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Milking wisdom: Unraveling the knowledge tapestry of dairy farmers in storage and packaging of milk and value-added products

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Abstract
Navigating the intricate landscape of dairy farming, this study delves beyond raw milk production to scrutinize the multifaceted realm of value-added products. Focusing on storage and packaging practices, the research evaluates the knowledge dynamics of dairy farmers in Hisar and Kurukshetra districts of Haryana, India. With an average knowledge score of 8.58, farmers showcase commendable understanding despite diverse demographics. The paper unravels correlations between demographic variables and knowledge levels, highlighting the positive impact of age, gender, education, income, and media exposure. Conversely, negative correlations with family type and occupation reveal potential barriers, urging tailored interventions. The study concludes by advocating for continuous research, innovation, and targeted educational programs to fortify the dairy industry's resilience and secure a sustainable future.

Keywords: Knowledge, unravels, conversely, negative

Introduction

Dairy farming is a complex and diverse industry that extends beyond the mere production of raw milk. It encompasses the creation of a wide array of value-added products, such as cheese, yogurt, and butter (Brar *et al*., 2021) [6]. Over the past decade, dairy farming has faced escalating input costs, placing farmers in a challenging cycle of rising expenses. Increasing the herd size alone proves insufficient to boost income significantly. However, by incorporating value-added processes, farmers can potentially augment their income by approximately 20% (Aayog, 2018) [1].

There is a critical need to sensitize dairy farmers to modern practices and scientific interventions that transcend traditional methods of raw milk selling. In addressing these challenges, the adoption of value-added processing emerges as a viable option for dairy firms and wholesalers aiming to maintain or increase profitability. Value addition, as defined by Kuma *et al*., (2011) [7], involves enhancing a product to create form, place, and time utility, thereby increasing the overall value offered by a product or service. Profit margins in the liquid milk segment hover around 4-5%, whereas for Value Added Dairy Products (VADPs), the margins reach a substantial 34% (15-34%) (Ashokkumar, 2015) [3]. Understanding the value-adding techniques employed at the field level is essential to formulate an action plan that addresses the specific needs of dairy farmers.

The success of dairy farmers within this industry is intricately linked to their knowledge and comprehension of optimal practices in storage and packaging. These practices have a direct impact on the shelf life, quality, and safety of dairy products, ultimately influencing market acceptance and overall profitability.

Given the dynamic nature of the dairy industry, characterized by technological advancements and shifts in consumer preferences, it is imperative for dairy farmers to stay informed about the latest developments in storage and packaging methodologies. This paper aims to evaluate the current state of knowledge among dairy farmers, shedding light on the intricacies of storing and packaging both raw milk and value-added dairy products.

Methodology

The study was conducted in the Hisar and Kurukshetra districts of Haryana state, selected randomly for their combined 13.28% share of the total state's population of cattle and buffalo. Utilizing a multistage random sampling method, a total of 120 dairy farmers were selected as respondents from two subdivisions in each district. Subsequently, one block was randomly selected from each subdivision, and three villages were selected from each block. In this manner, 12 villages were chosen from both

districts, with 10 dairy farmers selected randomly from each village. Respondents were limited to those with a minimum of four milch animals at the time of data collection. All recommended practices of value addition to milk were incorporated into this study, covering various aspects, including storage practices, packaging materials, hygiene measures, and knowledge related to the preservation of value-added products. Statistical analysis will be utilized to quantify and interpret the gathered data. The Z-test and coefficient of correlation will be applied to ascertain relationships with demographic variables. This approach aims to offer valuable insights into the existing knowledge landscape of dairy farmers in the specified areas.

$$\text{Z score} = \frac{X - \bar{x}}{\sigma}$$

Where,
X = Standardized random variable
X = Mean of the data
σ = Population standard deviation

$$\text{Coefficient of correlation } (r) = \frac{[\Sigma XY - \frac{(\Sigma X)(\Sigma Y)}{n}]}{\sqrt{[\Sigma X^2 - \frac{(\Sigma X)^2}{n}][\ N\Sigma Y^2 - \frac{(\Sigma Y)^2}{n}]}}$$

Where, r = Coefficient of correlation
n =Number of paired observations being correlated
X= First variable being correlated
Y= Second variable being correlated
ΣXY = Sum of products of X and Y
ΣX = Summation of overall cell entries of the first variable
ΣY = Summation of overall cell entries of the second variable
ΣX^2 = Sum of all squared values of each cell of first variable
ΣY^2 = Sum of all squared values of each cell of second variable
$(\Sigma X)^2$ = Square of sum of overall cell entries of the first variable
$(\Sigma Y)^2$ = Square of sum of overall cell entries of the second variable.

