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Socio-economic Factors Influencing the Adoption of Scientific Dairy Animal Feeding and Breeding Practices: A Case of Muzaffarnagar in Uttar Pradesh

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ABSTRACT: This study was conducted in order to assess the degree to which dairy farmers in the Muzaffarnagar district of Uttar Pradesh adopted scientific feeding and breeding practices, and their correlation with the socioeconomic profile of the dairy farmers. In this study, a sample of 200 dairy farmers was randomly chosen from 4 villages that are within a 10-kilometre radius of ICAR-NDRI's field operational centre in Lalukheri village of Muzaffarnagar district. Overall adoption rates for breeding management (71.2%) were better than those for scientific feeding management practices (56.4%) among dairy producers in the studied area. Further, it was demonstrated that the improvement in socio-economic characteristics such as family income, landholding, educational attainment, and contact with extension agencies led to a rise in the adoption of scientific feeding and breeding practices by dairy producers. Often dairy farmers were unaware of modern scientific management practices. If feeding and breeding practices are properly managed, the desired amount of milk production would be feasible. Given this fact, the study managed to improve farmers' understanding of the significance of appropriate breeding and feeding practices.

Keywords: Adoption, Breeding practices, Dairy animals, Feeding practices, Socio-economic.

INTRODUCTION

Animal husbandry has a significant impact on the national economy by fostering socio-economic growth, creating employment opportunities for rural households ensuring year-round financial stability.For landless agricultural labourers, livestock sometimes serves as their only source of capital (Dash, 2017). Dairying plays a significant part in improving the socioeconomic condition of farmers and ensuring the balanced growth of the rural economy (Kumar *et al.,* 2011). With 209 million tonnes of milk exhibiting an annual growth rate of 5.81% and producing up to 23% of the world's milk annually, India is the largest milk producer in the world. Uttar Pradesh produces the first and most milk in India, accounting for around 16.3% of the country's overall milk output (DAH and D. 2022). In India, crossbred cows, indigenous cows, non-descript cows, indigenous buffaloes, and non-descript buffaloes all produce an average of 7.22, 3.34, 2.71, 6.41, and 4.13 kg of milk per day, respectively (DAH&D, 2022). Nonetheless, this productivity is still well below that of the global average and potential. Because of the indigenous animals' limited genetic potential for milk production as well as their poor dietary intake in comparison to their nutritional requirements, this low output can be explained. In addition, factors like inadequate adoption and dissemination of new/improved animal husbandry technologies/practices and limited understanding of the dairy farmers are shown to be accountable for lower output than the actual genetic potential of the dairy animals in India (Chander *et al.,* 2010). Increased milk production may be accomplished by properly putting scientific dairy husbandry techniques into effect, although it is frequently noted that dairy farmers in India are not keeping up with the continuously evolving, upgraded technology.Socioeconomic factors influence dairy production, animal management, and to some extent the adoption of scientific methods and farmers' decision-making (Sivabalan *et al.,* 2013; Swaminathan *et al.,* 2014; Prajapati *et al.,* 2015).

Sachan *et al.* (2017) conducted a similar study to find out how much scientific animal husbandry practiceswere in use and how they were related to the socioeconomic factors of dairy producers in the Unnao district of Uttar Pradesh. The survey indicated that around 40% of respondents had adopted scientific animal husbandry practices. A positive and significant association between overall adoption and factors such as mass media exposure, land ownership, herd size, milk consumption, and milk sale was discovered.In order to determine the parameters affecting the level of adoption of advanced dairy farming methods by peri-urban dairy farmers, Gunaseelan *et al.* (2017) undertook a study in the Thanjavur district. The study's results indicated that the co-efficient of multiple determination (R^2) was determined to be 0.669, suggesting that the combined effect of all the independent variables chosen was responsible for 66.90% of the variation in the adoption level of peri-urban dairy producers. A further explanation provided by the regression analysis was that family income and economic motivation had a positive and significant (1% level) impact on the variation in adoption level. The factors, namely education and milk output, demonstrated positive and significant (5% level) effects on the degree of adoption of peri-urban dairy

