

Technology Adopted in Dairy Farms in the Central-Western Province of Chaco-Argentina

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ABSTRACT---- *It's necessary to make visible the characteristics of the existing dairy systems in the province of Chaco, although it isn't taken into account in the statistics. The objective of the work was to identify the adoption of technology in different groups of producers of dairy establishments in the center-west of the province of Chaco-Argentina. Visits were identified and made to 14 dairy establishments between September 2021 and July 2022. The drums were divided into three groups: dairy farm group of agricultural schools (GEA) with mechanical milking, group of dairy farms with only one milking per day (G10) with manual milking and the group of dairy farm 3s with two milkings per day (G20) with mechanical milking. The medium and ranges were obtained. The number of cows in milking was 13 (4-24), 7 (12-15) y 14.5 (7-20) ($p \geq 0.05$). The hectares dedicated to milk production of 18 (13-69), 45 (25-247) and 30 (20-235) hectares ($p \geq 0.05$), the use of rotation within the lots, 66%, 57% and 100% apply technology. The age at first pregnancy was 24 (24-36), 24 (24-36) and 27 (24-36) months ($p \geq 0.05$), the duration of breastfeeding in days, 210 (210-300), 180 (150-240) and 205 (200-210) days ($p \geq 0.05$). The well-marked differences appear in the presence of floor and cement roof in the milking place that only the establishments of two milking possess it. The three groups perform hands hygiene before starting milking and nipple washing before the start of the milking. However, only GEA is the one that performs the sealing of the nipples at the end of the milking. The groups of producers of dairy establishments in the center-west of the province of Chaco-Argentina, which make two milking per day showed a greater adoption of technology in the social aspects and the milking routine. However, we must continue working and that forces the need to generate care policies.*

Keywords---- strategies, productivity, mechanical milking, small producers, subtropics

1. INTRODUCTION

Within the primary sector of the economy of the province of Chaco-Argentina, cotton crops, soybean crops, cattle production and wood extraction stand out (Pérez and Schorr, 2020), is no word is dairy farming observed how sector. It's necessary to make visible the characteristics of the existing dairy systems in the province of Chaco, even if it isn't taken into account in the statistics. A work by Cheij *et al.* (2022), identified and characterized the dairy establishments in the center-west of the province of Chaco, demonstrating that there is dairy production in the region and that this commits to generating policies for attention to dairy farms.

Milk production systems are characterized by their high complexity and their influence by the environment, the adopted production system, the institutional environment (technology and services) and cultural values (Navarro, 2001). The adoption of different technologies has been one of the many strategic proposals to increase the productivity and income of agricultural producers (Irz *et al.*, 2001). In milk production systems, the higher degree of technology adoption generates a higher level of productivity and income (Oros *et al.*, 2011; Juárez-Barientos *et al.*, 2015). Other studies have shown that the main factors in adoption are social and economic (Valencia, 2013; Rodríguez, 2013; Fresoli *et al.*, 2013), since it's considered as a basis for decision-making that the transferred technologies are consistent to the needs of the producer and show economic benefits of its adoption (Rodríguez, 2013).

Mechanical milking is a technology that is appropriated for family farmers to incorporate, that makes them acquire a certain degree of technology, so the mechanization of milking will allow each producer to work with greater hygiene and quality of milk, improve family working conditions by humanizing the milking task, increase the number of milking animals, achieve production volumes that improve their scale and business (Undersecretary of Social Communication, 2012).

The objective of the work was to identify the adoption of technology in different groups of producers of dairy farms in the center-west of the province of Chaco-Argentina.

2. MATERIALS AND METHODS

14 dairy establishments were identified and visited between September 2021 and July 2022. Within the methodological strategies, it was decided to opt for the case study, and as techniques, the in-depth interview and survey

turned out to be the most suitable material for survey the information of the establishments in the center-west of the province of Chaco. The climate in general responds to a humid subtropical, with a dry season. Average rainfall is between 800 and 1000 mm per year from west to east. Spring and summer are rainy and autumn and winter are dry, with well-defined seasons. An average annual temperature of 24 °C is observed, with maximum temperatures of 46 °C and minimum temperatures of -5 °C. Early frost calls are frequent, occurring in 80% of cases between May and June, late frosts are common until August. The soils are mollisol types with variable organic matter content with capacity for use II, III and IV. Its current use is mainly intended for agriculture, forestry and livestock, with potential use for silvopastoral agriculture (Ministry of Production, 2016).

The following aspects were recorded:

Of the system: cows in milking (VO), number of hectares, use of the rotary system for the use of forage.

Reproductive: age at first calving (EEP) in days, duration of lactation (DLACT) in days and natural service (SN).

Social: who does the milking, hiring external personnel, existence of a roof in the milking place and existence of a cement floor in the milking place.

Milking routine: number of milkings per day, hand hygiene before milking by the milker, washing the teats before milking, use of teat sealant at the end of milking and application of treatment of the cow when drying off.

The dairy farms were divided into three groups: dairy farm group of agricultural schools (GAS) with mechanical milking, group of dairy farms with only one milking per day (G1M) with manual milking and the group of dairy farms with two milkings per day (G2M) with mechanical milking. The median and ranges of the variables analyzed were obtained for each group. Also, the percentages and absolute values of the variables for each group. The division criterion also included the hypothesis that the dairy farms of the agricultural schools should have greater adoption of technology because many professionals coexist in them. Tukey’s analysis of variance and comparison of means tests ($p < 0.05$) (Sokal and Rohlf, 1979) were applied. Statistical analyzed were performed using the JMP program (JMP®, 2003). Version 5.0.

