ID # 22-46

ANALYSIS OF SOME FARM DRIVING VARIABLES AND ITS RELATION WITH MILK PRODUCTION IN A PASTORAL DAIRY FARM OF BUENOS AIRES, ARGENTINA.

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Abstract

The quantity of milksolids produced determines a dairy farm income and contributes to its profit. Total pasture production, forage quality and herd consumption are factors to be managed in this production system. The outcomes of two years were analyzed. Primary production showed its dependence on climatic conditions and use of technological inputs. Forage quality was promoted through interseeding legumes, applying fertilizer and maintaining the pasture young and leafy. Total forage removed by the herd was similar in both years although pasture production decreased. It was possible to cope with seasonal variations in forage production, by varying the grazing pressure and this allowed an increase in daily herd milk production and annual fat production per hectare. Changes in milk production per cow was not related to changes in stocking rate, however, although the nutritive value of the pasture was improved during the second period, daily milk production and forage consumption per animal decreased when grazing pressure increased. The relation between total milk produced and total dry matter consumed in both periods were similar.

Keywords: Dairy system production, stocking rate, pasture management.

Introduction

In a pastoral dairy farm the annual growth of the pastures and the proportion of forage that is consumed by the herd defines the system of milk production (Penno J. and Kolver E., 1998). Due to this, stocking rate is considered as one of the factors of greater impact on pastoral systems (Holmes C.W. and Wilson, G.F., 1984). Although animal consumption increases when management allow them to select a more digestible diet (Wales W.J. et al., 1999) that implies an important forage waste. It is possible to optimize herd production per area, by varying grazing pressure but to avoid declines in production per animal, it is also important the amount of forage mass offered and its nutritive value. If we considered that forage from grazed pastures is the cheapest way to feed the herd, farm profit could be improved by increasing the efficiency of utilization of this resource, and as consequence, stocking rate could be defined as a function of the offered green pasture mass. The objective of this study was to provide to farmers some alternatives to take better decisions on pastoral dairy farming in Argentina. It was analyzed some pastures and system variables of a commercial farm.

Material and Methods

This investigation was conducted in a commercial farm located at Chivilcoy, in the central area of Buenos Aires, Argentina (lat.35º S – long.60º W). On January 1997 the milking herd had 160 milking cows in 215 ha. These pastures had very low density of poor nutritive grasses, almost no legumes and a high cover of summer grasses. To increase forage production and its nutritive value, actions like intense defoliation were applied to remove summer forage and promote winter annual forrages, interseeding with legumes and winter perennial grasses and fertilization were applied. The area was directly grazed by the herd or harvested as hay, for use especially during the winter. In both years forty percent of the herd calved in autumn and sixty percent in spring. Day to day decisions about the opportunity and intensity of grazing were determined using a capacitance pasture meter. This instrument was calibrated using a double sampling technique (r^2=0,63 to 0,86, for different situations). Daily, the herd was moved to a new pasture two times, after each milking.

Data were recorded, during two periods, with different precipitation condition: **I**) from June 1997 to May 1998 (1303 mm), **II**) from June 1998 to May 1999 (720 mm). Pasture production and number of milking cows varied throughout both periods, resulting in monthly fluctuations in the area and in the stocking rate. Pasture mass was evaluated weekly, in representative sites of different paddocks, cutting the samples to ground level with electric scissors at 15 sites of 0.09 m^2. All the samples were taken to the laboratory, separated in green and dead material and dried in a stove at 65ºC. Each component was analyzed for crude protein and metabolizable energy. The sum of the positive increases of each component was used to calculate the total annual pasture production (APP) and the difference between observations to calculate pasture growth rate expressed monthly (PGR). Every week the green pasture mass offered at the beginning of each grazing (GMO) and the green residual pasture mass at the end of each grazing period (GMR) were evaluated. Data from GMO and GMR were used to estimate herd consumption (AHC), daily average cow consumption (DAC) and the proportion of the forage disappeared during the grazing period (U). Milk production per day (HP) and per cow (AP), milk fat (MF) and protein (P) per hectare produced in the farm were taken from the monthly information, provided by Sancor Cooperatives Ltda.

