

## Analysis of knowledge and adoption level of the dairy farmers regarding clean milk production (CMP) practices

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### ABSTRACT

The milk quality is determined by aspects of composition and hygiene of milk, where breeding, feeding, management of healthcare, fodder production, and many such facts mainly influence the compositional quality. Dairy farmer is the key client in this process, who decides the quality of milk from feeding of the milch animal to dairy product supply chain. This study was conducted to know the level of knowledge and adoption of dairy farmers regarding clean milk production practices. Rajasthan state was selected purposively for this study, where 120 dairy farmers from the milk shed area of four districts milk union were selected. The results of the study revealed that 55.84 per cent of the dairy farmers had medium level of knowledge in various aspects of CMP, followed by 33 and 20 per cents of them having low and high level of knowledge, respectively. They had highest knowledge in 'Housing' [Knowledge Index (KI)=85.83], followed by 'Milking' (KI=76.66). However, they had poor knowledge in 'Cleaning of animal' (KI=50.41) and 'Cooling of milk' (KI=57.91). It was observed that 71.67 per cent of the dairy farmers had medium level of adoption in various aspects of CMP, followed by 13.33 and 15.00 per cents of them having low and high level of adoption, respectively. It was also found that they adopted recommended practices of 'Transportation' up to maximum extent with Adoption Index (AI) of 86.50, followed by 'Feeding' (AI=68.68), however, extent of adoption regarding 'Cleaning of utensil' (AI=43.40) and 'Healthy herd management' (AI=45.23) was found less.

**Key words:** Adoption, CMP, DCS, Knowledge, Milk Unions.

### INTRODUCTION

In India fast deterioration in milk quality has been observed by the time it reaches from milk producer to processing plant. One of the major factors for low export of our dairy products has been the quality and safety aspects of the raw milk. Consumers all over the world have become quality conscious and prefer high quality products (Singh and Gupta, 2014). This needs to be taken into consideration of strictly follow the Clean Milk Production (CMP) practices at the household level. Clean milk can be defined as milk coming from healthy milch animal possessing normal flavour, devoid of dirt and filth containing permissible limit of bacteria and essentially free from adulterants, pathogens, various toxins, abnormal residues, pollutants and metabolites (Gupta, 2003). The efforts were initiated by the National Dairy Development Board (NDDB) in collaboration with different dairy federations of various states to introduce the practices of CMP at the village level to meet the present day challenges. These initiatives are intended towards attaining milk quality at all stages from producer to consumer. The CMP involves thorough cleanliness at all phases of handling and stringent quality control and hygienic measures have to be adopted at farm level. The milk quality is determined by aspects of composition and hygiene of milk.

Breeding, feeding, management healthcare and many such facts mainly influence the compositional quality. Dairy farmer is the key client in this process, who decides the quality of milk from feeding of the milch animal at *pail* (milking stage at dairy farmers home) level to dairy product supply chain i.e. DCS system. So, this study was purposively conducted to assess the level of knowledge and adoption of dairy farmers in the study area.

### MATERIALS AND METHODS

The study was conducted in dairy cooperative system of Rajasthan state. Rajasthan Cooperative Dairy Federation (RCDF) is having 21 district cooperative milk unions. The milk shed area of four district milk unions (*viz. Alwar, Bhilwara, Bikaner and Hanumangarh*) was selected by using multistage proportionate random sampling procedure. Four Dairy Cooperative Societies (DCS) from each union were selected (*viz. Alwar (Bhuda, Karanpura, Mundawar, and Bagthala); Bhilwada (Dhanpura, Suras, Irans, and Lambiaklna); Bikaner (Jegla, Palana, Barsingsar, and Janglu); Ganganagar & Hanumangarh (Salamgarh, Kola, Talwada, and CJSW)*), and a list of dairy farmers was prepared from each DCS, who were poding milk for the last two years. Continuously, a total of 120 farmers were selected on the basis of proportionate random sampling from each

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selected DCS. The data were collected finally from all the selected 16 DCSs and 120 respondents.