3. RESULTS AND DISCUSSION

The results obtained from the analyzed variables of the system, showed that the median and ranges of the number of cows in milking, for the group of dairy farms of the agricultural schools was 13 (4-24), for the dairy farms of a single milking per day it was 7 (2-15) and for the group of dairy farms with two milkings per day it was 14.5 (7-20), not showing significant differences ($p \geq 0.05$). The dispersion in the values and the low number of dairy farms per group could explain the results, although the group of dairy farms with only one milking per day would tend to have a lower number of cows than the other two groups. Regarding the hectares dedicated to milk production, the median and the range for the group of dairy farms of the agricultural schools presented 18 (13-69) hectares, for the dairy farms of a single milking per day 45 (25-247) hectares and for the group of dairy farms with two milkings per day, 30 (25-235) hectares, showing not significant differences ($p \geq 0.05$). This variable would not be limiting for the adoption of technology in the system. And the last variable of the system analyzed, which was the use of rotation within the lots, the group of dairy farms of the agricultural schools 66% apply this technology, the dairy farms with only one milking per day 57% and the group of dairy farms of two milkings per day, 100% apply rotation technology in batches.

The results obtained from the reproductive variables of the groups showed that the median and age ranges at first pregnancy, for the group of dairy farms from the agricultural schools was 24 (24-36) months, for the dairy farms of a single milking per day was 24 (24-36) months and for the group of dairy farms with two milkings per day it was 27 (24-36) months, showing not significant differences ($p \geq 0.05$). The age values at first calving in the three groups coincide with the results presented by (Krpalkova *et al.*, 2017; Olechnowicz *et al.*, 2016; Zavadilová and Štipková, 2013) where they state that to maximize production and minimize heifer rearing costs, it should be less than or equal to 24 months. Regarding the duration of lactation in days, the medians and ranges were obtained for the group of dairy farms from the agricultural schools where they showed 210 (210-300) days, for the dairy farms with only one milking per day of 180 (150-240) days and for the group of dairy farms with two milkings per day of 205 (200-210) days, not observing significant differences ($p \geq 0.05$). Although yes, a tendency for dairy farms with only one milking per day to present fewer days of lactation than cows in production, this could be explained by several reasons, among them: nutritional management, health status and/or the environment of the rodeo production, where the stress associated with handling and inadequate facilities could be expressed (Bretschneider *et al.*, 2015).

Table 1: Absolute values and percentage of the social variables analyzed in the dairy farms.

Variables	Groups		
	GAS (3)	G1M (7)	G2M (4)
Who does the milking	Employees (100%)	Family (100%)	Family (75%)
Existence of external staff	Yes (100%)	No (100%)	Yes (50%)
Roof in the milking place	3 (100%)	2 (28.5%)	4 (100%)
Cement floor in the milking place	3 (100%)	(0%)	4 (100%)

Dairy farm group of agricultural schools (GAS) with mechanical milking, group of dairy farms with only one milking per day (G1M) with manual milking and the group of dairy farms with two milkings per day (G2M) with mechanical milking.

Table 1 shows that the group of two milkings per day, the dairy farm group of agricultural schools, is the only one that has employees, while the other two mostly presented the form of family work. This result in the GAS was logical, since the schools belong to the provincial government and depend on employees for their operation. The same occurs with the presence of external personnel to carry out tasks in the establishment, where the G1M doesn't have it and the G2M in half of the establishments only has it. The well-marked differences appear in the presence of a cement ceiling and floor in the milking place, where the two milking establishments have these comforts that aren't only for the workers, but also for the animals (Landaeta-Hernández and Drescher, 2012). The milking shed must be the well-being of the people, and facilitate the flow of cows and their well-being. People and cows feel better in a bright and well-ventilated place. Well-designed milking facilities allow people to work for less time and with greater well-being (Lazzarini *et al.*, 2018). Here a substantial difference is observed over those producers of only one milking per day. Although there aren't studies in dairies in the province of Chaco, these results coincide with those presented by De Nicola *et al.* (2012) and Giordano (2013) in small dairy farmers.

Table 2: Absolute values and percentage of the variables analyzed in the dairy farms surveyed for the milking routine

Variables	Groups		
	GAS (3)	G1M (7)	G2M (4)
Number of milking per day	2	1	2
Hand hygiene	3 (100%)	7 (100%)	4 (100%)
Nipple wash	3 (100%)	7 (100%)	4 (100%)
Teat sealing	3 (100%)	1 (14.3%)	1 (25%)
Drying treatment	2 (66%)	2 (25.5%)	4 (100%)

Dairy farm group of agricultural schools (GAS) with mechanical milking, group of dairy farms with only one milking per day (G1M) with manual milking and the group of dairy farms with two milkings per day (G2M) with mechanical milking.

Table 2 shows that the three groups perform hand hygiene before starting milking and teat washing before starting milking. However, only the group of agricultural schools is the one that performs the sealing of the teats at the end of the milking. Dairy farms have a high risk of bacterial infection. For this reason, after milking the cow's teats should be sealed (Scaramelli and González, 2005). The GAS and G2M groups are the ones that carry out the treatment with antibiotic therapy to the dry cows. The therapeutic drying of all quarters at the end of the last milking before drying is a necessary and excellent opportunity for the treatment of intramammary infections acquired during the last lactation, as well as for the prevention of possible infections that could occur in the next period (Castro, 2018).

Finally, it can be pointed out that these results should serve as the basis for implementing a program (governmental and private) to increase the adoption of input and process technologies in the dairy cattle sector in the center-west of the province of Chaco-Argentina.

4. CONCLUSION

The producer groups of dairy farms in the center-west of the province of Chaco-Argentina, which perform two milkings per day, showed a greater adoption of technology in the social and routine aspects of milking. However, we must continue working and that forces the need to generate attention policies for them.

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