



AGE AT THE FIRST CALVING AND EFFICIENCY INDICATORS IN DAIRY COWS WITH DIFFERENT PRODUCTIVE POTENTIAL IN GRAZING SYSTEMS

EDAD AL PRIMER PARTO E INDICADORES DE EFICIENCIA EN VACAS LECHERAS CON DIFERENTE POTENCIALIDAD PRODUCTIVIDAD EN SISTEMAS A PASTOREO

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Article received on August 15, 2018. Accepted, after review, on February 11, 2019. Published on March 1, 2019.

Resumen

El objetivo del presente trabajo fue analizar la relación entre la edad al primer parto con la producción láctea e indicadores reproductivos en vacas lecheras, con diferente potencial productivo. Se utilizaron datos retrospectivos de 260 vacas de raza Holstein biotipo Americano-Canadiense con información desde su nacimiento hasta finalizar la lactancia, recolectados entre los años 1992-2012 en el tambo cabaña perteneciente a la Escuela Agrotécnica Gral. San Martín dependiente de la Universidad Nacional de Rosario. El mismo se encuentra ubicado en la localidad de Casilda, Departamento Caseros, provincia de Santa Fe, Argentina. Los animales se dividieron en dos categorías: vacas puras (n=103) y vacas con registro de cría (n=157). Cada una de las vacas pertenecientes a cada uno de los grupos mencionados se caracterizó en función de los valores de dos indicadores reproductivos: edad al primer parto en días e intervalo parto concepción en días y dos indicadores productivos: producción de leche ajustada a 305 días de lactancia en litros y número de partos. No hubo diferencias significativas entre grupos en su precocidad. Las vacas puras presentaron mayor producción ($t = 4,493$; $P < 0,0001$) mientras que las vacas con registro de cría fueron más fértiles ($t = 2,039$; $P = 0,043$). Los grupos no difirieron en el número de partos. Las diferencias en el comportamiento de las vacas puras y las vacas con registro de cría, con diferente potencialidad productivo, pone en discusión el objetivo de ejercer presión para lograr un primer parto a los 24 meses como propuesta generalizada en los sistemas a pastoreo. **Palabras clave:** Producción de leche, reproducción, longevidad, eficiencia.

Abstract

The objective of this study was to analyze the relationship between age at first calving with dairy production and reproductive indicators in dairy cows with different productive potential. Retrospective data of 260 Holstein American-Canadian biotype cows with information from birth to the end of lactation, collected from 1992 to 2012 in the dairy farm belonging to the agro-technical school Gral. San Martín, National University of Rosario, were used. The farm is located in the city of Casilda, province of Santa Fe, Argentina. Cows were divided into two categories: pure cows ($n = 103$) and cows with breeding records ($n = 157$). Each cow belonging to each of the aforementioned groups was characterized according to the values of two reproductive indicators: age at first calving in days and calving-conception interval in days and two productive indicators: milk production adjusted to 305 days of lactation in liters, and number of calving. There were no significant differences between groups in age at first calving. The pure cows presented higher production ($t = 4,493, P < 0,0001$) while the cows with breeding record were more fertile ($t = 2,039, P = 0,043$). Groups did not differ in the number of calving. Differences in the behavior of pure cows and cows with breeding records, with different productive potential, puts into discussion the objective of exerting pressure to achieve a first delivery at 24 months as a generalized proposal in the grazing systems.

Keywords: Milk production, reproduction, longevity, efficiency.

Suggested citation: Marini, P.R. and Di Masso, R.J. (2019). Age at the first calving and efficiency indicators in dairy cows with different productive potential in grazing systems. *La Granja: Revista de Ciencias de la Vida*. Vol. 29(1):84-96. <http://doi.org/10.17163/lgr.n29.2019.07>.