producers.Another similar study was carried out in Gujarat's Kheda district by Divekar and Trivedi (2020). According to the study, overall 62.78% of the respondents had adopted scientific animal husbandry methods. The adoption rate for feeding and calf management was the second highest (77.00 and 62.00%), whereas the adoption rate for scientific milking and general management was the lowest (37.60 and 37.30%). The greatest adoption rate was for reproductive and healthcare management (81.40 and 81.33%). A very significant ($p<0.01$) positive relationship existed between the dairy producers' education, landholding, yearly income, herd size and adoption status. In the Saurashtra area of Gujarat, Vekariya *et al.* (2016) conducted research and according to the results, just 14% of farmers had adopted scientific dairy methods at a high level, while 58% of farmers had a medium degree of adoption. The socio-economic characteristics of education (0.73), annual income (0.71), size of land holding (0.55), and extension participation (0.55) were also found to have positive and highly significant relationships with adoption level, whereas age (-0.78) and experience (-0.59) were found to have the negative effect.Animal husbandry practices adopted by dairy producers and their relationship with socioeconomic profile were investigated by Nande *et al.* (2019). The results showed a strong correlation between the adoption of scientific practices and annual income. Similarly, according to the report ofGodara*et al.* (2018), most dairy cattle owners in Rajasthan (59.17%), (69.16%), (75.83%), and (65.00%) had a moderate degree of adoption for breeding, feeding, management, and health care practices, respectively. Yet, there hasn't been much research done in recent years in the research area to link the demographics of dairy farmers with their use of scientific dairy animal management practices which can help ICAR-NDRI to improve their services in the study area.The implementation of better animal husbandry techniques can optimise the opportunity for an increase in dairy animal output. Even before that, it is necessary to understand the foundational details of the current aspects of small dairy farmers' adoption status. The goal of the current study was to examine the demographics of those who benefited from the ICAR-NDRI's field operation centre, which offers elite bull semen and mineral mixture in the study area.Thus, the objective was tostudy beneficiaries' adoption of scientific dairy animal feeding and breedingpractices as well as the correlation between beneficiaries' socioeconomic profile and improved dairy cattle management practises.

MATERIALS AND METHODS

For the present study the district Muzaffarnagar was purposely selected, it is located in the western part of Uttar Pradesh and is renowned as "The Sugar Bowl of India" since the region's economy is mostly dependent on agriculture; sugarcane. A total of 4 villages were covered in this study (Lalukheri, Alipur, Dhansaini and Bhoura-Khurd). Fifty respondents were randomly selected from each village. As a result, 200 dairy farmers were chosen as respondents for the study.

In this study, adoption is defined as the proactive choice made by dairy farmers to accept and adopt a scientific feeding or breeding practice that represented their adoption behaviour.The most relevant dairy animal management practices in the key areas of feeding and breeding were chosen based on a literature review and consultations with experts. In obtaining the required data, and keeping the study's objectives in view, a pre-tested structured interview schedule was adopted. The adoption of scientific dairy animal breeding and feeding practices was the dependent variable in this study. Age, education, household size, family income, dairy farming experience, land holding, caste, interaction with extension agencies, dairy herd size, and daily milk yield were the independent factors analysed.

A dairy farmer's existing adoption of practices was measured by the adoption index. For each adoption practice, a score of 1 was assigned if it was considered scientifically "adopted" and a score of 0 if it was not. Accordingly, a respondent could receive a score of 0 to 10.

The following formula was utilized to determine the adoption index:

Adoption index =

$$\frac{\text{Number of scientific practices adopted}}{\text{Total number of practices}} \times 100 \qquad (1)$$

Following the computation of the extent of adoption of the scientific feeding and breeding practices of the individual farmer, the correlation coefficients (r) values of a subset of respondents' socioeconomic characteristics were computed to examine the relationship between profile and adoption of scientific dairy animal breeding and feeding practices.

RESULTS AND DISCUSSION

Socio-economic characteristics. Table 1 lists the socioeconomic attributes of the sampledairy households. Dairy farmers' economic position is expressed through the size of their landholding. According to various research, animal husbandry is mostly pursued by poor and impoverished farmers in developing nations. The present study of the Muzaffarnagar district showed a similar tendency. It was observed that the majority of dairy farmers were marginal and small farmers with less than one hectare and one to two hectares of land, respectively.These findings derive support from the findings of Gopi *et al.* (2016); Kord (2020). The basic information on the respondents' household sizes gives an indication of the extent to which family labour is used in the dairy enterprise. Regarding the household size of the dairy farmers in the study area, it was observed that the majority of dairy farmers had medium family sizes (5-7 members) indicating the trend of fragmentation of large families in the social system. The findings of the present study are in consonance with the findings of Vekariya *et al.* (2016): Chandrasekar *et al.* (2017); Atreya *et al.* (2018). One of the most significant markers of human growth is the level of education. Education is often held to have the effect of broadening a person's mental perspective and this helps him in the adoption of new techniques and ideas. The majority of respondents in the study area completed secondary and higher secondary

