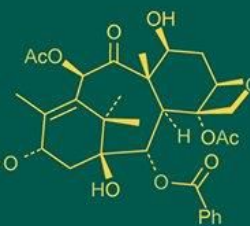
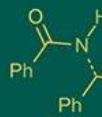
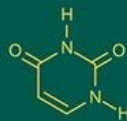


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Study on reproductive performance of cattle at dairy farms in arid region of Rajasthan

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Abstract

This present study was carried out with the objectives to determine socioeconomic status and assess welfare status of dairy farms, to determine productive and reproductive performance and correlation between performance and welfare status of dairy farms and to find out the correlation between socio-economic status and welfare status of dairy farms. The study was conducted in four randomly selected districts of Rajasthan's arid region. Each district had two tehsils, further divided into rural and urban dairy farming areas. From each tehsil, 10 dairy farms were selected from both rural and urban regions, totaling 20 farms per tehsil. Overall, 160 dairy farms were studied across eight tehsils in four districts. Using a tested interview schedule data were collected and analyzed on production and reproduction performance of cattle. The data were subjected to analyse by t-test, chi-square test and Pearson correlation using the statistical package SPSS software version (25.0). Whereas cattle welfare was assessed using Dairy Cattle Welfare Scale (DCWS). Age at first calving (months) was 43.6 and 54.4 in urban and rural dairy farms respectively with an overall average of 44.0. It was significantly ($p < 0.05$) lower for urban dairy farms. Average service period (months) was 4.53 and 4.9 in urban and rural dairy farms respectively with an overall average of 4.71. It was significantly ($p < 0.05$) lower for urban dairy farms. Average calving interval (months) was 15.5 and 16.17 in urban and rural dairy farms respectively with an overall average of 15.84. It was significantly ($p < 0.05$) lower for urban dairy farms. In rural dairy farms age of first calving was highly significantly correlated with animal health. Urban dairy farms typically achieve higher productive and reproductive performance in cattle due to the predominant use of crossbred cattle. In contrast, rural dairy farms primarily rely on indigenous cattle breeds, which tend to have lower productive and reproductive efficiency.

Keywords: Age at first calving, calving interval, reproductive performance, service period

Introduction

Livestock rearing is one of the most important economic activities in the rural areas and provide income to household dependent on agriculture and landless households. About 20.5 million people involve in livestock rearing in India. Livestock rearing is a major source of livelihood for over 70% of rural household in India, with significant proportion being small and marginal farmers and landless labours. This sunrise the sector provides employment to about 80 million people across India. The livestock sector is vital sector of India, economy and sector grow at an impressive compound annual growth rate of 8% constant prizes. It provides employment to about 8.8% of total population. The contribution of livestock to total GVA in agriculture and allied sector increased from 24.32% in 2014-15 to 30.23% in 2023. The livestock sector contributed 5.5% of total GVA in 2022-2023 (BAHS, 2024).

India is predominantly an agrarian society where animal husbandry plays an important role in the socio economic development of India. Development of livestock sector has a significant beneficial impact in generating employment and reducing poverty in rural India. In Rajasthan state, more than 80 percent of the rural households keep animals which continue to provide subsistence income during scarcity. Around 35 to 40 percent of total annual income generated through only livestock by the small and marginal farmers in arid regions. Rajasthan dairy milk production and marketing of milk in rural areas have faced many constraints. Infertility problem, unavailability of high genetic merit bull and poor conception rate through artificial insemination were the major breeding constraints. Non remunerative price for the milk, Inability to market for value-added products and exploitation by middle man were the marketing constraints.

High cost of cattle feed and mineral mixture, high cost of cross-breed cow and less economic returns were the financial constraints. (Saran *et al.*, 2020) ^[12].

Rajasthan is large scale commercialization/ intensification of dairy farming based on crossbred/indigenous cattle. Although commercialization of dairy farming has greatly impacted the productivity and performance of dairy animals, it may also have impacted the animal welfare as well. It has been well established by now especially from researches conducted in developed countries that the animal's welfare is severely impaired by the intensive confinement of modern production systems because in these production systems animals are unable to exercise, fully extend their limbs and they are unable to express many important natural behaviors (Humane Society of US, 2012) ^[7]. In India, there has been scant effort to understand dairy cattle welfare or to identify the indicators of welfare or to assess the level of welfare especially in the era of commercialization and intensification of dairy farming. Therefore the status of dairy animal welfare under our different dairy farming systems needs to be studied so that the animal welfare areas or management practices which jeopardize animal welfare could be identified and a strategy could be developed for enhancing the animal welfare.

