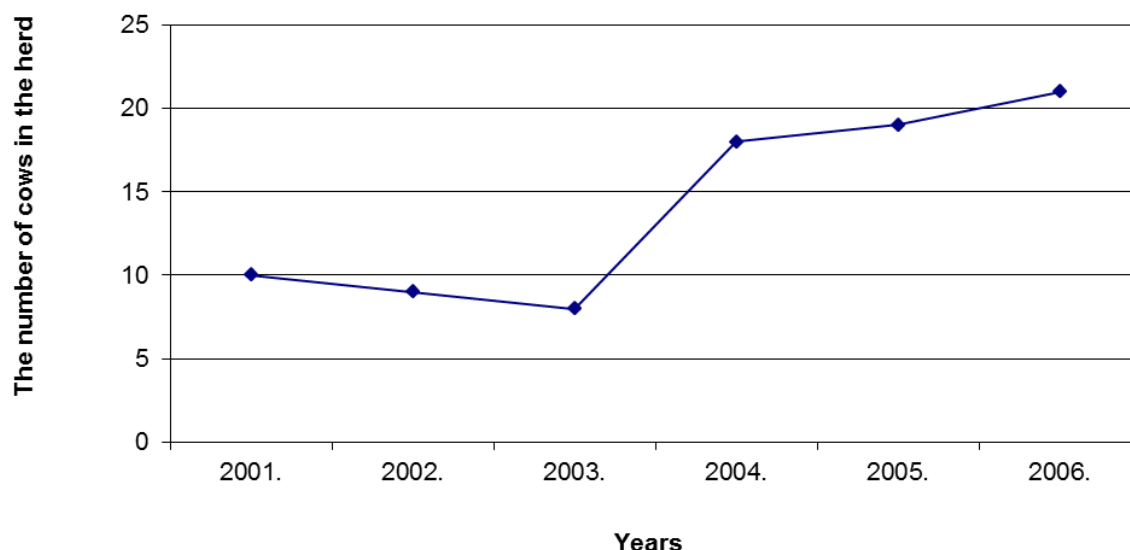


Fig. 1 The number of family farms with a herd size of 11 or more dairy cows in the Primorsko-Goranska County during 2001-2006 period.

In 2006, in the Primorsko-Goranska County there were ten family farms that had 15 or more cows in their herds. Among them, the most frequent breed was the Brown breed of cows (45.1% or 102/226 cows) while the rarest breed was the Simmental breed of cows (7.1% or 16/226 cows) (Table 4).

The fact that the Brown breed of cows is the most frequent breed of cows in this county is consistent with the expert recommendations concerning the best choice of breeds for hilly and mountainous areas such is the area of the Primorsko-Goranska County [15-17]. In this sense, the breed structure of the family farms with 15 or more cows from the Primorsko-Goranska County is one of the fundamentals for the further development of the cattle production in this region [3].

Artificial insemination of breeding cows in the

Primorsko-Goranska County is not at the level of the Croatian average. Unfortunately, there is still fairly large percentage of cows (32.11%) that had been fertilized without any control. This data is quite disturbing, because following such an approach it is almost impossible to conduct any serious selection measures for dairy farms (Table 5).

From a total of 53,427 recorded lactations in the Republic of Croatia in 2006, the Primorsko-Goranska County had 90. For such a small number of recorded lactations it is very difficult to monitor and implement selection measures in a modern dairy. This has also been shown through the milk results for standard lactation in Brown and Holstein breeds of cows, that in Primorsko-Goranska County in 2006 were significantly lower than the national average (where

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Table 4 Breed structure of the family farms with 15 or more cows from the Primorsko-Goranska County.

Year	The number of breeders	The number of cows according to the breeds (%)				The total number of cows
		Simmental breed	Holstein breed	Brown breed	Istrian cattle	
2006	10	16 (7.1)	88 (38.9)	102 (45.1)	20 (8.9)	226

Source: Croatian Livestock Center, 2007.

Table 5 The reproductive status of the breeding cows in the Primorsko-Goranska County and in the Republic of Croatia.

