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Biological Efficient Dairy Cows in Grazing Systems

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Abstract

The availability of indicators that would help to avoid the overvaluation of one of the characteristics involved in the assessment of a good dairy cow over others that are important as well would also allow identifying the most adapted biotypes to the different environments existing at the place of the evaluation This article aims to discuss the need to use several productive and reproductive indicators when measuring the biological efficiency of a dairy cow in grazing systems. It was used retrospective data corresponding to the lactations of 300 primiparous and multiparous cows of the Holstein breed - American-Canadian biotype, along with records of their entire productive life, from their incorporation into the system until their sale or death. The animals were divided into two categories: pure cows (PC, n = 120) and cows in the breeding record (CBR, n = 180). It is observed that there are two different strategies in some variables that achieve the same biological efficiency, where the CBRs live longer, produce less and have smaller first delivery intervals. There are no significant differences in the milk index but in the fat index. It is concluded that the greater individual production does not guarantee a greater production at the end of the productive life of the cow, nor a greater productive efficiency when considering the time involved to produce a certain amount of liters. In grazing systems, the contribution of other variables included in the milk index - longevity, rearing efficiency and reproductive behavior - should be considered while searching for an aggregate indicator that tends to achieve greater productive efficiency.

Keywords: Dairy cows; Indicators; Efficiency; Grazing Systems

Introduction

The notable increase in the productive performance and size of these modern high-production cows has been made possible by the repeated and asymmetric use of a selection based exclusively on milk production. Although this process has been accompanied by changes in the nutritional area, these have not been sufficient to prevent vital function deterioration such as reproduction and survival. It becomes increasingly difficult to provide a non-limiting environment, being almost impossible during the initial phase of lactation [1]. The efficiency of a productive system is one of the most important factors from an economic and social point of view. And the most used modality to evaluate it is assessing indicators of biological and economic productivity. However, when producing in conditions where resources are scarce and expensive (grazing systems), not only products or outputs but also inputs should be considered when evaluating efficiency. In the particular case of high production dairy cows, the traits associated with biological efficiency or fitness (reproduction and longevity) have deteriorated despite their importance for the viability of the company [2,3].

Suggest that the sustainability of dairy systems depends, to a large extent, on the availability of a biotype adapted to the handling conditions and that it is capable of efficiently transforming food into good quality milk. This biotype must have a good reproductive performance, being the main goal of the system to maximize an efficient productive response per unit area [4]. The search for the maximization of the value of a single productive variable disregarding the remaining variables can alter the equilibrium and deteriorate the overall efficiency of productive systems [5]. Every open system processes the inputs received and generates outputs. In productive systems, the concept of efficiency refers to the most appropriate way to use resources with existing technology and products.

As a result of this positioning, it is considered that a production process is efficient if the maximum output is obtained with the lowest possible inputs [6]. In dairy production, the expression "maximize outputs" may have different connotations: maximize individual production during lactation or maximize production considering the entire life of the cow, reproductive success should be considered in the analysis. The amount of milk produced by a cow can be considered the most important indicator in intensive systems, even though, this indicator alone is not the most appropriate to make operational a complex variable like

productive efficiency, when the goal is to make the most out of grazing systems. In these cases, it should be complemented, or even replaced, by other more aggregated indicators that constitute alternatives as a more comprehensive measure to assess the behavior of production in those systems in which pasture is the basic component of the diet.

The availability of indicators of this nature would help to avoid the overvaluation of one of the characteristics involved in the assessment of a good dairy cow over others that are important as well. It would also allow identifying the most adapted biotypes to the different environments existing at the place of the evaluation [7]. This article aims to discuss the need to use several productive and reproductive indicators when measuring the biological efficiency of a dairy cow in grazing systems.

What Is Efficiency

Efficiency is the relationship between an income and an expense, between an input and an output or between a resource and a product [8]. When measuring efficiency, it is necessary to specify exactly which elements are used to evaluate the result through a relation of its values. And to define the units used to measure the values of these elements. The concept of efficiency refers to a relationship between elements and that the circumstances in which the relationship is established have a high specificity. As a consequence, the term itself is very relative, and any value that can be considered as good or low is even more so [8].

How to Measure Efficiency

The advantages of grazing systems are sought within the framework of this approach, in which the cow is provided directly with the necessary input to meet its food requirements, without the need for transportation, processing or distribution of rations [9]. Although it is the most widespread modality, the amount of milk produced by a cow does not represent the most appropriate indicator to make operational a complex variable as productive efficiency. As such, it should be complemented or replaced by other more aggregated indicators creating alternatives for a more comprehensive production measurement to assess their performance in grazing systems. The availability of indicators of this nature would help to avoid the overvaluation of one of the characteristics involved in the assessment of a good dairy cow over others that are important as well. It would also allow identifying the most adapted biotypes to the different environments existing at the place of the evaluation [10].

It was used retrospective data corresponding to the lactations of 300 primiparous and multiparous cows of the Holstein breed - American-Canadian biotype, along with records of their entire productive life, from their incorporation into the system until their sale or death. The animals were divided into two categories: pure cows (PC, n = 120) and cows in the breeding record (CBR, n = 180). The existence of significant differences in the assessed time between groups was studied by applying variance analysis to a classification criterion. JMP 5.0 for Windows (JMP®, SAS Institute, 2003) was used for statistical analysis Table 1.