We used regression analysis to describe the relationship between average monthly stocking rate (SR) and annual pasture production (APP), pasture mass disappeared during each grazing (U), milk production per day (HP) and per cow (AP) on month basis. We also analyzed the relationship between production per cow (AP) and metabolizabe energy (E) and crude protein (CP) of the forage (average of the total forage mass before and after each grazing).

Results and Discussion

The average monthly SR were positive related to changes in PGR in both periods (**I**:y=0,0101x+0,7437; r^2=0,54; p=0,00; **II**: y=0,0149x+0,7926; r^2=0,68; p=0,00). At the same time the increase of SR led to an increase in HP (y=1564,20x+436,36; r^2=0,58; p=0,00) without negative effect in AP (y=-0,7271x+14,61; r^2=0,00).

The lower APP during period **II** (table 1a) was probably due to the low rain occurred along this period and, as AHC did not differ, U was increased. Nevertheless, DAC and AP were lower in the second period when the SR was higher. Both GMO and GMR were reduced during period **II** (table 1b), nevertheless, the green pasture mass removed by the herd in each grazing was similar between periods. We observed that GMR affected AP during period **II** (y= 0,0029x+12,16; r^2=0,22; p=0,01) highly when this variable was low. Lesser pasture mass in the paddock indicate that grazing intensity was higher in period **II** than in the first one.

Average milk yield per cow in each grazing period was higher as the metabolizable energy and crude protein content of the offered forage increased (figure 1). A higher nutritive value in the pasture allowed an increase in the total metabolizable energy removed per hectare during period **II** (+17,90%, data not shown) although the high grazing intensity caused a reduction in AP (-

8,68%)(table 1a). This drop of milk production per cow could be a consequence of lesser consumption as a result of the increment of SR at the farm in period **II**.

Although total milk production was determined by the size of the herd, production per cow might be taken into account, simultaneously with the stocking rate to improve the outcome of the system. Pasture nutritive value was one of the factors that improved with the use of corrective management however, this was not the only factor that determines AP. The low residual pasture mass at the end of each grazing seemed to explain the decreased DAC and thus AP and could be considered as an indicator that the daily area assigned was not well adjusted.

These results indicate that the stocking rate could be adjusted to changes in pasture growth rate, in order to increase the proportion of the pasture production transferred to the herd. This strategy need to be adjusted year around because of the different rain conditions and thus, pasture production and forage distribution. Nevertheless, stocking rate did not assure by itself that the potential milk production determined by herd characteristics could be obtained, if the increment in grazing pressure affected consumption and milk production per cow, despite of the improved pasture nutritive value.

References

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Table 1 - Annual Pasture Production (APP); Annual Herd Consumption (AHC); Daily Animal Consumption (DAC); Daily Animal Production (DAP); Milk Production per hectare/AHC (T); Pasture Utilization (%)(U); Stocking Rate (SR); Green Mass Offered (GMO); Metabolizable Energy (E) – O: offer, R: residual; Crude protein (%)(CP); Green Mass Residual (GMR); Herd Production (HP); Milk Fat Production (MF). Data were recorded during two periods with different precipitation condition, at a commercial dairy farm located at Chivilcoy, Buenos Aires, Argentina.

a) System descriptive variables

Period	Rain Mm	APP KgDM ha^{-1}	AHC KgDM ha^{-1}	DAC KgDM day^{-1}	DAP Lt cow^{-1}	T Lt kgDM^{-1}	U %	SR Cow ha^{-1}
I 97-98	1303	13914	5712	13,96	14,28	1,03	41,05	1,12
II 98-99	720	9413	5990	12,72	13,04	1,02	63,64	1,29

b) Pasture and management descriptive variables

Period	GMO KgDM ha^{-1}	EO ME kgDM^{-1}	CPO %	GMR KgDM ha^{-1}	ER ME kgDM^{-1}	CPR %	HP Lt day^{-1}	MF Kg ha^{-1}
I 97-98	2462	2,44	14,00	1365	2,28	11,39	2335	230,72
II 98-99	1839	2,53	15,78	610	2,42	13,71	2372	243,07