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Perception of multi-stakeholders towards clean milk production practice at field conditions in Indian dairying

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ABSTRACT

Government of India (GoI) efforts in making Clean Milk Production (CMP) as a practice of socio-economic importance, still needs to be emphasized by highlighting the field level realities, and study the perception of multi-stakeholders, viz. dairy farmers, scientists and extensionists towards CMP in Indian dairying. Hence, the present study was designed to know the efforts of GoI for promoting CMP, perception and per cent gap among multi-stakeholders with regards to relevance, profitability and sustainability of CMP in dairying. The study included primary data of 360 dairy farmers, 80 research scientists and 40 extensionists in North India and also relevant secondary data. The study revealed that perception of scientists and extension experts was more favourable towards relevance, profitability and sustainability of CMP, while the perception of farmers was less favourable towards CMP. It was also observed that there was a wide gap between farmers-scientists and farmers-extensionists with respect to relevance, profitability and sustainability, whereas the gap was very narrow among scientists and extensionists. It was concluded from the study that researchers and extension experts must create awareness about the practice of CMP and its advantages for the farmers and the consumers. Further, a need based long-term study under field conditions is very essential with the involvement of farmers so that CMP can be adopted and diffused effectively at field conditions to achieve the target of GoI.

Key words: Clean milk production, Multi-stakeholders, Profitability, Relevance, Sustainability

India is bestowed with highest cattle (190.1 million) and buffaloes (108.7 million) population (GoI 2012), but the quality and productivity *per se* is very poor which is a major cause of concern in Indian livestock and dairy sector (Chander *et al.* 2010). In addition, there is fast deterioration of milk quality over the time period before it reaches dairy processing plant from milk producer (Muhammad 2009, Aaglave and Wadatkar 2012). The microbial contamination in fresh milk may occur from the utensils, animal, environment, or water used etc. (FAO 2008). This needs to be taken into consideration by introducing concept of clean milk production (CMP) at the farmers' level.

Clean milk production

Clean milk can be defined as milk from healthy milch animal possessing normal flavour, devoid of dirt and filth with permissible limit of bacteria and essentially free from adulterants, pathogens, various toxins, abnormal residues, pollutants and metabolites (Gupta 2003, Das 2003, Barbuddhe and Swain 2008). The quality of raw milk is determined by its bacterial count and the somatic cell counts. With simple and low-cost husbandry practices, it is possible to produce milk with a count of less than 50,000 bacteria/ml (Pandey and Voskuil 2011). On the farm, contamination of milk may occur at the milking shed, environment, animal, milker or during milking, milking equipments or utensils, storage and transportation (Barbuddhe and Swain 2008, Pandey and Voskuil 2011). Clean milk is considered to increase the quality and shelf life of milk and milk products and helps in controlling the spread of infectious diseases like Tuberculosis and Diphtheria etc. The tropical temperatures in India make this problem more acute, as ambient temperature is favourable for microbial growth leading to rapid deterioration in quality of milk. Similarly, financial losses due to spoilage of milk and milk products in the plant can be prevented by taking adequate precautions to obtain raw milk of good quality. Nanu *et al.* (2007) suggested that hygienic practices followed during the production of milk at the point of production should be emphasized to reduce microbial count and overcome the impact of harmful pathogens. Major reasons that impede the process of quality milk production are lack of awareness and concern for hygiene of surroundings and animals, poor availability of clean drinking water, lack of requisite infrastructure and financial resources etc (Pandey and Voskuil 2011, Jacob and George 2013). It is therefore, critically important to produce high quality raw milk from

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healthy animals under hygienic conditions to protect consumer health.

In spite of the efforts initiated by various research and development organizations through Government of India for CMP, still a lot of work needs to be done at field conditions. Though, CMP is considered as an emerging practice of socio-economic importance (Rathod and Chander 2014), there is a need to emphasize on the field level realities, and study the perception of multi-stakeholders viz. dairy farmers, scientists and extensionists towards CMP in Indian dairying. The present study focused on the efforts of Government of India for promoting CMP, perception and per cent gap among multi-stakeholders with regards to relevance, profitability and sustainability of CMP in dairying and has proposed certain policy implications for Indian dairy industry to improve the quality of milk.