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1 Introduction

The age at first calving is an indicator of the time it takes an animal to reach its sexual maturity and reproduce for the first time (Hare, 2006); it can be influenced by the body size and the onset of hormonal activity of the reproductive system (Moore et al., 1991). Although it is considered that the age at puberty is not determined by a particular body weight, it is determined by an indeterminate order of physiological conditions that result from a given weight (Grajales et al., 2006). In grazing production systems, the body weight-onset ratio of reproductive activity becomes more extreme (Marini et al., 2007). Due to the short productive life of dairy cows (Novaira et al., 2018; Seegers et al., 1998), it is necessary to have an efficient ageing process to replace the discarded cows. The breeding stages of these heifers are unproductive periods, in which the income by selling discarded cows only contributes to the maintenance of the feeding of the cow entering the production, hence the costs of the previous stages are not recovered. The breeding of the females lasts at least two years (Hare, 2006), time that is currently equivalent to almost half the life of the dairy cows. In this context, increasing the longevity of cows would reduce the impact of the non-productive stage (breeding and rearing) with higher productivity (Grandl et al., 2016).

Additionally, the breeding of heifers is an investment that does not generate profits until a calving or a sale, reason for which they receive a lot of attention and care in the first months of their life (Pieroni, 2014). It is important to assess the economic implications of this situation on the dairy company, where a totally unproductive category is maintained in the system for a longer period of time. The heifer represents approximately 15 to 20% of the operating production costs, and it is considered as the third cost after feeding and labor in our dairy establishments (Berra, 1998). Marini et al. (2001) based on records of 1 282 first lactating cows from five dairy farms in grazing systems with different supplementation levels, observed that the age at first calving did not significantly affect the values of two productive indicators (milk production and lactation duration) and four reproductive indicators (calving interval first estrus, interval breeding first service, calving interval conception and breeding record). In fact, the annual replacement rate is high in most countries, and the average number of lacta-

tions at the time of discard cows is generally low, about three in France and similar values in Peru (Seegers et al., 1998; Orrego et al., 2003). Hadley et al. (2006) observed an average slaughter rate varying between 30% and 40% in dairy herds in the United States, when the optimum slaughter rate at herd level should vary from 19% to 29%.

The objective of this study was to analyze the relationship between age at first calving with milk production and reproductive indicators in first lactation dairy cows, with different productive potential, maintained in grazing systems.

2 Materials and methods

The data used corresponded to 260 American-Canadian Biotype Holstein breed cows with information from their birth to completion of lactation, collected between the years 1992-2012 in the production unit belonging to the Escuela Agrotécnica Gral. San Martín, belonging to Universidad Nacional del Rosario. It is located in the town of Casilda, department Caseros, province of Santa Fe, Argentina (33°2'39" south latitude, 61°10'5" west longitude), with milk control of the rural society of Totoras, official entity N° 13 and with the following characteristics: 1) exclusively uses cows of the American-Canadian biotype Holstein breed, 2) feeding is basically grazing (alfalfa meadows) with supplementation (maize grain, corn silo and rolls) supplied in different proportions according to the seasonal availability of alfalfa meadows, 3) is complied with a gynecological periodic control, 4) official dairy control is performed, 5) is free of brucellosis, tuberculosis, campylobacteriosis and trichomoniasis; 6) with control of leptospirosis, infectious bovine rhinotracheitis and bovine viral diarrhea, 7) is artificially inseminated with semen of American and Canadian origin, in the studied period all cows were managed in the same milking facilities. The animals were divided into two categories: pure cows (VP) (n= 103) and cows with breeding register (VRC) (n= 157). The difference between both is based on the fact that the first ones are always inseminated with semen of bulls tested, whereas this practice is not maintained in a constant way in the case of the second ones. To achieve the condition of pure cow, seven generations are required with proven parents, which implies that the members of the group of cows with breeding record are at different times of

that path to achieve it.

During the period covered by this evaluation, cows consumed forages under direct grazing (polyphite fodder and green pastures of winter and summer) or conserved (whole-plant silo of maize and sorghum, prairie hay) and concentrated (grains of maize and sorghum). The climatic environment during that time was varied, both in precipitations and in the combination of temperature and relative humidity environment. Each cow belonging to each of the two groups mentioned was characterized according to the values of two reproductive indicators: age at first calving in days (EPP) and calving-conception in interval of days (IPC), and two productive indicators: milk production adjusted to 305 days of lactation in liters (PL) and longevity (number of births, NP). The cows of each group were divided into four subgroups by their age at first calving, taking as a criterion the values of the first or-

der quartile, the median and the third order quartile.