Keeping this in view the proposed study conducted to study on the reproductive performance of cattle at dairy farms in arid region of Rajasthan.

Materials and Methods

About Rajasthan

Rajasthan (Mean land of kings) is a state of northern India. The state covers an area of 342,239 square kilometres or 10.4% Of total geographical area of India. Rajasthan state has three native breeds viz Rathi, Tharparker and Nagori

having great deal of endurance. The state of Rajasthan located in western part of India It located between 23.3°N to 30.12°N latitude and between 69.3° to 78.17° longitude.

Climate and Rainfall

The climate of Rajasthan in northwest India is generally arid or semiarid and features fairly hot temperature over the year. In summer due to desert geography temperature climb above 40 to 45 degree Celsius in most places, due to its location, summers are the longest season in Rajasthan. The cold weather commences early in October and ends around the end of February. The monsoon season in Rajasthan extends from July to September. The district of east Rajasthan and south Rajasthan receive more rain (About 900 mm) than the west Rajasthan (About 100 mm).

Selection of districts and dairy farms

The study was conducted in four randomly selected districts of the arid region of Rajasthan. Each district was further divided into two tehsils, and each tehsil was categorized into rural and urban dairy farming regions. A total of 10 dairy farms were selected separately from both rural and urban regions within each tehsil. Consequently, 20 dairy farms were selected from each tehsil, resulting in a total of 160 dairy farms across eight tehsils in four districts of the arid zone of Rajasthan.

Data collection

Data was collected as per semi-structure interview schedule of dairy farm owner for different variable like socio-economic profile, production and reproduction performance and cattle welfare. Data was also collected from available literature, publications and records. Collected data was analyzed by using suitable statistical method.

Table 1: Selection of dairy farms in different district of Rajasthan

Arid region of Rajasthan															
Bikaner				Jodhpur				Barmer				Ganagnagar			
Loonkaransar (20 dairy farms)		Dungaragarh (20 dairy farms)		Phalodi (20 dairy farms)		Balesar (20 dairy farms)		Chohtan (20 dairy farms)		Balotra (20 dairy farms)		Suratgargh (20 dairy farms)		Gharsana (20 dairy farms)	
Rural 10 dairy farms	Urban 10 dairy farms	Rural 10 dairy farms	Urban 10 dairy farms	Rural 10 dairy farms	Urban 10 dairy farms	Rural 10 dairy farms	Urban 10 dairy farms	Rural 10 dairy farms	Urban 10 dairy farms	Rural 10 dairy farms	Urban 10 dairy farms	Rural 10 dairy farms	Urban 10 dairy farms	Rural 10 dairy farms	Urban 10 dairy farms

Analytical tools

The data were subjected to analyzed by t-test, chi-square test and Pearson correlation using the statistical package SPSS software version (25.0).

Parameter to be studied

Reproductive performance

The various parameters of reproductive performance were recorded by onsite observation and information from dairy farms owner and available herd records. The reproductive performance parameters were assessed by the age at first calving (Months), service period (Months) and calving interval (Months).

1. Age at first calving

Age at first calving means that age when heifer give to birth the calf for the first time. This was assessed based on available records and dairy farms owner's information.

2. Service period

It is the period between date of calving and date of successful conception. It was estimated by available records and information provided by the dairy farms owner.

3. Calving interval

Time period between two successful calving is called as calving interval. Previous calving interval were estimated by available records and information provided by the dairy farms owner.

Results and Discussion

Reproductive performance

1. Age at first calving

The data on age at first calving (months) of milch cattle at urban and rural dairy farms is presented in table 2. The average ages of first calving in selected urban and rural dairy farms were 43.6±0.52 months and 54.4±0.50 months

respectively, whereas the overall age of first calving was 44 ± 0.36 months. A statistically significant difference in age at first calving was observed between urban and rural dairy farms ($p = 0.024$). The age at first calving observed in this study aligns with the earlier findings of Gillah *et al.* (2012), which reported a range of 29.7 to 46.0 months in urban dairy farms. The AFC most likely is a reflection of management strategy and was expected to influence milk

production in some way, depending on management of replacement heifers Enevoldsen *et al.* (1996) [5]. It has been reported in many studies that proper nutrition and feeding management plays a major role for attaining early puberty and age at puberty can be reduced by adequate and balanced feeding (Rafiq and Chaudhry 2002; Shiferaw *et al.* 2003, Ciccio *et al.* 2005, Bhatti *et al.* 2007) [11, 13, 4, 2].