Year	The total number of breeding cows	Fertilized						
		Artificial insemination		Natural mating		Number of bulls with pedigree	Uncontrolled fertilization	
		Number	%	Number	%		Number	%
2005	1,473	1,000	67.89	-	-		473	32.11
The total number in Croatia	268,100	218,031	81.32	5,352	2.00	109	44,717	16.68

Source: Croatian Livestock Center, 2006.

results for Brown breed of cows were 1,157 kg lower than the national average, while the results for Holstein breed of cows were 1,764 kg lower than the national average). The situation is quite similar for the percentage of fat and the percentage of proteins in milk, which observed values in the Primorsko-Goranska County have also been below the average national values of these parameters (Table 6).

The trend of significant decrease in milk production reflects the continuous decline in the Primorsko-Goranska County. The smallest amount of milk in the county was produced in the year 2006. When comparing this amount with the amount of milk produced in 2005, one can say that there is 13.44% decrease in the amount of milk produced in 2006 (Table 7). Although such modest milk production in the Primorsko-Goranska County accounts for only 0.33% of the total national milk production (Table 7), it still manages to meet around 65% of the total county needs for milk. According to the estimates, the needs of the Republic of Croatia for fresh cow milk are about one billion gallons per year [18].

4. Recommendations and Development Opportunities

Based on the results of the present study it is obvious that the Gorski Kotar as a part of the Primorsko-Goranska County has a real technical and

technological prerequisites for intensive cattle production because it is predominantly hilly and mountain area with the prevailing mountain-type of climate where one can observe domination of meadows and pastures with low vegetation that are extremely suitable for cattle breeding. Such natural wealth could be used in a sense of development of organic (ecological) farming with the implementation of an extensive beef and dairy cattle breeding. In this way one can mobilize significantly unused and ecologically 'clean' natural meadows and pastures, and in return one would get environmental friendly (organic) products (milk and meat) as potentially good and valuable export products. By opening the mini-dairies, which would ensure their raw materials from the local county farms, one could produce high-quality native cheeses, cream and milk as a recognizable domestic brand of the Primorsko-Goranska County.

The fragmented agricultural land should be, wherever possible, consolidated and smaller farms should be merged into cooperatives. It is necessary to retain the existing fund of the cattle and then to gradually increase the number of the cattle in the county, through the import of breeding heifers of Brown, Holstein and Simmental breed from the neighboring European countries with highly developed cattle production. It is possible to do that through the use

Table 6 Milk production in standard lactation in the Primorsko-Goranska County and in the Republic of Croatia.

Year	Total recorded lactations	Production in 305-day lactation					
		No.calc. lactation	Milk (kg)	Fat (kg)	Fat (%)	Protein (Kg)	Protein (%)
Simmental breed							
2002	2	2	4,000	161	4.02	120	3
2003							
2004							
2005	8	6	3,784	150	3.97	120	3.18
2006	9	9	3,742	139	3.71	112	3
Total-Croatia	35,233	34,672	4,459	181	4.07	149	3.35
Holstein breed							
2002	10	10	5,371	209	3.9	161	3.01
2003							
2004							
2005	32	21	4,585	180	3.94	141	3.07
2006	45	43	4,397	169	3.86	129	2.95
Total-Croatia	17,217	16,930	6,161	243	3.94	200	3.25
Brown breed							
2002	22	22	4,857	191	3.93	152	3.14
2003							
2004							
2005	24	21	3,955	155	3.92	126	3.2
2006	36	35	3,895	150	3.86	121	3.12
Total-Croatia	977	959	5,052	203	4.03	173	3.43

Source: Croatian Livestock Center, 2007.

Table 7 The amount of the produced cows' milk in the Primorsko-Goranska County (PGC) and in the Republic of Croatia (CRO).

Localit y	The amount of the produced cows' milk (kg)			Decrease in milk amount between the year 2006 and 2005 (%)	% of total CRO milk production in 2004.	% of total CRO milk production in 2005.	% of total CRO milk production in 2006.
	Year 2004	Year 2005	Year 2006				
PGC	2,420,450	2,373,628	2,054,685	-13.44	0.45	0.39	0.33
CRO	532,838,138	605,721,367	631,619,285	-	-	-	-

Source: Croatian Livestock Center, 2007.

of credit lines of the cattle production operative program. The purchase of new breeding heifers of Brown, Holstein and Simmental breed will significantly improve the existing cattle breed structure. In order to have the best possible quality of final products and due to the dislocation of small milk producers it is necessary to invest in the purchase of coolers that should be placed near each small farm.

