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Annual Behavior of Milk Production Bio economic Indicators in Dairies of *Ruta Invasora* Cattle Raising Enterprise, Ciego de Ávila. II. Case Study Dairy

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ABSTRACT

Previous research of ten dairies at Ruta Invasora Cattle Raising Enterprise, in Ciego de Ávila, about the annual behavior of bio economic indicators of milk production singled out Dairy No. 1 as the most outstanding. It was then used as a comparison model in a case study, with the remaining nine units, based on the average reproductive, productive and economic indicators for the five-year period studied. Decomposition of seasonal time series to determine birth behavior was performed, using a multiplication model, considering 10 % above or below 100 %. Dairy No. 1 had birth peaks in the April-July period, with the highest values in May, which seemed to have determined a better behavior, especially in its best year, in relation with reproductive efficiency (78 % birth rate); productive, (1 393 kg/ha); and economic (0.86 CUP/kg of milk), in comparison with the rest of the units and the means from the years studied. These results corroborate the feasibility of improving milk production efficiency when the birth peaks occur within the rainy season.

Key Words: *seasonability, births, milk production, efficiency*

INTRODUCTION

A great deal of factors governs dairy production, whose complexity is high (Holmes, 2001). Individual yields per area and annual total may be affected due to a wide range of handling aspects, including annual calving strategies, which can be anarchic or with poor birth control; or be goal-oriented, or time set (Guevara *et al.*, 2007a).

By reorienting the herd´s reproductive strategy higher bio-economic efficiency can be achieved, and it has been corroborated throughout different studies on isolated herds in the country (Rodríguez Saavedra, 2003) using the high yields and nutritional value of tropical pastures to convert them into animal products in the least expensive way (Senra, 2005).

For each calving occurring in the most efficient period, an extra milk kg will be produced every year (Peña *et al.*, 2012). Any increases in production without increases in supplies is noteworthy, taking into account the price of powder milk in the world market (Guevara *et al.*, 2010; Loyola *et al.*, 2010 and Soto *et al.*, 2010).

Accordingly, milk production gains critical importance in grazing systems, where efficiency of forage resources is vital, especially if concentrates and other supplements to increase the production potential of the system and the physical conditions of the grassland are used, making them much costlier (Guevara *et al*. 2003; Mena, 2014).

The purpose of this research was to assess the effect of birth seasonability on the bio-productive and economic behaviors in a case study dairy.

MATERIALS AND METHODS

A previous five-year study (2008-2012) conducted at *Ruta Invasora* Cattle Raising Enterprise, in the province of Ciego de Ávila, focused on the behavior of bio-economic indicators. Of the ten dairies in the study, No. 1 showed the best results, which were used for comparison in a case study.

The dairy had crossbred animals (Holstein x Zebu), in 122 ha of grazing land and a mean of 138 cattle heads (UGM) (PV: 400 kg/UGM) in the period studied (1.1 UGM/ha). The availability of dry matter (MS) was 10.4 kg MS/cow/day, higher than the mean of the remaining units (8.4 kg MS/cow/day). Forage balance was negative in both seasons (- 7 t MS in the rainy season, and – 98 t MS in the dry season). Average annual Norgold[@] consumption was 5.2 t MS, similar to the total mean of all the units (5.1 t MS). The calves were subjected to restricted breastfeeding in rotational grazing.

To determine the birth behavior in the case study, decomposition of seasonal time series was

used, through a multiplication model, considering 10 % above or below 100 % (SPSS, 2006).

Dairy No. 1 was compared with all the other nine units assessed, using the following indicators (five-year study average) as reference: cow average reproduction (cab); total days of lactation (d); calving/calving interval (d); cow average (cab); natality (%); milk production/ha/year; milk production kg/ha/year; milk production kg/work unit (UT); forage t/cow/year; produced milk t - t forage consumed relation; and cost of produced milk kg.

RESULTS AND DISCUSSION

Birth seasonal behavior in the case study dairy (see figure), shows peaks in the April-July period, especially in May, which is similar to reports by several authors (Rath, 2003; Holmes, 2006; Guevara *et al*., 2007b and Soto, 2010).

For Cuban climatic conditions it is critical to adjust the requirements for improved grassland possibilities. Positive dividends are reported in Cuba, in studies made in production conditions where high percentages of births in the rainy months have occurred spontaneously in most of the cases, as reported by García López *et al*. (2005), Soto (2010) and Mena (2014), for different scenarios, usually characterized by low costs, cost-effectiveness, optimum grassland use, and reduction of extra feedstuffs in the system. Furthermore, appropriate economic performance has corroborated our results, making the seasonal proposal for milk production a solid alternative for dairies.

Table 1 shows the best behavior of unit No. 1, which is above the mean of all dairies assessed, and the five-year period mean of dairy No. 1, with a better reproductive behavior in relation to natality and calving-calving interval.

The behavior of natality has resulted in interval shortening, and it is an indicator that should be taken into account to determine the reproductive efficiency of the herd (Brito *et al.*, 2001).

In fact, estrus detection efficiency is related with the inter-calving period (IPP), the one most commonly used, and may be considered as an indicator for cow fertility due to its increased correlation with several direct fertility measures implemented (Pryce *et al.*, 1998), regarding two elements: calving-gestation interval (IPG), or servicing period (PS), the key element in IPP lasting. The inter-calving period, the number of services made to achieve gestation, and the gestation rate, are related to embryo mortality, and the chance that cows have normal genital tracts, along with normal ovarian activity after calving (Plaizier and King, 1996).

All these reports have been corroborated by Bertot (2007) in facilities of the *Dairy Basin*, using databases collected for 22 years (1984-2006), and Loyola (2010), in studies on calving intensification, both in the province of Camagüey.