Strengthening infrastructure for quality and clean milk production in India

The scheme "Strengthening Infrastructure for Quality and Clean Milk Production" started during 2004–05 for creation of necessary infrastructure for production of quality milk and milk products at the farmers' level up to the points of consumption through improvement of milking procedure at the farmers' level through training and strengthening of infrastructure. This centrally sponsored scheme is implemented through the State Government by District Cooperative Milk Union/State Level Milk Federation. The scheme is implemented on 100% grants-in-aid basis to the State Government/UTs for the components, viz. training of farmer members, supply of detergents and antiseptic solutions, stainless steel utensils, strengthening of existing laboratory facilities. In addition, 75% financial assistance is provided for setting up of milk chilling facilities at village level in the form of bulk milk coolers (GoI 2014).

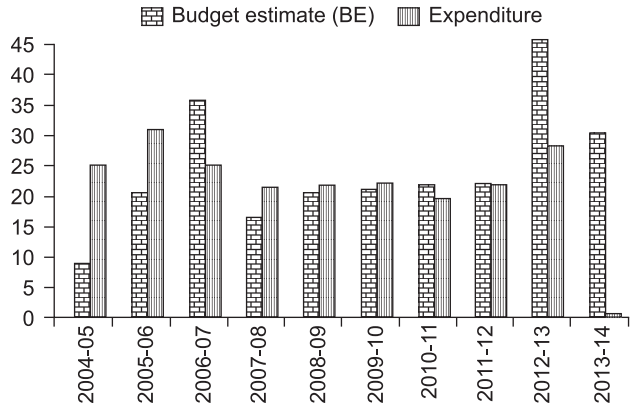

Fig. 1. Annual outlay and expenditure of budget during 2004–05 to 2013–14. Rupees in crore. Source: GoI, 2014.

Since inception, 169 projects for 22 states and 1 union territory covering 241 districts with a cost of ₹ 313.12 crore with a central share of ₹ 258.02 crore was approved up to 31.03.2013 under the scheme. Under this scheme, 6.91 lakh farmers were trained, 2,181 bulk milk coolers with a total chilling capacity of 44,51,800 litre/day installed and 1,515 existing laboratories were strengthened till 2014 (GoI 2014). The annual outlay and the expenditure of the budget during 2004–05 to 2013–14 is indicated in Fig. 1.

MATERIALS AND METHODS

Sampling: A combination of purposive and multi-stage random sampling was adopted in the study to select the respondents. Four Agriculture/Veterinary Universities and Institutes which are at the forefront of research in livestock sector, were selected. The selected Universities/Institutes have carried out research in development of various practices including CMP. The districts in which these institutes are situated were thus selected to ascertain the extent of adoption of CMP at field conditions. Multistage random sampling and snow ball method were followed to select 15 dairy farmers from each village. Total 6 villages/district within a state were selected so as to have final sample size of 360 farmers from a total of 24 villages in 4 states (Table 1). During the selection of respondents, care was taken to select the farmers having at least 2 dairy animals at the time of survey. The scientists or teaching faculty of the universities involved in teaching, research and extension activities were randomly selected. Among 30 scientists selected, 10 were extensionists either from universities or allied *Krishi Vigyan Kendras* (KVKs) and remaining 20 were from the research background.

Data collection: A judicial mix of both primary and secondary data was used in the study. The data from the dairy farmers was collected either at their farm or home

Table 1. Locale of the study

Universities under study (for scientists and extensionists)	Districts (for dairy farmers) under study	State	Geographical location
ICAR-Indian Veterinary Research Institute (IVRI), Izatnagar	Bareilly	Uttar Pradesh	28.36° N 79.41° E
G.B. Pant University of Agriculture & Technology (GBPUA&T), Pantnagar	Udham Singh Nagar	Uttarakhand	28.98° N 79.40° E
ICAR-National Dairy Research Institute (NDRI), Karnal	Karnal	Haryana	29.69° N 76.98° E
Guru Angad Dev Veterinary and Animal Sciences University (GADVASU), Ludhiana	Ludhiana	Punjab	30.91° N 75.85° E

using pretested interview schedule and open schedule, while that of scientists was collected personally at their offices using questionnaire. The data from all the stakeholders was collected during November 2013 to June 2014. Information through observation during interview, group discussion and secondary sources like departmental documents, records, reports and other sources were also collected.