The effect of the belonging group on each of the variables was assessed with a variance analysis to a classification criterion, followed by *t* Student test with the exception of the survival (number of calving) for which the variance analysis by Kruskal-Wallis ranges and Dunn multiple comparison test was used. For the analysis between quartiles, a variance analysis was used to a classification criterion, followed by Tukey multiple comparison test with the exception of survival (number of calving), for which Kruskal-Wallis variance analysis was used as well as Dunn multiple comparison test. The associations between variables were quantified from Pearson linear correlation coefficient calculation of the product-moment or Spearman nonparametric correlation coefficient.

Table 1. Productive-reproductive indicators in dairy cows with different production potential in grazing systems.

	Pure cows	Cows with breeding record
¹ Earliness	964.9 ± 15.54	980.4 ± 15.47
¹ Production	5835 ± 138.3	5134 ± 87.9
¹ Fertility	196.3 ± 9.08	172.9 ± 7.14
² Survival	3 (1 – 8)	3 (1 – 10)

¹ Values: Arithmetic mean ± standard error. *t* student test for independent data. Earliness: Age at first calving in days, Production: Total liters at the end of the first lactation adjusted to 305 days. Fertility: calving-conception interval.

² Values: Median (range). Mann-Whitney *U* test. Survival: Number of calving during the productive life.

3 Results

Table 1 shows the absence of statistically significant differences between groups in their earliness ($t = 0,675; P = 0,500$). Pure cows showed higher milk production ($t = 4,493; P < 0,0001$) whereas cows with breeding record were more fertile ($t = 2,039; P = 0,043$). The groups did not differ in their survival ($U = 7264; P = 0,159$), although cows with a higher total number of calving were observed among those with a breeding record. Ta-

ble 2 shows the differences generated by categorizing cows from both groups per quartile according to their age at first calving. The cows located in the first quartile with an age close to 25 months presented optimal values of earliness. Those located in the remaining quartiles (second quartile-VP: 30 months and VRC: 29 months; third quartile-VP and VRC: 33 months and fourth quartile – VP: 38 months and VRC: 41 months at first calving are progressively further away from the value of 24 months considered optimal.

Table 2. Age at first calving (days) of dairy cows with different production potential and discriminated in quartiles.

Pure cows			
Quartile 1	Quartile 2	Quartile 3	Quartile 4
771.8 ± 17.27 ^a	920.0 ± 5.88 ^b	1009.0 ± 5.82 ^c	1166 ± 18.71 ^d
Cows with breeding record			
Quartile 1	Quartile 2	Quartile 3	Quartile 4
768.4 ± 11.68 ^a	895.5 ± 4.58 ^b	1009.0 ± 6.52 ^c	1250 ± 20.97 ^d

VP: $n = 26$ cows per group [$F = 153,7; P < 0,0001$].
 VRC: $n = 39$ cows per group [$F = 263,9; P < 0,0001$].
 All values correspond to the arithmetic mean ± standard error.
 a,b,c,d values with different letters differ at least at 0.05.

Table 3. Milk production adjusted to 305 days in the first lactation of cows with different production potential discriminated in quartiles by their age at first calving.

Pure Cows			
Quartile 1	Quartile 2	Quartile 3	Quartile 4
5287 ± 246.9	6175 ± 324.8	5783 ± 218.6	6103 ± 285.9
Cows with breeding record			
Quartile 1	Quartile 2	Quartile 3	Quartile 4
4887 ± 195.3	5137 ± 156.2	5426 ± 186.4	5086 ± 158.3

VP: $n = 26$ cows per group [$F = 2,226; P = 0,090$].
 VRC: $n = 39$ cows per group [$F = 1,614; P = 0,1883$].
 All values correspond to the arithmetic mean ± standard error.

The results of Table 3 show the absence of statistically significant differences ($p > 0,05$) between quartiles in the milk production adjusted to 305 days in both types of cows. In either case, the ma-

ximum yield agreed with the most precocious cows (quartile 1). In the case of the VP the higher production is presented in quartile 2, while in the VRC it is in quartile 3.

Table 4. Calving-conception interval (days) of dairy cows with different production potential, discriminated in quartiles by their age at first calving.