when it came to dairyfarmers' educational standing. These findings are well supported by the results of Chandrasekar *et al.* (2017). It was observed that, on average, the head of the farm household was 44 years old and had more than 15 years of experience in dairy farming. This result may be due to the fact that middle age is a more productive stage in a person's life and that young people were less interested in dairy farming as a livelihood. This result agrees with those of Nande *et al.* (2019). India is a country divided into socioeconomic classes. According to several pieces of research, backward classes drive livestock husbandry in general and dairy farming in particular. It was found that most of the respondents belonged to other backward classes. These results are in line with the findings of Atreya *et al.* (2017). Early adopters tend to be people with high annual incomes. It was found that the majority of farm households earned between Rs. 3 to 5 lakh per year.The majority of dairy animal owners in the study area had herd sizes in the middle range (4-6 animals). According to the data, the average milk output in the study area was 8.6 litres per day. These results are similar to those of Nande *et al.* (2019). Every agricultural or dairy technology adoption requires the assistance of an extension organisation. Most dairy farmers in the study area had interaction with the ICAR-field NDRI's operation centre. It demonstrates the possibility that dairy farmers may have shown interest in and confidence in the useful information and knowledge offered by experts from ICAR-NDRI through extension programmes. Similar findingswere reported by Ravel and Chandawat (2011); Nande *et al.* (2019).

Adoption level. After a thorough preliminary survey interspersed with focus group talks, 10 main scientific animal husbandry methods were chosen under two separate categories, namely breeding and feeding management, to examine the issue-wise adoption levels of dairy producers. Table 2 shows the respondents' overall and component-specific levels of adoption in several facets of scientific animal breeding and feeding in the research region. In comparison to feeding management, reproductive management approaches showed a higher degree of adoption.

Table 1: Socio-economic characteristics of sample dairy farmers in Muzaffarnagar district.

Variable	Mean	SD
Landholding *(Hectare)*	1.06	0.49
Household size *(Nos.)*	5.70	2.06
Education (Illiterate – *1, Primary – 2, Middle – 3, Secondary – 4, Higher Secondary – 5, Graduation and above – 6)*	3.54	1.41
Age (Years)	44.53	13.72
Experience in dairy farming *(Years)*	15.505	7.19
Social group (*ST – 1, SC – 2, OBC – 3, General – 4*)	2.75	0.53
Annual income *(Lakhs)*	4.185	2.02
Extension contact *(1 – No, 2 - Yes)*	1.46	0.49
Herd size *(Nos.)*	4.78	1.98
Milk yield *(Litres)*	8.635	3.20

Table 2: Adoption level of scientific breeding and feeding practices.

Sr. No.	Practices	Respondents (n=200)
A	**Feeding Practices**	**112.8 (56.4)**
1	Mineral mixture feeding	70 (35)
2	Balanced concentrate mixture on the basis of production	113 (56.5)
3	Feeding of chopped fodders	134 (67)
4	Extra pregnancy allowance	118 (59)
5	Provision of *ad-lib* clean and fresh water to animals	190 (95)
B	**Breeding Practices**	**142.4 (71.2)**
1	Artificial Insemination	185 (92.5)
2	Dairy animals are served within 90 days after calving	133 (66.5)
3	Pregnancy diagnosis between 60 - 90 days after service	110 (55)
4	Insemination or service near the end of mid heat	
5	Treatment of anoestrus, metritis, and repeat breeders by a veterinarian	188 (94)

Figures in parentheses indicate the percentage

A balanced plane of nutrition provided by a scientific feeding regimen guarantees improved milk production for better financial returns. It was found that the majority of respondents used practices including offering balanced concentrate mixture on the basis of milk production, pregnancy allowances to advance pregnant animals, feeding chaffed fodder and provision of adlib fresh water. Yet, it was rather less common to offer mineral mixture. Similar acceptance rates for the aforementioned feedingmethods were reported by Khatri *et al.* (2016); Divekar and Trivedi (2020). Similar results were found for feeding the mineral mixture by Sabapara *et al.* (2016).In a similar context, Saurav *et al.* (2023) found that around 71.67% of respondents did not offer mineral mixture to their animals. However, Kumar *et al.* (2019) reported a higher adoption rate of feeding mineral mixture (82%) in the Saharanpur district of Uttar Pradesh. Mineral deficiencies were common in feeds given to animals in the study area. It is believed that up to 70–80% of reproductive issues in animals are mostly brought on by mineral deficits. The use of mineral mixtures is therefore necessary. For this reason, ICAR-NDRI began offering mineral mixture in the research region at subsidized prices.