Table 1: Averages and standard errors of the analyzed variables. Median and range for np. In cows of more than 30,000 liters in their productive life.

	PC	CBR	Meaning
NP	5 (3-9)	6 (4-10)	*
EPP (days)	929±31	974±36	
IL (liters)	11.7±0.3	11.0±0.3	
IG (kg)	0.392±0.01	0.361±0.01	*
PL305 (liters)	6516±134	5933±119	*
LT (liters)	39653±1490	41767±1827	
GB (kg)	1328±53	1285±83	
IPP (days)	503±12	452±7	*
Note: * indicates significant differences p≤0.05			
Pure cows (PC, n = 120) and cows with breeding record (CBR, n = 180)			

The following variables were analyzed:

a. Number of births

b. Milk production (PL by its initials in Spanish): liters produced per cow adjusted to 305 days

c. Age at first birth (PPE by its initials in Spanish) in days

d. Total Butyrose Fat production in kg: GB, ∑GBi where "i" are the kilograms produced in the j-th lactation

e. Total milk production (liters) = pl, ∑pli, where "i" are the liters produced in the j-th lactation

f. Milk index (milk production per day of life) in liters = IL, by its initials in Spanish, (il: LT / e e: age in days at the end of the last lactation): il = pl / age [11]

g. Fat Index (production of Butyrose fat per day of life) in kg = IG by its initials in Spanish, (ig: Total GB / e e: age in days at the end of the last lactation): ig = kg GB / age [10]

h. First delivery interval - delivery in days (IPP by its initials in Spanish): ∑ipp, where "i" are the days between deliveries / number of deliveries [12].

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Pure cows are pregnant at an age closer to optimal, showing a difference of 60 days with cows in the breeding record. They produce in their five lactations 6516 liters on average against the 5933 liters in six lactations of cows in the breeding record, achieving a total of 41767 liters in its life against the 39653 liters of pure cows. Additionally, the pure cow takes for each new delivery 51 days (total 306 days (6 deliveries * 51 days)) more than the cow in the breeding record. In conclusion, the advantage in days they have because of its first birth during its life is lost in a single IPP, as well as producing almost for a year in the less efficient part of the lactation curve.

It is observed that there are two different strategies in some variables that achieve the same biological efficiency, where the CBRs live longer, produce less and have smaller IPP. There are no significant differences in the milk index but in the fat index. Although considering each variable separately is relevant, when reference values are available and allow these cows to be positioned in particular in the framework for milk production of the Holstein breed, the characterization of the efficiency of a productive system requires a joint analysis of all of them instead of individual consideration [5].

Conclusion

It is concluded that the greater individual production does not guarantee a greater production at the end of the productive life of the cow (LT) nor a greater productive efficiency when considering the time involved to produce a certain amount of liters (il). In grazing systems, the contribution of other variables included in the milk index - longevity, rearing efficiency and reproductive behavior - should be considered while searching for an aggregate indicator that tends to achieve greater productive efficiency.

References

1. Camargo O (2012) La vaca lechera entre la eficiencia económica y la ineficiencia biológica. Arch Zootec 61: 13-29.
2. Rauw WM, Kanis E, Noordhuizen EN, Grommers FJ (1998) Undesirable side effects of selection for high production efficiency in farm animals: a review. Livest Prod Sci 56: 15-33.
3. Dillon P, Berry D, Evans R, Buckley F, Horan B, et al. (2006) Consequences of genetics selection for increased milk production in European seasonal pasture-based systems of milk production. Livestock Science 99: 141-158.
4. González H, Magofke J, Mella C (2005) Productivity, consume and biological efficiency in cows Frisón New Zealand and F1 (Jersey-Frisón New Zealand) delivered in late winter in Region X, Chile. Veterinary medicine 37(1): 37-47.
5. Rabasa SL (1986) Relative importance of the components of production. Creole cattle, Advisory Subcommittee of the Argentine Subtropical Area of the Secretariat of Science and Technology and Graphic Guidance Editor pp 151-163.
6. Coelli TJ, Rao DSP, Battese GE (1998) An Introduction to Efficiency and Productivity Analysis. In: Kluwer Academic Publishers Boston, pp 345.
7. Marini PR, Masso RJ (2017) Historical Evolution of Productive Indicators in Dairy Cows in Grazing Systems. La Granja: Life Sciences Magazine 28(2): 103-115.
8. Wadsworth J (1997) Analysis of Animal Production Systems. The Basic Tools. (FAO Study Animal Production and Health 140/2).
9. Molinuevo HA (2005) Selection of dairy cattle for the grazing system. In: Molinuevo HA (Ed.). Bovine genetics and grazing production. INTA, Argentina, pp 283-315.
10. Marini PR, Castro R, Frana E, Masso RJ (2017) Multivariate Characterization of Biological Efficiency in Dairy Cows in Grazing Systems. Sustainable Agriculture Research 6(4): 83.
11. Marini PR, Oyarzabal MI (2002) Production patterns in dairy cows. 1 Production components and their characteristics according to production level. Rev Arg Prod Anim 22(1): 29-46.
12. Marini PR, Oyarzabal MI (2002) Production patterns in dairy cows. 2 Production components and their characteristics according to production level. Rev Arg Prod Anim 22(1): 47-60.

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