**Knowledge about CMP Practices:** It refers to the extent of information possessed by and understanding of the respondent about selected scientific dairy farming practices used for CMP. A knowledge test was developed based on the principle of “*Teacher Made Type Test*”. Teacher made tests are those which develop by the teacher to test the knowledge of the student. This test was used by different researchers in the past in field of agriculture and in dairying for measuring the knowledge respondents.

The items for this test were selected with the consultation of scientists of NDRI, subject matter specialists from NDDB, different milk union’s quality control and extension staff, field veterinarians and reviewing literature and previous research studies. The selected items were divided into following heads: housing, healthy herd, feeding, cleaning of animal and udder, milking, cleaning of utensils, cooling of milk and transportation. To quantify the responses of individual dairy farmer, the data were collected on the basis of dual ended responses i.e. Yes (score 1) and No (score 0). The following formula was used to measure the knowledge index of all aspects of CMP practices

$$\text{Knowledge Score} = \frac{\text{Score obtained}}{\text{Maximum obtainable score}} \times 100$$

**Adoption of CMP practices:** Adoption of CMP refers to the practices recommended for quality milk production is in continuous use by the dairy farmers of the study area. A schedule was developed to ascertain the adoption level of dairy farmers in which, included items from different aspects of CMP. The same aspects of knowledge were used for measuring the level of adoption. To calculate the quantitative score of individual respondent, the data were collected on the basis of four point continuum scale *viz.* always, most frequently, some times and never with the score of 3, 2, 1 and 0, respectively. To measure the individual respondent adoption level score following formula was used:

$$\text{Adoption Score} = \frac{\text{Score obtained}}{\text{Maximum obtainable score}} \times 100$$

## RESULTS AND DISCUSSION

### Knowledge level of the dairy farmers regarding CMP practices

**Knowledge regarding housing of animals:** A close perusal of Table 1 indicated that 55.84 per cent of the farmers had medium level of knowledge regarding housing of animals. On the other hand 22.50 percent dairy farmers were in high knowledge category, followed by 21.66 percent had low level of knowledge regarding housing. The knowledge index of this aspect (85.83) was highest than all other aspects. In the present study, the research area was basically from desert part of Rajasthan, where dairy farming is the traditional

enterprise. Most of the farmers had good knowledge regarding general practices *viz.* availability of potable water, provision of proper aeration, disposal of wastes (for this purpose all the farmers in *Bhilwara* region using traditional method of compost making), plenty of bedding etc. because they were using it from last several years. The overall performance regarding knowledge in this aspect was highest in *Bhilwara* followed by *Bikaner* milk union area.

**Knowledge regarding healthy herd management:** Data in Table 1 revealed that 65.00 per cent farmers had medium level knowledge regarding healthy herd management, followed by low and high category with equal percent of 17.50, respectively. Further their knowledge index (KI) was 62.72, which is a good score for knowledge. Healthy herd management aspect included items *viz.*, diagnosis their local treatments, vaccination schedule, mastitis control etc. Farmers in study area having close attachments with their animals from generation to generation might be responsible for their caring nature towards their animals. They had awareness of contagious diseases and used vaccination against them. Most of the respondents were able to identify symptoms of different disease like Foot and Mouth Disease (FMD), Rinder Pest (RP), Black Quarter (BQ), *Hemorrhagic Septicemia* (HS) and the Clinical Mastitis [sometimes at sub-clinical stage by using mastrip, (mestrip is a litmus type paper which developed by NDDB for checking the mastitis according to its stages)] as they had long experience in rearing of animals, particularly cattle and buffaloes.