Within the modernization of cattle production it is necessary to raise the expertise levels of farmers, as a main precondition for the successful implementation of the best technical and technological solutions. This

can be done through the activation of experts from advisory services and faculties who should educate milk producers through the various practical seminars dealing with the most important facts of the modern cattle production.

The fact that the cattle production in the specialized family farms from the Primorsko-Goranska County is increasingly based on the highly productive dairy and combined breeds raises the breeders' need to properly control the amount and nutrient ratio of the cattle meals through the professionally guided feeding protocols. It is crucial because only in such

circumstances one could expect healthy animals with continuously high production through the expected long period of exploitation. Therefore, it is recommended to produce sufficient amounts of fresh or preserved voluminous feeds that accounts for the largest part of the cattle meal. By using these feeds, one can reduce the largest input in the production of milk and meat, and on the other side these feeds have a very favorable physiological and nutritional effect on the production and the general health of the animals.

Using the latest knowledge in the field of animal nutrition, one should conduct a proper choice of feeds and optimally adjust them according to the direction and the intensity of the production. This adjustment can easily be done through the application of the serving norms recommended for the different categories of cattle.

In the area of the Primorsko-Goranska County clover-grass mixtures can have the primary importance in the production of the high-quality forage, both in the fresh and in the preserved state (haylage, hay) during the winter. Within the meals of dairy cows such high-quality forage can be used in quantities up to 30 kg, which in combination with the concentrated part of a meal can satisfy the daily milk production of the 20-25 kg of milk, and daily weight gain in beef categories of over the 1,000 g. Depending on the type of the soil, several mixture prescriptions containing alfalfa and grass can be recommended for this area (Table 8).

In compliance with the Law of Animal Welfare, intensive cattle production should be planned in the technologically acceptable facilities, following the European trend of the free friendly cultivation methods. During the construction of the new facilities it is not necessary to use expensive materials and develop tendency towards the general extravagance of the construction, which is quite often the case in the practice, but one should aim towards its comprehensive functionality, easy and inexpensive maintenance and the greater length of the exploitation in the intended production. Due to its specific geographic location and harsh mountain-type of climate, in the area of Primorsko-Goranska County it is recommended to construct closed stables, in which professionally controlled normatives for internal dimensions should comply with all the technological and technical standards for the dairy or beef cattle breeding.

5. Conclusion

During 2007, 260 families engaged in the cattle production in the Primorsko-Goranska County were surveyed. The survey showed that in the mentioned county there was 0.57% of the total number of the cows in the Republic of Croatia, out of which 81.6% have been located in the family farms that owned from one to three cows. The most frequent breeds of cattle were Brown breed (45.1%) and Holstein breed (38.9%) with the average lactation production (305 days) in 2006 of 3,895 kg of milk for the Brown breed and 4,397 kg of

Table 8 The recommended mixtures of alfalfa and grass for the area of the Primorsko-Goranska County.

The soil of the slightly acid reaction, moderately moist	The soil of the strongly acid reaction, moderately moist
10-15% <i>Festuca pratensis</i> Hudson or <i>Dactylis glomerata</i> L.	70% alfalfa
10-15% <i>Arrhenatherum elatius</i> P. Beauv and	15% <i>Festuca pratensis</i> Hudson and
85-90% alfalfa	15% <i>Dactylis glomerata</i> L.
The soils of the heavy acid reactions and wetter soils	
35% alfalfa	
25% <i>Lotus corniculatus</i> L.	
10% <i>Arrhenatherum elatius</i> P. Beauv	
10% <i>Dactylis glomerata</i> L.	
10% <i>Festuca pratensis</i> Hudson	
10% <i>Phleum pratense</i> L.	

Source: Mijić and Domaćinović, 2007.

milk for the Holstein breed. In the same year the overall production of milk in the Primorsko-Goranska County was 2,054,685 kg, which accounted for only 0.33% of the total milk production in the Republic of Croatia.