Pure cows			
Quartile 1	Quartile 2	Quartile 3	Quartile 4
199.0 ± 19.90	189.5 ± 15.01	213.5 ± 19.39	182.8 ± 18.47
Cows with breeding record			
Quartile 1	Quartile 2	Quartile 3	Quartile 4
217 ± 16.69 ^a	159.6 ± 12.37 ^b	161.2 ± 13.50 ^b	154.3 ± 12.28 ^b

VP: $n = 26$ cows per group [$F = 0,529; P = 0,664$].
 VRC: $n = 39$ cows per group [$F = 4,531; P = 0,0045$].
 All values correspond to the arithmetic mean ± standard error.
 a,b values with different letters differ at least at 0.05.

The values in Table 4 show that in the case of pure cows, there are no significant differences between quartiles in the average value of calving-conception interval. With the exception of quartile 1, the indicator values in cows with breeding record are

lower than those observed in purebred cows. In both groups of cows, and regardless their earliness, the values of the calving-conception interval are far from the optimum of 82 days required to obtain a birth per year.

Table 5. Number of calving of dairy cows with different production potential, discriminated in quartiles by their age at first calving.

Pure cows			
Quartile 1	Quartile 2	Quartile 3	Quartile 4
3(2 – 5)	2.5(2 – 4)	3(2 – 5)	3(1.5 – 5.5)
Cows with breeding record			
Quartile 1	Quartile 2	Quartile 3	Quartile 4
4(2 – 5)	3(2 – 5)	3(2 – 4)	3(2 – 5)

VP: $n = 26$ cows per group [Statistics of $KW = 2,651; P = 0,449$].
 VRC: $n = 39$ cows per group [Statistics of $KW = 2,515; P = 0,473$].
 All the values correspond to the median (interquartile range).

The values in table 4 show that in the case of pure cows, there are no significant differences between quartiles in the average value of calving-conception interval. With the exception of quartile 1, the indicator values in cows with breeding record are lower than those observed in purebred cows. In both groups of cows and regardless their earliness, the values of the calving-conception interval are far

from the optimum of 82 days required to obtain a birth per year. The results of Table 5 show absence of significant differences between precocity quartiles, in the number of births of both pure cows and with breeding records. The values of the survival indicator in the system are similar for both groups of cows and reveal a replenishment of 33 % in most quartiles.

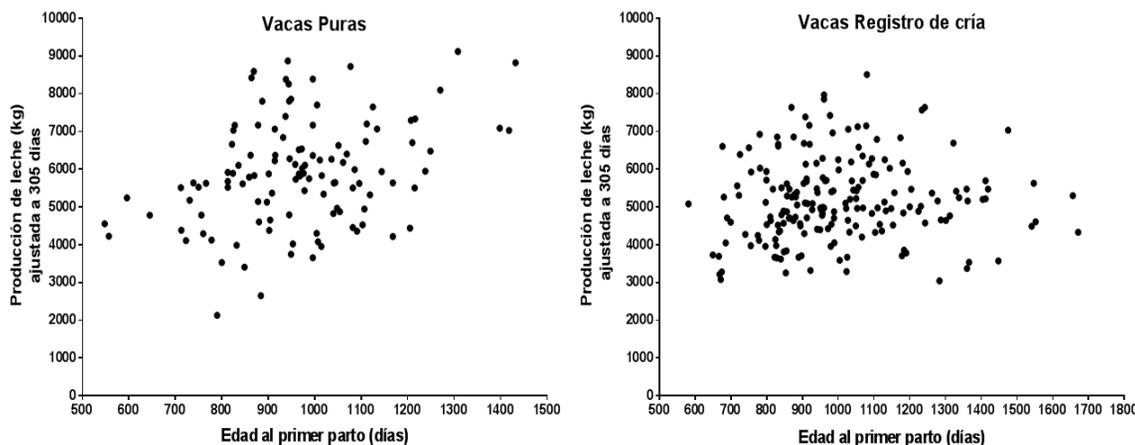


Figure 1. Association between age at first calving and milk production adjusted to 305 days in two groups of Holstein cows with different production potential in grazing systems.