Results and Discussions

The respondents from Hisar and Kurukshetra demonstrated an average knowledge score of 8.30 and 8.85, respectively, pertaining to the storage and packaging of milk and value-added products. Overall, the combined knowledge score for storage and packaging was 8.58 (refer to Table-1). A statistical analysis of the mean difference between respondents from Hisar and Kurukshetra regarding storage and packaging revealed no significant disparity.

Table 1: Distribution of respondents based on knowledge about storage and packaging of milk and value added products

Category	Kurukshetra (n= 60)	Hisar (n= 60)	Overall (N= 120)	Z-value
Low (3-8)	29 (48.33)	33 (55)	62 (51.67)	
Medium (9-14)	29 (48,33)	27 (45)	56 (46.67)	-
High (above 14)	2 (3.33)	0 (0)	2 (1.67)	0.93^{NS}
Mean ± S.E.	8.85±0.42	8.30±0.41	8.58±0.29	

Figures in parentheses indicate percentage

The results were categorized into three levels based on knowledge scores: low (3-8), medium (9-14), and high (above 14), as depicted in Table-1 and Figure-1. Notably, 55% of respondents from Hisar obtained low knowledge scores concerning the "storage and packaging of milk and value-added products," while 45% had a medium knowledge score. In Kurukshetra, a comparable percentage (48.33%) of respondents exhibited low and medium levels of knowledge regarding storage and packaging, with an additional 3.33% possessing a high level of knowledge. These findings align with the results reported by Sharma *et al*., (2018) [9], Singh *et al*., (2018) [12], Ahmed *et al*., (2020) [2], and Singh *et al*., (2021) [11]. Similarly, Raval and Chandawat (2011) [8] and Bhise *et al*., (2018) [5] also noted that respondents exhibited a high level of knowledge in their respective studies. The consistency of these results suggests a common trend among studies, emphasizing the need for further research to explore the factors contributing to varying levels of knowledge among dairy farmers.

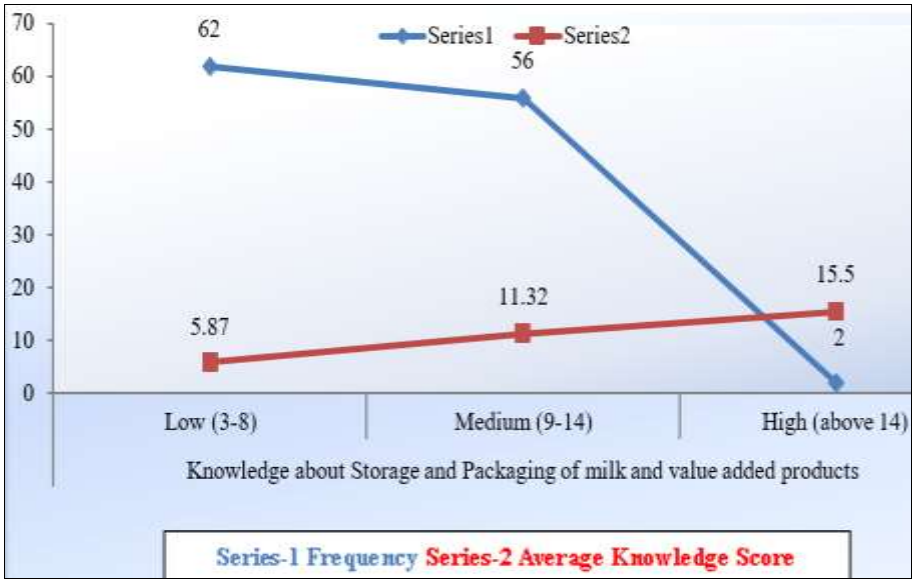

Fig 1: Diagrammatic presentation of distribution of all respondents based on their 4 parts of overall knowledge

