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ASPECTS OF DAIRY CATTLE BREEDING AND IMPROVEMENT IN ROMANIA

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Abstract

Dairy cattle sector in many countries is still in focus for improving both livestock and milk production, as a necessity for increasing food demand. To achieve progress in this area, the specific conditions of each country should be considered for designing adequate strategies and programmes for improving dairy cattle breeding. The present paper shows aspects and progress related to dairy cattle effective size, milk production and advances in genomic technology use in Romania. Dairy cattle breeding and improving perspectives are provided too.

Key words: dairy cattle, milk production, animal breeding, performance control, genomic selection.

INTRODUCTION

The worldwide human population increasing number is reflected in higher necessities for food, mainly meat and diary products. Animal production yield should stand on this trend. Moreover, dairy products health and nutritional benefits imply human health issue aspects. Milk and dairy products concur to meet human needs for high-quality protein, calcium, magnesium, selenium, riboflavin, vitamin B12, and pantothenic acid (vitamin B5) (Tricarico et al. 2020).

European dairy industry directions rely on influencing factors such as growing human population, facilitated access and availability of dairy farm animals, particularly cattle and specific dairy farming climate, so that it shows for cca 22% of global milk production (EMR, 2020).

Milk industry growth is showing output increameant by 0.7% in 2018 compared to the previously year concur to dairy market of Europe, to point 226.7 million tones (EMR, 2020).

Highly specialized breeds show production traits improvoved by genetic or animal breeding means, so that animal improvement programmes need to be adapted to the current progress in various fields (Woelders et. al., 2006). Genetic make-up in dairy cattle shows a great role in milk yield and composition variation range (Kiplagat et al., 2012).

Also, sustainable intensification is a practical way to apply for improving milk production and consumption sustainability in many

countries, by means of animal genetics potential improvement, balanced feeding and local resources availability for feeding (Tricarico et al. 2020).

Dairy cattle populations and cattle breeds characterisation is very important in implementing suitable livestock breeding and improvement programmes (Hoffmann et. al., 2010). Phenotypes and genotype information related to various functional traits in cattle conduct to an adequate characterization of population and individuals and futher contributing to breeding and improvement programmes set up (FAO, 2011). Such strategies can be used and adapted for dairy cattle breeding in our country.

DNA data based genomic technologies enable large scale predictions of dairy cattle performance potential, which can be used for enhancing milk productivity, genetic improvement of cattle livestock next to heath, welfare and lowering the value of generation interval, all in an approriate herd management system (Hart, 2017).

Genomic selection enable earlier identification of elite individuals of a herd and higher efficiency in breeding pair sellection by means of breeding indices contributing to estimate breeding values next to multiple traits information in order to provide an efficient deccision making and breeding management plan based on the selected and ranked reproducers furfilling best selection criteria (Hart, 2017).

Considering that the breeding objective for dairy cattle is still a concern and there is no single objective wich can be used as best fitting for all cattle populations (Cole, VanRaden, 2017), different countries should define and addapt in this regard appropriate breeding solutions for an efficient dairy cattle management.

The present paper provides an overview related dairy cattle breeding including genomic selection, showing aspects and priorities to be considered for cattle breeding in Romania too. New strategies are still demanding for livestock improvement addapted to our country specific conditions in dairy cattle.

MATERIAL AND METHOD

The present study analyzes dairy cattle data recorded in Romania to draw up an overview and new perspectives for breeding and improvement purposes. It include data collected from dairy cattle farm holding from the field and reported by all County Animal Husbandry Offices, centralized by The National Agency for Animal Husbandry „Prof. dr. G. K. Constantinescu".

Data presented referred to breed category at national level related to the effective number of cattle dynamics and also under performance control for milk production. Reports of The National Agency for Animal

Husbandry „Prof. dr. G. K. Constantinescu" and of the Ministry of Agriculture and Rural Development were used to generate the situation of dairy cattle breeding at national level.

The paper is an assessment of the actual status in dairy cattle breeding sector in Romania, carried out to point some relevant aspects to consider for dairy cattle development and management, considering other European achievements in this area.