Analytical framework: The relevance of CMP in dairying was studied using the score of 3, 2 and 1 for 'relevant', 'undecided' and 'irrelevant' at field conditions, respectively. The profitability of CMP was studied on three point continuum as 'profitable', 'undecided' and 'not profitable' with the score of 3, 2 and 1, respectively. The sustainability of CMP as an innovative process in dairying was studied using the sustainability index of Swaminathan (1991) with suitable modifications. The responses for sustainability were studied in 14 different dimensions and the responses were assigned the score of 3, 2 and 1 for 'agree', 'undecided' and 'disagree', respectively. Further, the innovation was classified into low, medium and high favourability for sustainability categories. The data collected from sample respondents were coded, tabulated, analyzed and presented in the form of tables. The statistical tools viz. frequency, percentage, mean, standard deviation and Chi-square test were used for analysis of the data using SPSS version 20.0 package. The inferences were drawn in light of the results obtained, keeping in view the objectives laid in the study.

RESULTS AND DISCUSSION

Perception of dairy farmers about practice of CMP in dairying: The relevance, profitability and sustainability of CMP at field conditions is presented in Table 2. A cursory look at the table highlights that majority of the respondents in pooled data perceived CMP as irrelevant to field conditions followed by undecided category, while very negligible (0.55%) number of respondents perceived CMP as relevant to the field conditions. Further, the study depicted that majority of the dairy farmers' responded undecided for profitability of CMP at field conditions followed by the response of non-profitable. With regards to sustainability of CMP, majority of the respondents were in medium favourable category followed by low and high favourability at field conditions. However, a highly significant difference (P<0.001) among the respondents across the states with regards to relevance, profitability and sustainability of CMP at field conditions was observed in the study. Since, CMP concept widely included the components of farmer, animal, surrounding, utensils etc., the farmers were unable to follow at field conditions. Hence, the farmers complained that it was very difficult to practice

Table 2. Perception of dairy farmers about CMP in dairying

N=360

Variable	Category	State				Pooled	χ^2
		UP	UK	Haryana	Punjab		
Relevance	Irrelevant	77(85.56)	69(76.67)	56(62.22)	43(47.77)	245(68.06)	38.11**
	Undecided	13(14.44)	21(23.33)	34(37.78)	45(50.0)	113(31.39)	
	Relevant	0(0)	0(0)	0(0)	02(2.23)	02(0.55)	
Profitability	Non-profitable	09(10.0)	15(16.67)	09(10.0)	06(6.67)	39(10.83)	16.7**
	Undecided	81(90.0)	73(81.11)	77(85.56)	75(83.33)	306(85.0)	
	Profitable	0(0)	02(2.22)	04(4.44)	09(10.0)	15(4.17)	
Sustainability	Low	28(31.11)	13(14.44)	10(11.11)	07(7.78)	58(16.11)	52.2**
(Mean± SD:	Medium	62(68.89)	69(76.67)	58(64.45)	56(62.22)	245(68.06)	
22.16±3.560)	High	0(0)	08(8.89)	22(24.44)	27(30.0)	57(15.83)	

Figures in the parenthesis indicate percentage.

Table 3. Perception of scientists about CMP in dairying

Variable	Category	University				Pooled	χ^2
		IVRI	GBPUAT	NDRI	GADVASU		
Relevance	Irrelevant	0(0)	02(11.11)	0(0)	0(0)	02(3.08)	9.00
(n=65)	Undecided	0(0)	02(11.11)	0(0)	01(6.25)	03(4.62)	
	Relevant	16(100.0)	14(77.78)	15(100.0)	15(93.75)	60(92.30)	
Profitability	Non-profitable	01(6.25)	01(5.56)	0(0)	0(0)	02(3.08)	4.63
(n=65)	Undecided	01(6.25)	04(22.22)	01(6.66)	02(12.5)	08(12.30)	
	Profitable	14(87.5)	13(72.22)	14(93.34)	14(87.5)	55(84.62)	
Sustainability	Low	02(25.0)	01(12.5)	0(0)	01(12.5)	04(12.5)	3.2
(n=32)	Medium	04(50.0)	06(75.0)	06(75.0)	06(75.0)	22(68.75)	
(Mean± SD:	High	02(25.0)	01(12.5)	02(25.0)	01(12.5)	06(18.75)	
36.78±4.07)							

Figures in the parenthesis indicate percentage.

CMP on scientific lines. But, most of them perceived that they produced milk through the cleanest possible ways. Since few of the farmers also complained that CMP did not fetch them any special incentives or price, they were not much inclined towards the concept of CMP. Lack of incentives on CMP was perceived as very serious constraint by majority of the farmers in Rajasthan (Singh and Gupta 2014). Although paying incentives for the farmers for producing quality milk was a component in Government of India (2014) programme, still majority of the farmers were not aware of such benefits.