Relationship of knowledge about storage and packaging of milk and value added products with antecedent variables

Analysis of Table-2 indicates a clear correlation between various demographic factors and the knowledge levels of dairy farmers regarding the storage and packaging of milk and value-added products. Positive and significant correlations were observed for age (r = 0.256), gender (r = 0.376), education (r = 0.252), family size (r = 0.255), land holding (r = 0.304), herd size (r = 0.265), total milk production (r = 0.262), total milk sale (r = 0.355), annual income (r = 0.359), mass media exposure (r = 0.451), and extension contact (r = 0.318). Shayo (2013) conducted a study with analogous outcomes. These findings suggest that certain demographic characteristics contribute positively to farmers' knowledge in this domain.

The positive correlation with age implies that older farmers may have accumulated practical experience and knowledge over time, enhancing their proficiency in storage and packaging practices. Similarly, the positive correlation with higher income levels indicates that financial resources may play a crucial role in adopting advanced storage and packaging techniques. Furthermore, exposure to mass media was found to be positively correlated with knowledge, emphasizing the role of external information sources in enriching farmers' understanding.

Conversely, family type (r = -0.400) and occupation (r = -0.281) exhibited significant but negative correlations with knowledge about storage and packaging. Best and Kneip (2011) discovered comparable findings. This suggests that specific family structures and occupational backgrounds may pose challenges to acquiring knowledge in this domain. Further exploration is essential to understand the dynamics influencing these negative correlations, and interventions should be designed to address potential barriers faced by farmers in these categories.

Table 2: Correlation between independent variables and 4 parts of overall knowledge score

Sr. No.	Attribute	Knowledge about Storage and Packaging of milk and value added products
1.	Age	.256**
2.	Gender	.376**
3.	Education	.252**
4.	Family type	-.400**
5.	Family size	.255**
6.	Occupation	-.281**
7.	Land holding	.304**
8.	Herd size	.246**
9.	Total milk production	.262**
10.	Total milk sale	.355**
11.	Annual income	.359**
12.	Mass Media exposure	.451**
13.	Extension contact	.318**

**Significant at the 0.01 level (2-tailed) *Significant at the 0.05 level (2-tailed)

Conclusions

In the dynamic landscape of dairy farming, where challenges of rising input costs persist, this study underscores the pivotal role of knowledge in shaping the success of farmers, particularly in the realms of storage and packaging of milk and value-added products. Our findings from Hisar and Kurukshetra indicate an average knowledge score of 8.58, with respondents demonstrating a commendable grasp of storage and packaging practices. The absence of significant differences between the two regions implies a consistent knowledge level among dairy farmers, despite varied demographics. The correlation analysis shed light on the positive influence of variables like age, gender, education, income, and exposure to mass media and extension services on farmers' knowledge. On the flip side, family type and occupation exhibited negative correlations, indicating potential barriers that demand careful consideration.

Suggestions

1. **Tailored Educational Programs:** Develop targeted educational initiatives focusing on storage and packaging practices, considering the specific needs and challenges faced by farmers in different demographic categories.
2. **Knowledge Dissemination:** Employ diverse channels, including mass media and extension services, to disseminate information and best practices, ensuring that farmers stay abreast of the latest developments.
3. **Demographic-specific Interventions:** Recognize the influence of demographic variables on knowledge levels and design interventions that address the unique challenges faced by farmers based on age, family type, and occupation.
4. **Research and Innovation:** Encourage continuous research and innovation in storage and packaging methodologies, with a focus on practical applications at the field level. This can contribute to sustained knowledge enhancement among dairy farmers.

In conclusion, by bolstering the knowledge base of dairy farmers and addressing demographic specific challenges, the industry can fortify its resilience, navigate evolving market demands, and secure a sustainable future.

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