Farmers' breeding practices have an impact on the genetic potential of the animals, which has long-term consequences for the sustainability of dairy farming. The adoption rate was high for breeding practices like artificial insemination and proper veterinary care for animals with repeat breeding, metritis, endometritis, and anoestrus. However,inseminating animals at the right time of oestrus, and serving animals within 90 days post-calving followed by pregnancy diagnosis between 60 and 90 days after service was moderately adopted.In the Kheda district of Gujrat, Divekar and Trivedi (2017) likewise recorded 82–95 percent of adoptions for artificial insemination. Prajapati *et al.* (2015); Divekar and Trivedi (2020) observed an early higher adoption rate for pregnancy diagnosis in Gujrat. Similar adoption rates for the treatment of reproductive problems were observed by Singh *et al.* (2018).

Correlation between the extent of Adoption of scientific breeding and feeding practices and the socio-economic profile of dairy farmers. Table 3 lists the socio-economic variables affecting the adoption of dairy farmers' scientific animal management practices.

Table 3: Correlation between socio-economic variables and adoption of improved feeding and breeding practices.

Profile	Correlation Coefficient 'r'
Land-holding	0.420**
Household size	-0.085^{NS}
Education	0.198**
Age	0.047^{NS}
Experience in dairy farming	-0.176*
Caste	-0.063^{NS}
Extension contact	0.300**
Annual income	0.202**
Herd size	0.095^{NS}
Milk yield	0.028^{NS}

*p <0.05, ** p <0.01, NS = Non-Significant.

It was observed that the adoption of better dairy animal management methods was significantly correlated with land holding,education and economic status. That may be because dairy farmers had a greater knowledge of the significance of better feeding and breeding methods in dairy farming for boosting productivity and reducing inputs and because their better risk-bearing ability due to higher agricultural land availability, labour availability, social connections and high-income drive economic incentive. These results concur with those of Khode *et al.* (2009). Similar findings were made by Quddus (2012); Gunaseelan *et al.* (2017), who found that family income and education had a positive and significant impact on dairy farmers' adoption levels. Moreover, there was a negative and significant correlation between dairy farming experience and adoption in the present study. This can be the result of experienced farmers' rigidness to accept new technology. Divekar and Trivedi (2020) observed a similar tendency. The information in Table 3 clearly shows that there was a non-significant relationship between the size of the family and the adoption of scientific procedures by dairy producers. The results of Ghosh *et al.* (2004); Vekariya *et al.* (2016) corroborate this result. As well as the caste of respondents had no significant effect on the adoption rate. Because in the study area, General and OBC respondents might be more economically stable as compared to respondents belonging to SC and ST categories. But ICAR-NDRI provided additional support to SC and ST households through special extension programmes. This result is well supported by the report of Sigha *et al.* (2020). Herd size and milk yield had no statistically significant impact on adoption status in the current study. However, Rahman and Gupta (2015); Saha *et al.* (2010) found a positive and significant correlation between the size of the herd, the milk output, and the adoption rate. There was a positive and significant correlation between adoption status and extension contact. This demonstrates that as the level of their extension engagement developed, so did the dairy farmers' adoption of scientific procedures. The connection between local dairy farmers and extension agency i.e., ICAR-NDRI may have helped them develop knowledge and skills, which is the most likely explanation. The results

of the current investigation are consistent with those of Prajapati *et al.* (2015); Divekar and Trivedi (2020).

CONCLUSIONS AND FUTURE SCOPE

According to the study, the total adoption rate of scientific feeding and breeding methods was about 56% and 71%, respectively, in the study area. The correlation between landholdings, education, annual income, and extension contact was extremely significant ($p < 0.01$). Conversely, there was a significant negative connection ($p < 0.05$) between experience in dairy farming and adoption. On the other hand, there was no significant relationship between the adoption of better animal husbandry practices and household size, age, herd size, or milk yield. These associations showed that farmers with higher levels of education, land ownership, annual income, and extension contact may be more likely to adopt more advanced animal breeding and feeding practices. To increase the degree of adoption of scientific dairy animal breeding and feeding practices and other aspects of animal management as well, it is necessary to regularly undertake training and awareness programmes with regard to animal management issues. That would guarantee the dairy cattle owners' long-term economic security.

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Conflict of Interest. None.

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