RESULTS AND DISCUSSION

DAIRY CATTLE OVERVIEW IN ROMANIA.

The Ministry of Agriculture and Rural Development, throughout its institutions and regional departments, in agreement to other current European regulations and also to national specific programmes, aim to inventory and stimulate breeding and improvement of dairy cattle populations. The National Agency for Animal Husbandry „Prof. dr. G. K. Constantinescu" is the main authority of the Ministry of Agriculture and Rural Development enrolled in genetic animal resources improvement, by implementing specific feasible strategies and programmes.

Cattle population has been on a decline from 2.9 million heads in at the end of 2006 to 1.9 million heads at the end if 2011. Milk production was in the same line with cattle effective number, shoing a decline from 5.45 billion liters in 2007 to 4.37 billion liters in 2011 (USDA, 2013).

Table 1 shows the dynamics of total bovine effective number and milk production during 2001-2013 in Romania. By analyzing this data extending over a thirteen years period (MADR, 2020), it reflects the necessity to improve bovine sector both related to livestock effective size and milk production; specific climate and conditions of various regions should be considered in specific breeding and improvement programmes.

Table 1

Dymanics of total effective and milk production in bovine in Romania during 2001-2013

Year	Total effective no. (thousands heads)	Average milk production (l/head)
2001	2.800	3.014
2002	2.878	3.133
2003	2.897	3.263
2004	2.801	3.493
2005	2.862	3.510
2006	2.934	3.688

2007	2.819	3.564
2008	2.684	3.653
2009	2.512	3.807
2010	1.985	2.595
2011	2.130	3.529
2012	2.164	3.417
2013	2.197	3.385

*data acording to the Technical report - operative on bovine herds at 30 June 2017 availabale of the Ministry of Agriculture and Rural Development (MADR, 2020)

In the last five years we can ascertain a maintain and a slight increase related to bovine effective size under performance control in Romania, proving a progress made in dairy cattle breeding sector, even if the value of 296655 recorded in 2020 (ANZ, 2020) still need to be raised up.

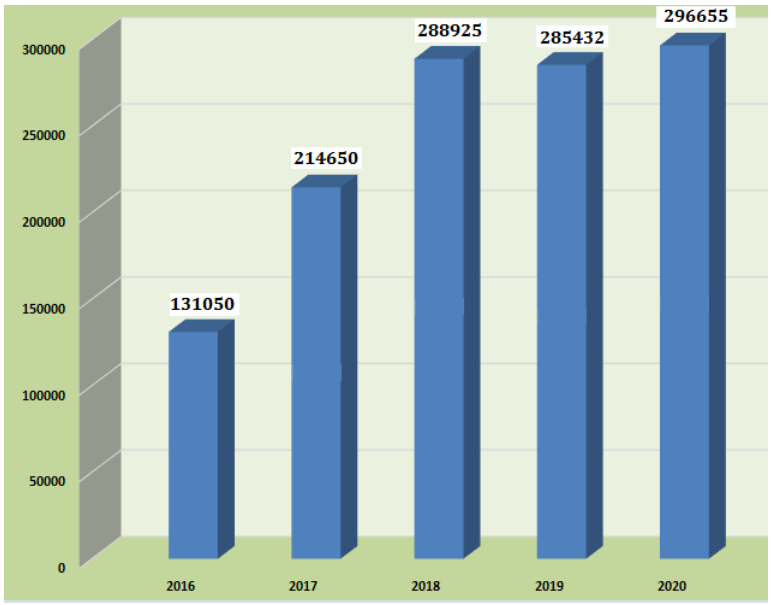

Fig. 1 Dynamics of bovine under performances control in Romania during 2016-2020 (including buffaloes)

**data acording to the Technical bulletin report in bovine species at 31.03.2020 for the first quarter of 2016-2020, of The National Agency of Animal Husbandry(ANZ, 2020)*

Values presented in table 2 are showing that Romanian Spotted Cattle – Simmental is the main cattle breed in our country for milk production and that a relevant progress was made regarding the effective number included in performance control for milk production. The other breeds under performance control are important too.