Table 2: Mean $\pm$ SE of reproductive performance of cattle in different dairy farms

Parameter	Urban (80) Mean $\pm$ SE	Rural(80) Mean $\pm$ SE	Overall (160) Mean $\pm$ SE	P value
Age at first calving (Months)	43.6 ± 0.52	54.4 ± 0.50	44 ± 0.36	0.024*
Calving interval (Months)	15.5 ± 0.23	16.17 ± 0.18	15.84 ± 0.15	0.029*
Service Period (Months)	4.53 ± 0.11	4.90 ± 0.11	4.71 ± 0.08	0.023*

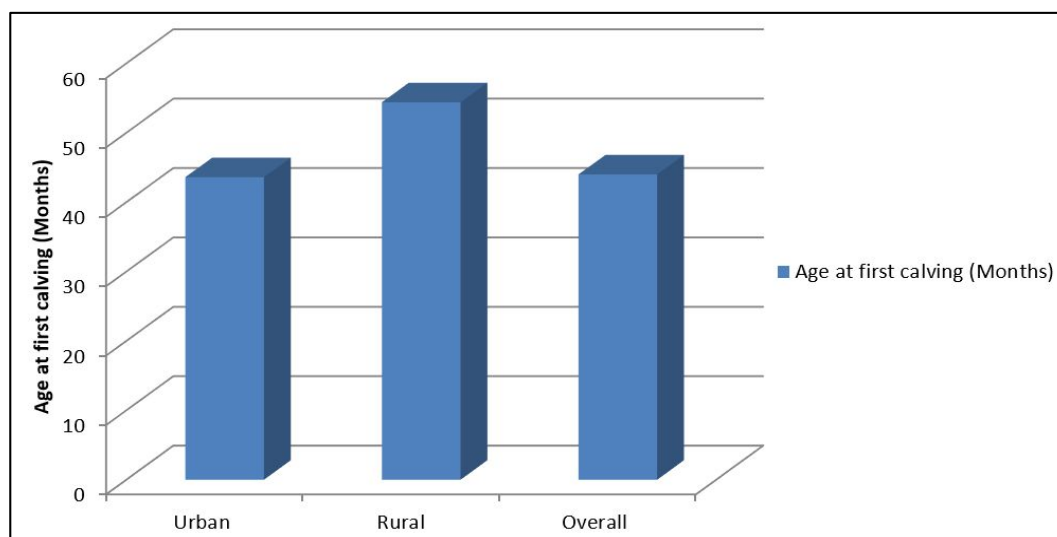


Fig 1: Age at first calving (Months) at different dairy farms

2. Calving interval

The data of calving interval (months) of milch cattle at urban and rural dairy farms is presented in table 2. Calving interval has been considered as practical and useful parameters to indicate the reproductive status of individual cow and the reproductive efficiency of a Dairy herd. It can be divided into three periods: gestation, post partum anoestrus (from calving to first estrus) and the service period (from day of parturition to day of Conception).The

average calving interval in selected urban and rural dairy farms were 15.5 ± 0.23 months and 16.17 ± 0.18 months respectively, whereas the overall average calving period was 15.84 ± 0.15 months. A statistically significant difference in calving interval was observed between urban and rural dairy farms ($p = 0.029$). Musa *et al.* (2019) [10] reported that crossbred cows exhibited a significantly shorter calving interval of 16.02 ± 0.23 months compared to zebu cattle, which had a calving interval of 14.44 ± 0.43 months.

