Constraints in Adoption of clean and safe milking techniques by dairy farmers in Kerala :An assessment

Abstract

Aim: The constraints involved in the adoption of clean and safe milk production practices were identified from a sample of 210 farmers covering three major districts of Kerala i.e. Kollam, Thiruvananthapuram, and Palakkad randomly. Average adoption score of 65 out of 95 practices indicated the need to sensitize the farmers for adoption of clean and safe milk production practices.
Methodology: constraints involved in the adoption of clean and safe milk production practices were identified and ranked using Garrett's ranking technique. Kendall rank correlation was used to estimate the ordinal association of the ranks given to constraints by the farmers.
Results: Lack of information about clean and safe milk production practices was identified to be the major constraint faced by the farmers followed by high cost of inputs, lack of finance, lack of infrastructure and constraints on the availability of land. Lack of finance, high cost of inputs and constraints on the availability of land were found to be strongly correlated to each other, having a cumulative adverse effect on the adoption of Clean and Safe Milking Practices.

Keywords : constraints, Garrett's ranking, Kendall coefficient,

Introduction

India is the largest milk producing nation in the world arena and anticipated would account for more than half the growth in global milk production over the next twenty years[1]. With an increase in income per capita of the country the consumption of milk and milk products is expected to increase[2]. More over the dairying has become an integral secondary source of income for the rural farmers engaged in livestock and agriculture[3]. The central government had laid more emphasis in the growth of dairy industry as one of the pertinent route to double farmers' incomes and contribute to national Gross Domestic Product[4]. Since ages the consumption of milk is associated with health benefits. Milk intake can be a proxy for good overall nutrition, and dairy products provide access to nutrients (e.g., calcium in milk), which promote the growth and development of young children[5]. Most of the milk produced in India is consumed domestically as either milk or milk products (butter/clarified butter/ghee, yoghurt/curd, cheese/paneer, flavoured milk and ice cream etc.). Clean milk produced from healthy animal characterized by normal flavour, devoid of dirt, and essentially free from adulterants, various toxins, abnormal residues[6]. The state currently represents the twelfth largest dairy market in India. The volume of dairy market in terms of production

and sales are high in Kerala as per Dairy Development Department, Government of Kerala the volume of 2.5 billion liter of bovine milk production in the year 2019.At the same times, studies have proven that there is a huge gap between the desired and achieved milk quality in Kerala [6]. Clean and Safe Milk Production Index (CSMPI) was constructed after broadly considering the following parameters *viz.* Practices related to hygiene, Practices related to storage, Practices related to animal health and milking environment, Practices related to risk of contamination hazard [7]. The present study was an attempt to analyze the adoption behaviour of different clean and safe milk production practices by dairy farmers in Kerala.

Method and materials

Kerala state covers an area of 38,863 km^2 in the southern part of the country and bounded along, by the Western Ghats to the east and the Arabian Sea to the west. It is surrounded by the states of Tamil Nadu to the east and Karnataka to the north, as well as the Arabian Sea to the south and west. It is situated between 8° 18' and 12° 48' north latitude and 74° 52' and 77° 22' east longitude. Three districts, Kollam, Thiruvananthapuram, and Palakkad were randomly selected. 70 farmers from each district cumulating total of 210 farmers were selected for the study. The primary data were collected from 210 farmers by an exhaustive schedule covering all the information needed for the study Part 1 of the schedule pertained to Socio-economic characteristics and assets related to livestock. Section 2 of the schedule related to the adoption of clean and safe milk production practices, milk marketing and constraints faced in adoption. A random dairy farm's choice to adopt different clean and safe milk production practices are governed by non-observable utility function that is dependent on observed covariates (Z).

$$U_i^* = f\ (Z_i, \eta_i)\ where, U_i = \begin{cases} 1 & if\ U_i^* > 0 \\ 0 & otherwise \end{cases} \ldots (13)$$

where, U_i^* is utility indicator for dairy farm's choice to adopt clean and safe milk production practice, Z_i is the set of observed covariates viz. Age, Education, Herd composition (ratio of cross-bred to indigenous), Herd size etc., and is random error term explaining unobserved utility benefits for i^{th} individual dairy farmer [8].