Figure 1 shows a positive and significant correlation ($r = 0,346; P = 0,0002$), between the age at first calving and the milk production in pure cows, an association which did not reach statistical significance ($r = 0,078; P = 0,282$) in the case of cows with a breeding record. Figure 2 shows no associa-

tion ($r = -0,093; P = 0,353$), between the age at first calving and the calving-conception interval in pure cows, whereas in the case of cows with breeding register both variables are negatively associated ($R = -0,230$) and are statistically significant ($P = 0,0028$).

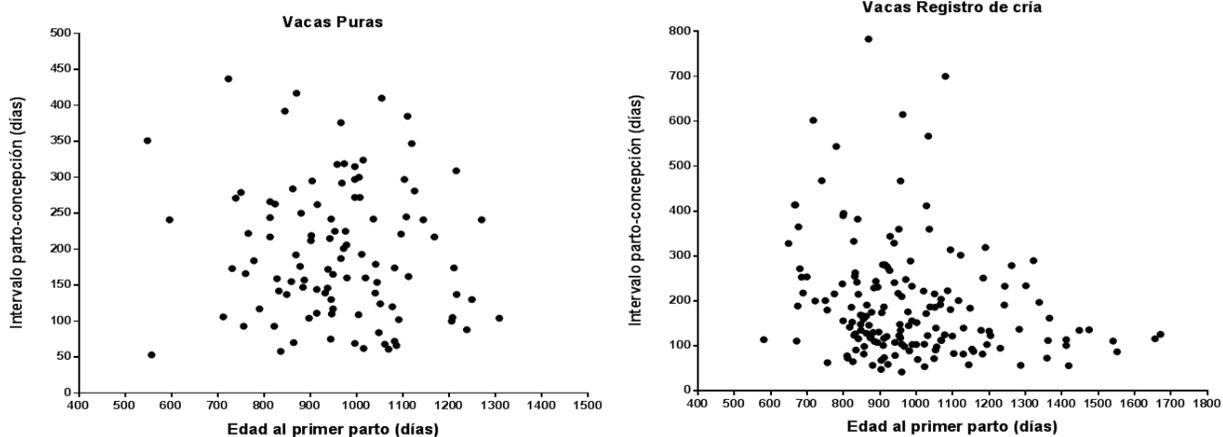


Figure 2. Association between age at first calving and calving-conception interval in two groups of Holstein cows with different production potential in grazing systems.

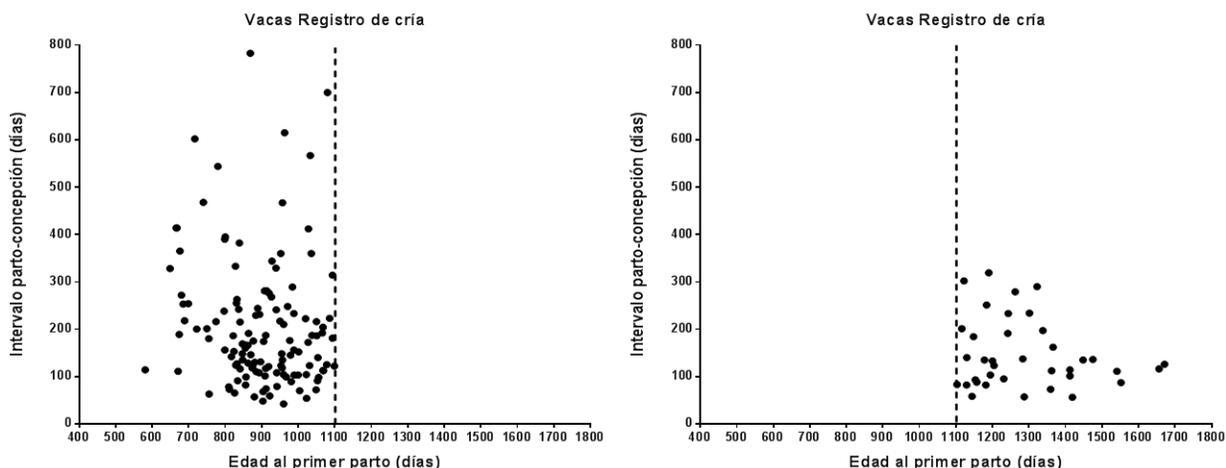


Figure 3. Association between age at first calving and calving-conception interval in two groups (≤ 1100 days and ≥ 1100 days) and calving interval conception of Holstein cows with breeding record in grazing systems.