**Knowledge regarding feeding practices:** A close perusal of data revealed that 70.00 per cent of the dairy farmers had medium level of knowledge regarding feeding practices, followed by those having high (23.34%) and low (6.66%) level of knowledge, respectively. A critical observation of the results suggested that the calculated KI (69.16) among the respondents was higher than some other aspects and, meanwhile it is also a basic aspect of CMP. So, it is good indication for programmers or respective milk unions to provide technology in the form of product or knowledge, which enhances the milk quality. The present study was conducted under cooperative system of Rajasthan, where feeding materials like concentrates, minerals mixtures, seed of high yielder fodder crops and some growth promoters were provided by milk union, on reliable cost with all relevant information regarding use and manufacturing, resulting in higher scores in the present study. The major brand of concentrates was *SARAS Pasuuhar*, which was manufactured by RCDF at their feed plants in *Jodhpur* and *Bikaner*

**Knowledge regarding cleaning of animals:** Cleaning of animal is first step in hygienic maintenance of CMP followed by cleaning of milker and utensils. The figures presented in Table 1 showed that most of the respondents (80%) were in medium category for the knowledge of cleaning of animals,

whereas, 10.84 per cent were in low knowledge category, followed by 9.16 percent in high level, respectively. Further, it can be seen from the table that the calculated KI, was the lowest apropos CMP practices (among the different aspects of CMP starting from housing to transportation) i.e. 50.41. The main emphasis in animal cleaning are cleaning before and after the milking by using clean water followed by rinsing with a cloth. Water is an issue of major crisis in Rajasthan particularly in *Bikaner* and *Bhilwara*, where a farmer spent his lot of time and energy for arranging water for their domestic consumption, hence respondents are difficult to get water for cleaning of animals that is why dry animal cleaning is most utilized and lack of knowledge regarding these modern practices. This particular situation is an impediment in adoption of cleaning udder with water. Hence, brushing and dry animal cleaning are more relevant in this part of the country.

**Knowledge regarding milking practices:** The milking practices include methods of milking, cleaning of milker, use of teat dipping, collection of first milk after stripping in separate utensil etc. All these practices are recommended under CMP, which are disseminated through different training programmes, group meetings, and educational tours and by milk route supervisor to the dairy farmers in all the selected milk unions as a routine work. The data presented in Table 1 showed the effect of all these activities, where the

KI (76.66) was second highest in all aspects of CMP. The table also indicated that majority of respondents (74.16%) were in medium category, followed by 20 per cent in low level category of knowledge. Only 5.84 percent of farmers had high level of knowledge in this aspect, but mean value of medium category was 5.6, which indicate that out of 9 items, they had knowledge of 5 to 6 items.

It was very interesting to know that most of the farmers under CMP route in *Alwar* and *Bhilwara* had good knowledge on teat dipping as well as cleaning of udder by using clean cloth, but in *Hanumangarh* and *Bikaner* union found that they had poor knowledge.

**Knowledge regarding cleaning of utensils:** Cleaning of utensil is the major part of CMP practices, where utensil is prone to aspects related to milk quality deterioration. So, there was an urgent need was felt to know the knowledge level of dairy farmers regarding cleaning of utensils. Table 1 revealed that 69.16 percent farmers had medium level of knowledge, followed by 18.34 percent in high level of knowledge category. It was found that only 12.50 percent farmers had low level of knowledge regarding this aspect. Knowledge index is shown somewhat satisfactory results with 65.62 score. All the DCS secretaries of CMP milk route areas had good knowledge about cleaning of utensils and they disseminated it to their members, regularly. The overall observation of *Bikaner* union milk shed area was appreciable,