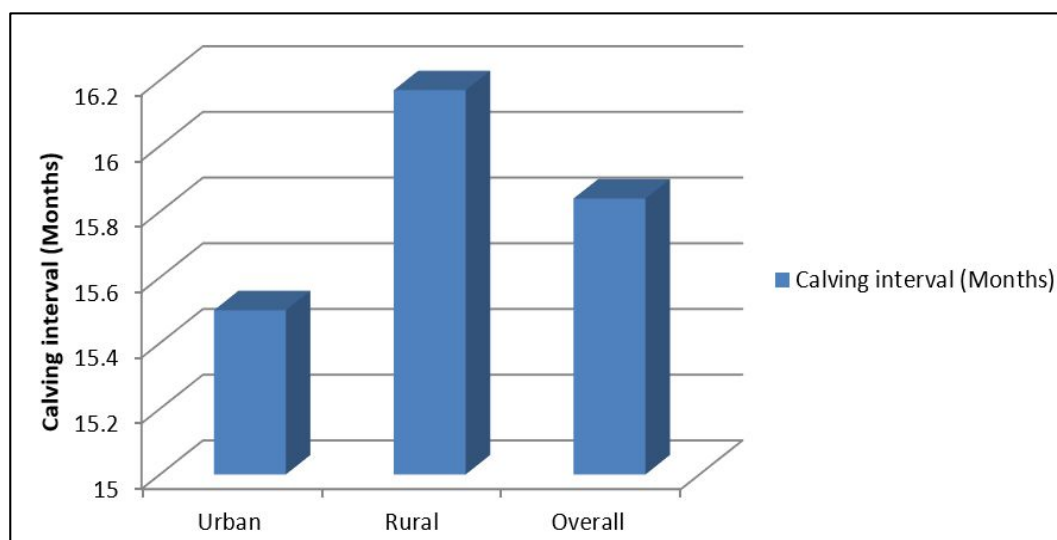


Fig 2: Calving interval (Months) at different dairy farms

3. Service period

The data of service period (months) of milch cattle at urban and rural dairy farms is presented in table 2. The average service periods in selected urban and rural dairy farms were 4.53 ± 0.11 months and 4.90 ± 0.11 months respectively, whereas the overall service period was 4.71 ± 0.08 months. A statistically significant difference in service period was

observed between urban and rural dairy farms ($p = 0.023$). Results of the present study are in line with the earlier finding of Mahla, 2018 (127.92 ± 2.70 days) and Chandra, 2018 (152.67 ± 9.23 days) under field condition. Although the lower than the finding was reported by Mathur and Chahal, (1997) [9].

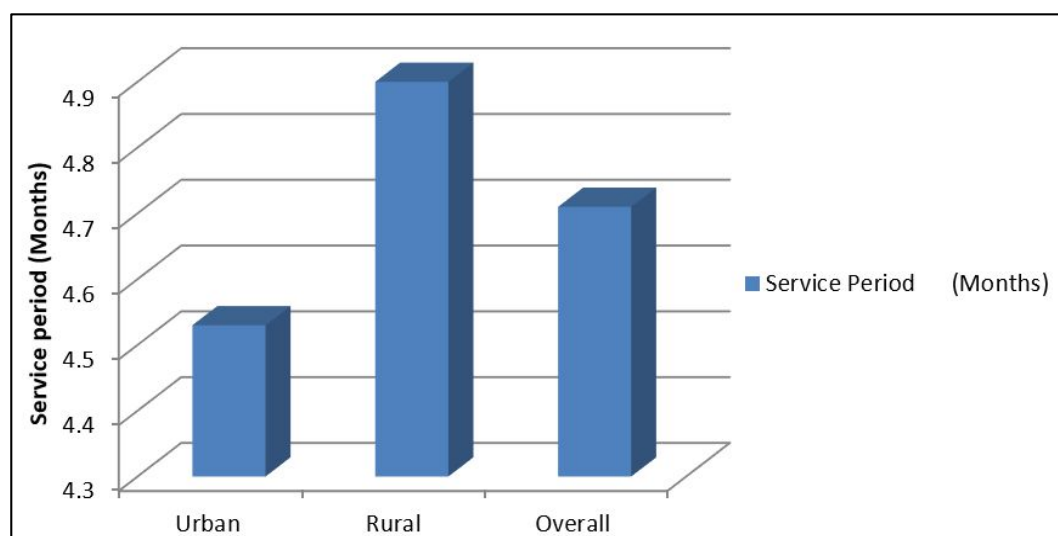


Fig 3: Service period (Months) at different dairy farms

Conclusion

This study highlights the significant variations in reproductive performance between urban and rural dairy farms. Age at first calving, calving interval, and service period all showed statistically significant differences between the two settings. Urban dairy farms had a younger age at first calving and shorter service periods compared to rural farms, which can be attributed to differences in management practices, particularly nutrition and feeding strategies. These findings emphasize the importance of proper herd management in improving reproductive efficiency. Future studies should focus on optimizing management strategies to enhance reproductive performance and milk production across different farm settings.

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