In the case of cows with breeding register, two groups of animals can be identified (Figure 3). Those whose age at first calving is less than 1 100 days ($n = 129$) in which the association is non-significant ($r = -0,130; P = 0,141$) and which shows a great dispersion in the value of calving-conception interval; and a second group, with ages at first calving exceeding 1 100 days ($n = 37$) in which the association is not statistically significant ($r = -0,189; P = 0,263$), but the values of the calving-conception interval show less variation. The VCR group with EPP <1100 days ($n = 129$) has EPP values: 900 ± 115 days and

CPI: 206 ± 137 days with a variation coefficient for CPI of 66,2%. For its part, the VRC group with EPP >1100 days ($n = 37$) has EPP values: 1279 ± 147 days and CPI: 147 ± 73 days with CV CPI = 49,8%.

Figure 4 summarizes the behavior of the calving record as an indicator of survival and age at first calving. In the VP the association was not statistically significant (r of Spearman = 0,030; $P = 0,746$), whereas in the case of VRC, the same was marginally significant ($RS = -0,138; P = 0,057$) and of a negative sign, i.e., at the earliest age at first calving there is a lesser number of calving.

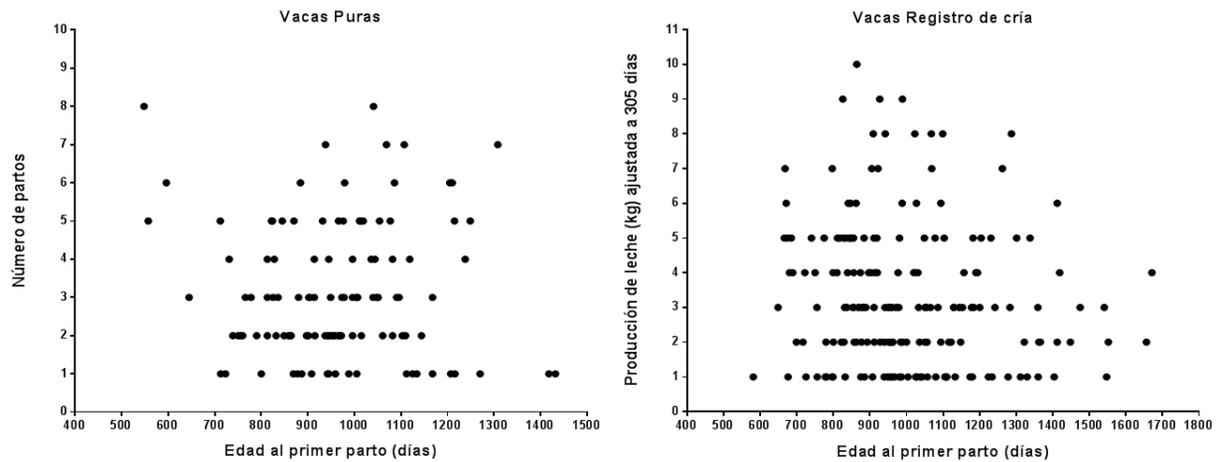


Figure 4. Association between age at first calving and number of calving in two groups of Holstein cows with different production potential in grazing systems.

4 Discussion

High costs, scale and production efficiency in dairy systems require rigorous monitoring of the Heifer to ensure the achievement of acceptable profitability margins. In the future, the investment in this type of establishments is the replacement heifer. The proper management of the heifer in the breeding and rebreeding stages, adapted to each production system, along with a sanitary management programmed according to the region, scale and intensification of the system are essential factors to be considered. The two groups of cows compared in this work were not differentiated in a significant way in the average age at the first calving, whose value is well above the desirable optimal of 24 months (Hare, 2006). The ousted values for this variable are higher than those reported by other authors (Pirlo et al., 2000; Salazar-Carranza et al., 2013), but similar to those reported by García Bouissou and Gens (1997) and by Snyder (2006). The milk production of both groups agree with the data reported in some publications (Glauber, 2007), although they are less than 6 500 liters and 7 500 liters obtained by others (Krupic et al., 2015; Romano et al., 2016), at the local level and for the same handling conditions. Significant differences were observed in the average values of the calving-conception interval. These were higher than 133 ± 9 average days reported by Krupic et al. (2015), and showed a tendency in the VRC to be more fertile than the VP.