**TABLE 1** Knowledge level of dairy farmers in various aspects of CMP practices

Aspects	Category	Criteria(Score)	Frequency(n=120)	Percent	Knowledge Index
Housing	Low	<5.34	26	21.66	85.83
	Medium	5.34 to 6.67	67	55.84	
	High	>6.67	27	22.50	
Healthy herd management	Low	<4.48	21	17.50	62.72
	Medium	4.48 to 9.31	78	65.00	
	High	> 9.31	21	17.50	
Feeding	Low	<1.88	8	06.66	69.16
	Medium	1.88 to 3.65	84	70.00	
	High	>3.65	88	23.34	
Cleaning of animal	Low	<0.88	13	10.84	50.41
	Medium	0.88 to 3.14	96	80.00	
	High	>3.14	11	09.16	
Milking	Low	<5.6	24	20.00	76.66
	Medium	5.6 to 8.19	89	74.16	
	High	>8.19	7	05.84	
Cleaning of utensils	Low	<1.69	15	12.50	65.62
	Medium	1.69 to 3.55	83	69.16	
	High	>3.55	22	18.34	
Cooling of milk	Low	<0.66	43	35.84	57.91
	Medium	0.66 to 2.07	60	50.00	
	High	>2.07	17	14.16	
Transportation	Low	<2.07	29	24.16	73.12
	Medium	2.07 to 3.93	56	46.68	
	High	>3.93	35	29.16	
Overall	Low	<25.11	33	27.50	69.74
	Medium	25.11 to 38.32	67	55.84	
	High	>38.32	20	16.66	

because most of the dairy farmers were using dry cleaning (dry cleaning of utensils is a traditional practice in western part of Rajasthan due to less sticky soil and scarcity water) of utensil as well as animal and they were more aware about cleaning from pail level.

**Knowledge regarding cooling of milk:** Cooling of milk is an issue of discussion not only in the Indian condition but, in whole tropical milk producing countries of the world. The milk quality is mostly in the hands of bacteria which are already available in milk and after getting higher temperature it increase by just double after every 20 minutes and cooling of the milk is only alternate for the inhibiting its growth. Present study revealed that half of the respondents came under medium category followed by 35.84 percent in low category of knowledge level. On the other hand only 14.16 per cent farmers had high level of knowledge regarding cooling of milk. Further, it can be seen from table that the calculated KI was 57.91 which was somewhat low than other aspects. It might be due to the lack of emphasis given by route supervisors on cooling of milk.

For instance of *Alwar* union, where market competition was very high, and route supervisors were more emphasizing on quantity rather than quality. This may be a probable reason for the low knowledge level of farmers on milk quality.

**Knowledge regarding transportation of milk:** In case of transportation of milk, Table 1 indicated that, near about half of the respondents (46.68%) had medium level of knowledge; whereas, 29.16 percent of them belonged to high level knowledge category. On the other hand 24.16 percent of the farmers had low level of knowledge regarding this aspect. Further, their KI was 73.12, which was relatively high. In the research area it was found that, all the members of DCSs were aware about regular time schedule of milk collection and milk van's trip at society. The milk transportation van is also used as vehicle for animal feed supply as well as emergency service for animal health, which was the reason behind high KI of this aspect.

**Overall knowledge regarding CMP practices:** Table 1 revealed that 55.84 percent of the dairy farmers had medium level of overall knowledge regarding CMP practices, followed by those (27.50%) having low level of overall knowledge. On the other hand, 16.66 percent of the respondents had high level of overall knowledge when all the eight aspects were combined together.

These findings were in conformity with of Maity (1999), Saha (2002), Das (2003), Jayrao (2005), Sarangi (2006), Patil et al. (2009), Vidya et al. (2009), Kumar et al. (2011), and Senthilkumar et al. (2013).

Further analysis of data indicated that the knowledge index of the respondents, on the overall basis, was 69.74. Therefore, it can be concluded that the entire samples of respondents were possessing adequate knowledge regarding CMP practices.

### **Adoption level of the dairy farmers regarding CMP practices**

**Adoption level of housing practices:** A close perusal of data presented in Table 2 indicated that 80 per cent of the dairy farmers had medium level of adoption regarding housing of animals. On the other hand 13.33 percent of them were in high adoption category, followed by 6.67 percent had low level of adoption regarding housing. The further analysis showed the extent of adoption of this aspect, which were 58.47.

These results were somewhat satisfactory because, as we discussed earlier that, the dairy is a traditional business in Rajasthan, which developed a good framework of set of practices for its different aspects in farmer's community. It was interesting to know that, some practices like, use of bovine disposals for compost making, open housing, use of clean potable water at community water center, daily cleaning of animal house etc were generally in practice as a part of their traditions. Some practices which, were not in use like regular white washing in cattle shed, use of disinfectants for keeping the cattle shed free from-ants, flies, cockroaches etc, might be due to high cost of white washing and disinfectants, which may reduce benefits from dairy business.