Table 2

Effectives of dairy cattle under performance control for milk production in Romania

Breed	Breed symbol	No. of bovine milk breed under performance control for milk production
Romanian Black Spotted Cattle - Holstein-Friesian	B.N.R.-H.F.	11.5173
Romanian Spotted Cattle – Simmental	B.R.-SIM.	153.308
Montbeliard	M.O.	3.211
Brown Cattle	B.	15.907
Pinzgau	P.Z.	3.207
TOTAL		290.806

**data acording to the Technical bulletin report in bovine species at 31.03.2020 of The National Agency of Animal Husbandry (ANZ, 2020)*

Dairy cattle populations from other countries (Boichrad et al., 2016; Meuwissen et. al., 2019) and Romania are valuable livestock, requiring a special interest for farming and animal improvement, but also for genetic conservation.

The valuable characteristics of Romanian breeds, like resistance and excellent adaptability to specific housing conditions, demand strategies for adequate breeding and improving systems throughout specific programmes. The financial support stimulated farmers in dairy cattle sector and should be further considered to ensure future progress.

DAIRY CATTLE OVERVIEW IN OTHER COUNTRIES. TRENDS AND PERSPECTIVES.

Genomic selection shows a wide use in dairy cattle industry and also for dairy cattle livestock improvement (Yadav et al., 2017). In developed countries the use of genomic selection resulted in increasead rates of genetic gains and number of genomic assessed young bulls for dairy breeding (Mrode et. al., 2019). Other countries which are still in development need to find out and implement strategies for specific small holder farm systems with small livestock populations, collection and data recording related pedigree, genetic evaluation, next to adequate breeding structures, programmes and breed associations or other type of organizations (Kosgey, Okeyo, 2007, Carvalheiro, 2014, Brown et al., 2016, Silva et al., 2016, Mrode et. al., 2019). Genomic selection is widely used to improve specific traits in dairy cattle associated with production yield and quality, animal heath, udder health and conformation of indiviuals.

The first place related genomic selection use in dairy cattle over the world is assigned to Australia, followed by USA, Canada, China and other

European countries (Yadav et al., 2017). In this context, worldwide the Eurogenomics harboring the Netherlands, Germany, France, the Nordic countries, Spain, and Poland; The North American, harboring USA, Canada, Italy) and Great Britain; and a "rest of the world" consortiums were settled for ensuring a collaboration for enhancing the use of genomic selection in dairy cattle (Yadav et al., 2017).

Table 3

Number of dairy cattle breeds genotyped for genomic prediction purposes in USA and France

Country	Total no. of dairy cattle genotyped	Breed	No. of dairy cattle genotyped
USA	2,000,000	Holstein	934,780
		Jersey	120,439
		Brown Swiss	19,588
		Ayrshire	4,767
France	360,000	-	-

**data according to Wiggans, personal communication referred in Meuwissen et. al., 2019 and Boichrad et al., 2016.*

Heifer calves are rather prefered for genotyping in many countries, even if young bull calves genotyping is showing increased genetic gaing. Also, genotyping is enough cheap to be applied for choosing heifer calves and bulls to be retained and furhter used for mating in dairy herds (Pryce, Hayes 2012; Hart, 2017).

Nowadys DNA chips for genotyping over 54,000 single nucleotide polymorphisms (SNP), next to mixed HD and LD high accuracy genotyping chips are available and used in many approaches (Mrode et. al., 2019).

Lately, following the example of other countries, specific programmes and stategies were made and implemented in Romania aiding to start up genomic assement in our country too, so that genomic data concur for estimating acurate breeding indices for dairy cattle breeding. However, progress is still needed to extent the use and implement such technologies in dairy cattle in our country.

CONCLUSIONS

In our country, specifically in dairy cattle sector, following the example of other countries and considering our specific conditions, some progress was recorded, but we still need to make efforts to find out solutions for efficient and satisfactory performance and pedigree recording also by using genomic evaluation, in breeding and improvement programmes.

Market growth for dairy products and the increasing demand for traditional milk products come to support the development of dairy cattle sector in Romania towards dairy cattle breeding and farming.

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