In terms of productive life, no significant differen-

ces were observed, agreeing the number of calving with the average number of 2.6 to 3.3 calving, reported in cows with high productive performance in the United States and Germany (Hare, 2006; Knaus, 2009; Frana et al., 2014). The joint consideration of these variables would indicate that, on average, these cows arrived at the first calving at an advanced age, with a moderate milk production, with difficulties to become pregnant after the first calving and with a decrease in the length of their productive life. The categorization of both types of cows in prematurity quartiles allowed to compare the performance of four groups of animals with differences in age at first calving. In this sense, the results show that only 25% of the heifers arrive at their first calving at an age close to the optimum of 24 months, with a difference of 13-15 months between the extreme categories. These results show how difficult it is in grazing systems to fulfil with certain requirements that are characteristic of other production systems, without a previous critical evaluation of the feasibility of reaching the age considered optimal for the first calving. In these productive systems can be affected the size of the body and the onset of hormonal activity of the reproductive system (Grajales et al., 2006). Undoubtedly, there are factors in grazing systems that are either unknown or well known, but are unmanageable under extensive management conditions, limiting the possibility of completing predetermined stages for intensive production systems.

Heinrichs (1993) suggested for Holstein cattle an

age at first calving of 23 to 24 months. Gill and Allaire (1976), indicated that in order to obtain a good yield during the whole productive life the first calving should occur from 22.5 to 23.5 months. These objectives, typical of other areas (intensive systems), are those posed for grazing systems. However, García Bouissou (1997) proposed, on the basis of different opinions both of consultants and producers, that the optimal age at the first calving of dairy cows in grazing systems should have a range between 22 and 27 months old. Beyond the fact that rearing and breeding systems have been modified and intensified from the point of view of food, the 27-month upper limit of the proposed range represents a value closer to the reality of grazing systems. Perhaps the approach to grazing systems is far from the real possibility of meeting that objective. Duplessis et al. (2015) report that in Quebec, the first calving occurs on average at 27 months, while the target is 23 to 24.5 months to maximize the profitability of the herd.

The age of Holstein heifers at first calving has generally varied between 24 and 25 months over the last decades (Mourits et al., 2000). Since the first calving at 24 months is becoming a common and widespread goal, it should be to assume that the age of the first calving will continue to reduce in the short term. In studies carried out with Jersey and Holstein animals of specialized establishments of Costa Rica (Castillo-Badilla et al., 2013; Salazar-Carranza et al., 2013) it was determined that the age at first calving exerts a significant influence on productive indices and on longevity within the herd. Snyder (2006) reported, based on the data from the Holar Argentinian Association that the average age at first calving for females of this breed for the period 1997-2007 was 32 months. Dairy systems in Argentina tend to intensify with more animal confinement, and the search for an increase in the liters of milk produced per cow with stabilization of dry matter consumption (Frossasco et al., 2017). However, in the Pampas plain, the temperate climate and the characteristics of the soils allow to have a forage base of good quality throughout the year, with the ups and downs considered typical of each one of the stations (Molinuevo, 1998), suitable for the development of grazing production systems by imposing, in some way, a limit to the demands of permanent growth in order to fulfil productive objectives of other systems.

The cows evaluated in this study showed no sig-

nificant difference between quartiles of earliness in the milk production adjusted to 305 days. This implies that the age of the first calving did not influence the production of the first lactation. In this regard, it should be added that milk production values are below the usual values of the area, and the highest production was not recorded in the most precocious cows. In the pure cows, this increased production was given in those belonging to quartile 2, whereas in the one with breeding register in those of the quartile 3, remarking the discrepancy between the prematurity pretended and the prematurity recommended for these systems. Authors such as Van Amburgh et al. (1994) and Hoffman et al. (1996), suggest that age at birth may be reduced to 22 months without negative influences on the milk production and the animal health. Vitullo et al. (2016) did not observe association between age at first calving and milk production, in agreement with what was reported in this work for cows with breeding record. On the other hand, other authors conclude that milk production is higher as the age of calving is delayed (Castillo-Badilla et al., 2013; Salazar-Carranza et al., 2013), results that coincide to the information found in the case of pure cows.