During lactation, the values were also positive for the case study dairy and its best performance year, indicating that the occurrence of birth peaks in the rainy season favors longer lactation periods with fewer restrictions and better use of pasture. Guevara (2004) found very significant and better responses, when calving was mainly concentrated in the early rainy season, with young cows, in cooperatives in Ciego de Ávila, with more than 230 days of lactation in grazing conditions. Soto (2010) reported an average of 240 days of lactation in dairies with more than 70 % births produced in the April-August period.

As expected, these results effected on milk production efficiency for the case study (Table 2).

Similar results to Lamela *et al*. (1998) were achieved for individual production, in cows grazing in clusters of graminaceae, crawling legumes and trees that reached 5.7-6.6 kg/cow/day, which tell of the importance of including these technologies in tropical grazing dairy systems, not only for yield increases, but also because of greater nutrient contribution from milk. In addition, it also proves that it is possible to obtain better results by making appropriate adjustments in zoo technical handling of the herd, without overloading the production costs. Likewise, García-Trujillo (1983) referred to yields of 6-7 kg/cow/day in native and improved (non-fertilized) graminaceae pastures.

According to the literature reviewed (Stobbs, 1976) on the possibility of 1 000-2 500 kg/ha/year in the tropical areas, in dairy systems with native grass, or improved fertilizer-free graminaceae (loads of 0.8-1.5 cows/ha); that possibility is evident in the case study dairy, where the birth peak matched the season with the highest forage biomass availability. Production per UT is also an important indicator. Mc Meekan (1963) calls the attention on city migration as a sensible phenomenon affecting dairy systems recently reported

by Baisre (2008), since the production indexes per worker are critical to improve economic efficiency, representing more income and advantages for the dairy business, and making producers more inclined to the occupation (Senra, 2005; Guevara *et al*., 2007a).

As Table 3 shows, dairy No. 1 was more efficient, considering the behavior of variable income-expenses, higher than the mean values of the rest of dairies assessed. As a result, the production costs for a kg of milk were the lowest.

In that particular case, the production cost from the best year is close to reports by Soto (2010) in calving concentration studies in the April-August period, with reports of 0.79 CUP/kg of milk for more than 70 % of births in the period, inferior to reports by Mena (2014) in similar studies conducted in state-owned dairies in the province of Ciego de Avila (1.09 CUP/kg of milk).

Anyhow, a decline in production costs, especially in imports, represents an essential element to achieve a higher stage in the system´s efficiency and food self-sufficiency of the country.

CONCLUSIONS

The case study proved that the occurrence of the birth peak in the rainy season favors higher efficiency of bio-productive and economic indicators of low-input dairy systems, in the province of Ciego de Ávila.

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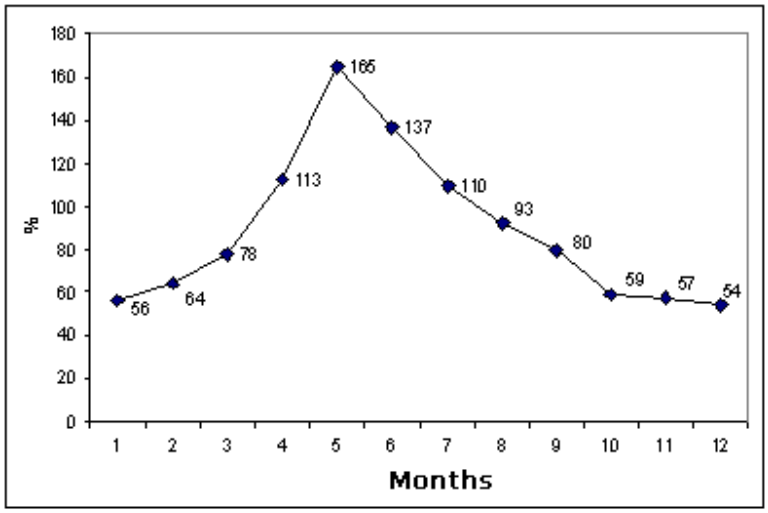

Fig. 1. Seasonal behavior in dairy No. 1 (case study)

Table 1. Seasonal behavior of reproductive indicators for the case study

Variables	Dairy mean values	Best unit Dairy No. 1	Best year Dairy No. 1	Difference dairy vs best year
Cow average reproduction (cab)	136	143	148	+12
Cow average (cab)	130	135	140	+10
Natality (%)	69	72	78	+9
Calving/calving interval (d)	361	356	349	-12
Total lactation days(d)	263	269	271	+8

Table 2. Behavior of milk production efficiency (kg) for the case study

Variables	Dairy mean values	Best unit Dairy No. 1	Best year Dairy No. 1	Difference dairy vs best year
Total production	174 314	276 677	295 812	+121 498
Production/ha	1 050	1 183	1 393	+343
Production/cow	3.9	5.1	6.2	+2.3
Production/U. work	1 786	2 186	2 576	+793

Table 3. Behavior of economic indicators for the case study (CUP)

Variables	Dairy mean values	Best unit Dairy No. 1	Best year Dairy No. 1	Difference dairy vs best year
Total expenses	84 878.54	113 466.82	115 962.32	+31 083.78
Expenses/ha	673.13	816.43	898.53	+225.40
Total income	110 694.42	182 702.87	185 641.13	+74 946.71
income/milk	101 110.30	149 737.65	181 072.13	+79 961.83
Income/ha	2 786.10	2 986.47	3 182.25	+396.15
Cost milk kg	0.94	0.91	0.86	-0.08
Income-expenses	24 798.88	85 732.05	88 196.81	+63 397.93