Let us assume the outcome functions where the farmer faces two regimes: (1) to be an

adopter, and (2) to be a non- adopter, can be represented as follows:

Regime 1: $Y_{1i} = X_{1i}\beta_1 + \varepsilon_{1i}$, $if\ U_i = 1$…. (14)

Regime 2: $Y_{2i} = X_{2i}\beta_2 + \varepsilon_{2i}$, $if\ U_i = 0$…. (15)

Where Y_{1i} and Y_{2i} are outcome variables, which represent the economic parameter (yield/income) per animal obtained under regimes 1 and 2 and X_i symbolizes a vector of covariates included in Z , and β is a vector of the parameters to be estimated. All the famers having adoption score less than mean adoption score were taken as non- adopters and farmers having adoption score above the mean value were considered adopters [9]. To identify constraints in adoption of clean and safe milk production practice at farm level as perceived by farmer, determinants will be identified and prioritized using Garrett's ranking technique from primary data collected and will be validated.

Percentage position=$\frac{100\,(R_{ij}-0.50)}{N_j}$, where, Rij =Rank given for the ith item by the jth individual, Nj =Number of items ranked by the jth individual.

Kendall τ test is a non-parametric hypothesis test for statistical dependence based on the τ coefficient. Kendall rank correlation coefficient, (Kendall's τ coefficient) will be used to measure the ordinal association between identified constraints.

$\tau = \frac{(number\ of\ concordant\ pairs - number\ of\ discordant\ pairs)}{\binom{n}{2}}$; where, $\binom{n}{2}$ is the binomial coefficient for the number of ways to choose two items from nitems.

The constraints involved in the adoption of clean and safe milk production practices were identified and ranked using Garrett's ranking technique. Kendall rankcorrelation was used to estimate the ordinal association of the ranks given to constraints by the farmers.

Results and discussion

The constraints faced by the farmers in the adoption of clean and safe milkproduction practices were identified (Table 2) and prioritized using Garrett's ranking technique. The biggest constraint was ranked 1 and vice versa for others. Using Garrett's ranking technique, Lack of information about clean and safe milkproduction practices was identified to be the major constraint faced by the farmers as observed by [10] on the Hazards Analysis and Critical Control Points (HACCP) and food safety programs (FSPS) employed by the dairy industry in Aydin, Turkey and identified lack of knowledge regarding HACCP and high costs involved as main barriers in its implementation. 46.5 per cent of the respondents reported not

really knowing what HACCP was, while 35.8per cent reported that it was too expensive.

Further the dairy farmers in Kerala also mentioned the high cost of inputs, lack of finance, lack of infrastructure and constraints on the availability of land. High cost of feed, followed by high cost of veterinary medicine were identified as major constraints as suggested by [11] **as** lack of education of the managers, small volumes of milk handled by the firms in Turkey, limited availability of resources, processors reluctant to apply the regulations set up by the government, etc., were identified as the major constraints by **[12].**

Association among constraints

Lack of finance, high cost of inputs and constraints on the availability of land were found to be strongly correlated to each other, having a cumulative adverse effect on the adoption of CSMP. Using Garrett's ranking technique; lack of information about clean and safe milk production practices was identified as the major constraint faced by the farmers followed by high cost of inputs, lack of finance, lack of infrastructure and constraints on the land availability etc. Lack of finance, high cost of inputs and constraints on the availability of land were found to be strongly correlated to each other, having a cumulative adverse effect on the adoption of CSMP [7].

Conclusions

Lack of knowledge about CSMP was found to be the major constraint. It was also observed that, better institutional support to dairy farmers and increasing awareness through training programs will help in increasing the extent of clean and safe milk production in the state. Paying higher price for milk by cooperatives, as a price support can act as an incentive for the adoption of CSMP practices as we have seen from the study that adoption of Dairy Cooperative marketing channel encourages clean and safe milk production. Lack of knowledge about clean production practices was identified as the major constraint in the study, thus indicating the significance of training programs in the state

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Table 1: Different practices of clean and safe milk production