**Adoption level of healthy herd management:** The figure presented in Table 2 revealed that 75.84 percent farmers had medium level of adoption regarding healthy herd management, followed by 10.82 percent in low and 13.34 percent in high category of adoption. The Adoption Index (AI) of this aspect was 45.23, which is very less in comparison with other aspects. The reasons behind this were no availability of health care practices in nearby villages, high cost of veterinary medicines, lack of knowledge about contagious diseases, unawareness about severity of diseases and development programmes launched by public departments.

**Adoption level of feeding practices:** In case of feeding practices, Table 2 indicated that 65.84 per cent of the dairy farmers had medium level of adoption followed by those who were having high (21.66%) and low (12.50%) level of adoption, respectively. A critical observation of the results suggested that the calculated Adoption Index (68.68) among the respondents was higher than some other aspects and, meanwhile it is also a basic aspect of CMP. The present study was conducted under cooperative system of Rajasthan, where feeding materials like concentrates, minerals mixtures, seed of high yielding fodder crops and some growth promoters were provided by union at reliable cost with all relevant information regarding use and manufacturing, leading to higher scores. The major brand of concentrates was *SARAS Pasuahar*, which manufactured by RCDF at their feed plants. Interestingly it was observed in *Alwar, Bikaner* and *Bhilwara* union, where hay making used as a general practice by which, they provide good quality fodder for whole year to their animal.

**Adoption level of cleaning of animals:** Table 2 revealed that half of the respondents (50.84%) were in medium category for the adoption of cleaning of animals, whereas, 30 percent in high adoption category followed by 19.16 percent in low level, respectively. Further, it could be seen from the table that the calculated Adoption Index was very less i.e.47.50. The main items in animal cleaning were cleaning before and after of milking by using water followed by wiping with clean cloth.

**Adoption level of milking practices:** It is evident from the Table 2 that the majority of respondents (75%) were in medium category, followed by 19.16 percent in high level category of adoption. Only 5.84 per cent of farmers had low level of knowledge in this aspect. A close perusal of table showed that the knowledge and adoption level of this aspect was almost similar, which indicated the efficiency of CMP programme. Further, their AI was 62.70, which is a satisfactory figure. It might be due to the adoption of teat dipping after milking, use of clean cloth for dry cleaning, removal of fore stripping of milk in separate utensil by farmers under CMP route in *Alwar* and *Bhilwara* union.

**Adoption level of cleaning of utensils:** It is apparent from the Table 2 which revealed that 74.16 per cent farmers had medium level of adoption, followed by 16.67 percent in high level of adoption category. Only 9.17 percent farmers had low level of adoption regarding this aspect. Further, it can

be seen from the table that the calculated AI, was the lowest apropos all the different aspects of CMP. It was observed that generally milking utensils (both for milking as well as pouring) were distributed by respective milk unions at the subsidized rate, but they did not prefer narrow mouth pails, this may be reason for not a single respondent used it, which was essential as per CMP practices. Other than this high cost of detergents and unawareness about cleaning of utensil were important factors, which hindered the adoption level of this particular aspect. One more important factor observed in this line was that, DCS secretary had the major role for enhancing the adoption level of all the practices, but most of non-CMP route secretaries did not tell their members about cleaning of utensils.