Lasa (2015) observed an important relationship between milk production in first lactation and reproductive earliness, with an increase in calving production between 18 and up to 26 months, and a posterior reduction as age at first calving increased. In relation to the re-entry of the first calving cow to the reproductive activity, no significant differences were observed between earliness quartiles in the interval calving-conception in the case of the pure cows, but differences were found in those with breeding register between the most precocious -quartile 1- and the rest of the categories. This difference indicates that for this group of cows, an early first lactation onset affects immediate reproductive behavior. The age effect at first calving on reproductive parameters, such as service by conception or interval birth-conception, have not been widely discussed in the literature (Castillo-Badilla et al., 2016). However, the younger age has been related to the first calving with the presentation of difficult births, most likely due to the scant body development of the calves (Ettema and Santos, 2004).

On the other hand, it has been observed that the age at first calving seems to have no effect on reproductive indicators (Marini et al., 2007), observation that is confirmed in the group of pure cows in which the-

re is no association between the age at first calving and calving interval-conception, contrary to the information found by Castillo-Badilla et al. (2016), who mentioned that they observed an effect in cows with breeding record. In this last group, the older the first calving the lower the interval-conception. Something interesting that showed the group of cows with breeding record is that two groups of animals were identified, those whose age at first calving is less than 36 months and whose association is non-significant and shows a great dispersion in the value of calving-conception interval, and a second group, with ages at first calving higher than 36 months, in which the association was not statistically significant, but the values of the calving-conception interval show less variation.

This behavior can be explained if taking into account that after the calving the requirements of the first group include production, growth and gestation, while in those of the second group only production and gestation participate. One of the possible advantageous age relationships to first calving with reproductive variables is that their decrease could increase the number of calves per cow, but, such a decrease could cause greater difficulty in calving with the consequential reduction in the viability of calves and an increase in their susceptibility to infectious agents due to a reduced absorption of immunoglobulins (Pirlo et al., 2000). The reduction of age at first calving would also lead to a reduction in fertility, with increased reproductive costs, especially to the calving interval and premature discarding of valuable animals (?). In contrast, age at first calving did not show significant effect on the calving interval conception in Jersey cows, coinciding with what was reported for grazing animals, in which no marked effect of age was observed at the first calving on reproductive indicators (García Bouissou, 1997; Marini et al., 2007). Other authors indicate that heifers with higher production show a deterioration in their ability to restart reproductive activity after the first calving (Kim and Suh, 2003; Marini et al., 2007).

Similarly, Roche et al. (2013) associated postpartum alterations with high milk production, especially in cows whose first calving is at ages from 24 to 28 months and older 28 months; this could indicate a high predisposition of cows to present postpartum disorders. No significant differences were observed between the quartiles in the number of calves. The values of this longevity indicator were similar for

both groups of cows, with a replacement of 33% in most quartiles. In the case of pure cows, no association was observed between the age at first calving and the number of calves, whereas in those with a breeding record, the association was significant ($p \leq 0,05$) and showed that at an older age of the first calving lower the number of calves. The effect of age at first calving on the length of productive life has not been widely discussed; Casanova et al. (2011) analyzed the effect of age at first calving and observed that cows that first calved at an advanced age- 40 months- presented 23% higher risk of being ruled out than cows that did so at an age of 30 months. Sewalem et al. (2003) also observed in the Holstein population of Canada that as the age of first calving increased, the discarding increased. Castillo-Badilla et al. (2016) showed confirmatory results of previous reports, according to which those females with age at first calving less than 23 months had greater longevity within the herd, in agreement with Cooke et al. (2013) and Zavadilová et al. (2013). Vukasinovic et al. (2001) reported a higher risk for cows that calve very early and also, and especially, for those who calve too late.

5 Conclusion

The relationship between age at first calving with milk production and reproductive indicators and longevity in first lactating dairy cows in grazing systems is complex; therefore, in this type of systems it is not possible to ensure that the animal requirements will be covered with the same degree of adjustment as is achieved in intensive systems. The differences in the behavior of purebred cows and cows with a breeding record with different productive potential, jeopardize the objective of exerting pressure to achieve a first calving at 24 months as a general proposal in the grazing systems.

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