Practices related to Hygiene	Practices related to Storage	Practices related to Animal healthand milking environment	Practices related to risk of contamination hazard
Cattle milked separately fromthe stall	Milk from diseased animal keptseparately	No faeces in the animal body	Floor of stall feed area kept welldrained daily
The floor of milking area keptwell-drained daily	Milk from seriously diseased/ infected animals discarded	Diseased animals isolated	Floor of stall feed area kept clean daily
Floor of milking area cleaneddaily	Milk stored separately from theanimal shed	Animals washed regularly	Dung disposed immediately after excretion
Hands washed before milking	Floor of milk storage area driedregularly	Animal drinks clean water	Urine drained immediately after excretion
Hands dried before milking	Milk storagearea swept regularly	Dry cow therapy	Chemicals used in dairy area
Hands sanitizedbefore milking	Milk storage area washed regularly		Chemicals used as per instruction
Utensils without joints	Milk storage area kept free ofpests		Workers wear suitable clean clothes
Utensils dried before milking	Milk containers used for bulkingwithout joints		Nails trimmed regularly
Utensils cleaned before milking	Milk containers used for bulkingwashed regularly		Cuts/wounds covered with appropriatewaterproof dressing
Utensils sanitized	Powder/baking soda mixed before selling milk		Dairy farm inspected regularly
Utensils washed immediatelyafter milking			Store empty containers/utensils
Milk thrown after use of medicine			
Udders/ teats cleaned beforemilking			
Udders/ teats dried before milking			
Udders sanitized			
Milk pasteurized and labelled			

Table 2 Constraints identified, with the ranks and scores obtained

Constraints	Ranks	Scores
Lack of knowledge about clean milkproduction practices	1	102.74
High cost of inputs	2	101.89
Lack of finance	3	97.43
Lack of infrastructure	4	96.62
Constraints on the availability of land	5	94.98

Table 3 Kendall rank correlation among the scores of identified constraints

	Hygiene related CSMPI	Health and milking environment relatedCSMPI	Storage related CSMPI	Risk of Contamination Hazard related CSMPI
Hygiene related CSMPI	1.000			
Health and milking environment relatedCSMPI	0.025	1.000		
Storage related CSMPI	0.280***	0.374***	1.000	
Risk of Contamination Hazard related CSMPI	0.161***	0.118**	0.290***	1.000

Table 4: Weights assigned to Practices for Hygiene for Index development

Sl.no	Practice	Weightage out of 100
1.	Cattle milked separately from stall	10
2.	The floor of milking area kept well-drained daily	5
3.	Floor of milking area cleaned daily	3
4.	Hands washed before milking	8
5.	Hands dried before milking	4
6.	Hands sanitized before milking	10
7.	Utensils without joints	10
8.	Utensils dried before milking	2
9.	Utensils cleaned before milking	8
10.	Utensils sanitized before milking	10
11.	Milk thrown after use of medicine	10
12.	Udders/ teats cleaned before milking	10
13.	Udders/ teats dried before milking	5
14.	Udders sanitized before milking	5
	Total weightage	100

Table 5: Weights assigned to Practices for Storage for Index development

Sl No	Practice	Weightage out of 100
1.	Milk from diseased animal kept separately	15
2.	Milk from seriously diseased/ infected animals discarded	10
3.	Milk stored separately from the animal shed	10
4.	Floor of milk storage area dried regularly	10
5.	Milk storage area swept regularly	2
6.	Milk storage area washed regularly	8
7.	Milk storage area kept free of pests	20
8.	Milk containers used for bulking without joints	10
9.	Milk containers used for bulking washed regularly	10
10.	Powder/ baking soda mixed before selling milk	5
	Total weightage	100

Table 6: Weights assigned to Practices for Animal Health and Milkingenvironment for Index development

Sl. No	Practice	Weightage out of 100
1.	No faeces in the animal body	25
2.	Diseased animals isolated	30
3.	Animals washed regularly	20
4.	Animal drinks clean water	5
5.	Dry cow therapy	20
	Total weightage	100

Table 7: Weights assigned to Practices for Risk of Contamination Hazardfor Index development

Sl. No	Practice	Weightage out of 100
1.	Dung disposed immediately after excretion	10
2.	Urine drained immediately after excretion	10
3.	Chemicals used in dairy area	10
4.	Chemicals used as per instruction	20
5.	Workers wear suitable clean clothes	5
6.	Nails trimmed regularly	20
7.	Cuts/wounds covered with appropriate waterproofdressing	10
8.	Dairy farm inspected regularly to ensure safety ofoverall farm	10
9.	Store empty containers/utensils in refrigerator	5
	Total weightage	100