**Adoption level of cooling of milk:** The data reported in Table 2 depicted that a large number of respondents i.e. 86.67 percent had medium level of adoption, as compared to 12.5 percent having low level of adoption. Interestingly there was a single farmer *Sh Hakikat Singh* in high category of adoption. He was an exception in *Hanumangarh* milk union's *Chack Jawala Singh Wala* (CJSW) DCS, who used refrigerator for cooling of his milk before pouring at the society. Further, it could be seen from table that the calculated AI was 48.19 which was lower than other aspects. Cooling of milk was an issue of debate in farmers community because, high cost of cooling units, lack of incentives for cooling of

**TABLE 2** Adoption level of dairy farmers in various aspects of CMP

CMP aspects	Category	Criteria(Score)	Frequency(n=120)	Percent	Adoption Index
Housing	Low	<8.88	8	06.67	58.47
	Medium	8.88 to 12.16	96	80.00	
	High	>12.16	16	13.33	
Healthy herd management	Low	<6.76	16	13.34	45.23
	Medium	6.76 to 12.23	91	75.84	
	High	>12.23	13	10.82	
Feeding	Low	<6.73	15	12..50	68.68
	Medium	6.73 to 9.74	79	65.84	
	High	>9.74	26	21.66	
Cleaning of animal	Low	<4.41	23	19.16	47.50
	Medium	4.41 to 6.98	61	50.84	
	High	>6.98	36	30.00	
Milking	Low	<11.75	7	05.84	62.70
	Medium	11.75 to 18.34	90	75.00	
	High	>18.34	23	19.16	
Cleaning of utensils	Low	<2.77	11	09.17	43.40
	Medium	2.77 to 7.64	89	74.16	
	High	>7.64	20	16.67	
Cooling of milk	Low	<2.44	15	12.50	48.19
	Medium	2.44 to 3.33	104	86.67	
	High	>3.33	1	00.83	
Transportation	Low	<11.53	19	15.84	86.50
	Medium	11.53 to 14.41	78	65.00	
	High	>14.41	23	19.16	
Overall	Low	<60.87	16	13.33	58.40
	Medium	60.87 to 79.30	86	71.67	
	High	79.30	18	15.00	

milk, unavailability of electricity were the major obstacles in this aspect. One another aspect which was found in *Alwar* union where market competition was so high was that in the particular route supervisors were emphasizing on quantity rather than quality, probably because of where the member farmers did not bother much about cooling of milk.

**Adoption level of transportation of milk:** In case of transportation of milk, Table 2 indicated that, the large number of the respondents (86%) had medium level of adoption; whereas, 19.16 per cent of them belonged to high knowledge category. On the other hand 15.84 percent of the farmers had low level of adoption regarding this aspect. Further, their AI was 86.50, which is highest in comparison with all aspects. In the research area it was found that, all the members of DCSs were aware about time of milk collection and trip of milk van at society, which motivate them for early pouring of milk. The milk transportation van is used as vehicle for animal feed supply as well as emergency service for animal health, which was the reason behind high AI of this aspect. It was found that all the DCSs of *Bhilwara* and most of CMP occupied milk routes of other union's the farmer poured their milk at DCS within two hours of milking, which is a very good indication for improving the milk quality.

**Overall adoption level regarding CMP practices:** It can be observed from the Table 2 that the majority of the respondent (58.40%) had medium level of overall adoption regarding CMP practices, followed by those (13.33%) having low level of overall adoption. On the other hand, 15 percent of the respondents had high level of overall adoption, when all the eight aspects were combined together. All these findings regarding level of adoption were in conformity with Maity (1999), Saha (2002), Donald (2003), and Srairi (2006),

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Further analysis of data indicated that the adoption index of the respondents, on the overall basis, was 58.40. Therefore, it can be concluded that the entire sample respondents were possessing adequate level of adoption regarding CMP practices. The close perusal of Table 1 and 2 indicated that there was a ten percent gap between knowledge and adoption level which indicated the inefficiency of CMP programmers and lacuna in resources in study area.

## CONCLUSION

The study indicated that the dairy farmers had medium level of knowledge and adoption in various aspects of CMP. However, they had poor knowledge in 'Cleaning of animal', but adopted recommended practices of 'Transportation' up to maximum extent followed by 'Feeding'. Same time extent of adoption regarding 'Cleaning of utensil' and 'Healthy herd management' was less. These results are showing that milk unions, research institutes and extension functionaries should develop literature (both soft and hard) and organize effective awareness programmes for CMP practices, which can support in improving the milk quality.

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