In the area of the Primorsko-Goranska County there is a large number of fragmented arable farmland, unsettled infrastructure and predominantly elderly population that do not possess enough expertise needed in the modern cattle production. The mentioned county is rich in unexploited and ecologically "clean" natural meadows and pastures which provide a wide range of options for the organic (ecological) milk and meat production. By adopting the proposed measures and with the help of the state and professionals in the terms of finance, organization and education, much better perspective of this unique Croatian region is realistically attainable and quite possible.

References

- [1] A.W. Speedy, Global production and consumption of animal source foods, *Journal of Nutrition* 133 (2003) 4048S-4053S.
- [2] H. Steinfeld, T. Wassenaar, S. Jutzi, Livestock production systems in developing countries: status, drivers, trends, *Scientific and Technical Review of the Office International des Epizooties* 25 (2006) 505-516.
- [3] P. Mijić, M. Domaćinović, Analysis of the current status and perspectives for the future development of the cattle production in the Primorsko-Goranska County, Croatia, Faculty of Agriculture in Osijek, Osijek, Croatia, 2007. (in Croatian)
- [4] G. Ameni, A. Erkhuna, Bovine tuberculosis on small-scale dairy farms in Adama town, central Ethiopia, and farmer awareness of the disease, *Scientific and Technical Review of the Office International des Epizooties* 26 (2007) 711-719.
- [5] A. Haug, A.T. Hostmark, O.M. Harstad, Bovine milk in human nutrition-a review, *Lipids in Health and Disease* 6 (2007) 6-25.
- [6] O.M. Koçturk, A case study of increasing income of dairy cattle in rural area in western part of Turkey, *Journal of Animal and Veterinary Advances* 8 (2009) 1685-1688.
- [7] P.K. Thornton, Livestock production: recent trends, future prospects, *Philosophical Transactions of the Royal Society B* 365 (2010) 2853-2867.
- [8] Z. Stilinović, *Physiology of Digestion and Absorption in Domestic Animals*, Školska knjiga, Zagreb, Croatia, 1993. (in Croatian)
- [9] E. Bostad, C. Swensson, S. Pinzke, Labour use in Swedish production of red veal, *Journal of International Farm Management* 5 (2010) 1-23.
- [10] V. Demircan, T.B. Koknaroglu, A.R. Aktas, Economic analysis of different dairy farm sizes in Burdur Province in Turkey, *Czech Journal of Animal Science* 51 (2006) 8-17.
- [11] Primorsko-Goranska County, *Regional Operational Plan of the Primorsko-Goranska County 2008-2013*, Primorsko-Goranska County, Rijeka, Croatia, 2008. (in Croatian)
- [12] Đ. Kamenski, The possibilities and the needs for the development of the animal husbandry in Gorski Kotar until the year 2005, Faculty of Economics in Rijeka, Rijeka, Croatia, 1996. (in Croatian)
- [13] Croatian Livestock Center: *Annual Reports 2000-2007*, Croatian Livestock Center, Zagreb, Croatia, 2001-2008. (in Croatian)
- [14] Vet-nova Ltd. Vrbovsko, Veterinary clinic Delnice Ltd. Delnice, Veterinary clinic Vrbovsko Ltd. Vrbovsko. Reports of the veterinary stations in Primorsko-Goranska County regarding the number of cattle in the County 2001-2008. Veterinary stations in Primorsko-Goranska County, Croatia, 2001-2008. (in Croatian)
- [15] I. Casaus, A. Sanz, D. Villalba, R. Ferrer, R. Revilla, Factors affecting animal performance during the grazing season in a mountain cattle production system, *Journal of Animal Science* 80 (2002) 1638-1651.
- [16] C. Vieira, A. Cerdano, E. Serrano, A.R. Mantecón, Adult steers for beef production: breed effect on animal performance, retail yield and carcass quality, *Czech Journal of Animal Science* 51 (2006) 467-474.
- [17] C. Dalvit, R. Dal Zotto, M. De Marchi, M. Cassandro, Genetic and productive characterization of the Burlina cattle breed, *Agriculture* 13 (2007) 124-127.
- [18] P. Mijić, I. Knežević, A new method of the evaluation of cow's milk in the Republic of Croatia, *Agriculture* 9 (2003) 52-55. (in Croatian)