Perception of scientists about CMP in dairying: The relevance, profitability and sustainability of CMP in the study as perceived by scientists are presented in Table 3. Majority of the scientists perceived that CMP was relevant and profitable at field conditions, while remaining scientists replied as undecided for the same. Further, majority of the scientists were in medium favourable category of sustainability followed by high and low favourability for CMP at field conditions.

Perception of extensionists about CMP in dairying: The relevance, profitability and sustainability of CMP in the study as perceived by extensionists are presented in Table 4. Majority of the extensionists perceived that CMP was relevant and profitable at field conditions, followed by the response of undecided for the same. Further, majority of the extensionists were in higher favourable category of sustainability for CMP followed by medium favourable category for CMP sustainability at field conditions.

With regards to the perception of scientists and extensionists, it was found that majority of them perceived that CMP was relevant, profitable and sustainable at field conditions. They were categorized in higher favourable category of sustainability for CMP at field conditions. This emphasizes the fact that there is a weak linkage among the farmers, scientists and extensionists leading to low level of knowledge and awareness about CMP at field conditions.

Perception of multi-stakeholders towards relevance, profitability and sustainability of CMP in dairying: The relevance of CMP at field conditions as opined by different stakeholders is presented in Fig. 2. The study revealed that majority of the dairy farmers perceived that CMP was irrelevant to field conditions which contradict the opinion of scientists and extensionists in the study. The profitability of CMP at field conditions as opined by different stakeholders is presented in Fig. 3. Majority of the farmers responded as undecided for profitability of CMP at field conditions, on the contrary, majority of the scientists and extensionists opined that CMP was more profitable at field conditions. The study indicated that 58.61 and 35.28% of the dairy farmers were in medium (21–28) and low (14–21) sustainable score categories, respectively, while

Table 4. Perception of extensionists about CMP in dairying

Variable	Category	University				Pooled	X^2
		IVRI	GBPUAT	NDRI	GADVASU		
Relevance	Irrelevant	01(10.0)	0(0)	0(0)	0(0)	01(2.5)	4.82
(n=40)	Undecided	01(10.0)	03(30.0)	01(10.0)	02(20.0)	07(17.5)	
	Relevant	08(80.0)	07(70.0)	09(90.0)	08(80.0)	32(80.0)	
Profitability	Non-profitable	01(10.0)	0(0)	01(10.0)	0(0)	02(5.0)	3.66
(n=40)	Undecided	01(10.0)	02(20.0)	01(10.0)	03(30.0)	07(17.5)	
	Profitable	08(80.0)	08(80.0)	08(80.0)	07(70.0)	31(77.5)	
sustainability	Low	0(0)	0(0)	0(0)	0(0)	0(0)	1.84
(n=23)	Medium	02(25.0)	03(50.0)	02(50.0)	03(60.0)	10(43.48)	
(Mean± SD: 36.78±4.07)	High	06(75.0)	03(50.0)	02(50.0)	02(40.0)	13(56.52)	

Figures in the parenthesis indicate percentage.

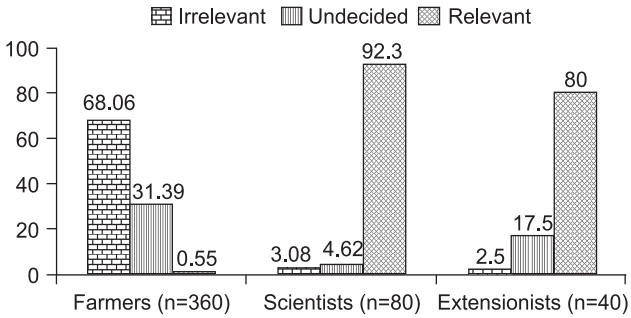

Fig. 2. Perception of multi-stakeholders towards relevance of CMP.

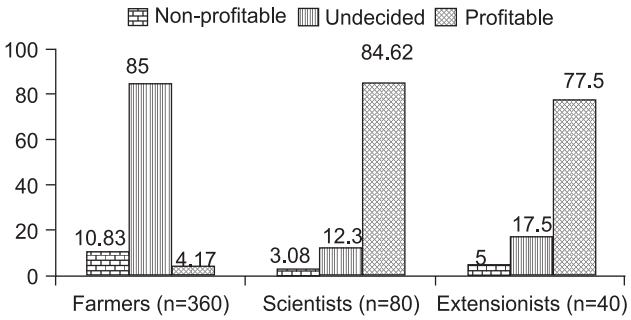

Fig. 3. Perception of multi-stakeholders towards profitability of CMP.

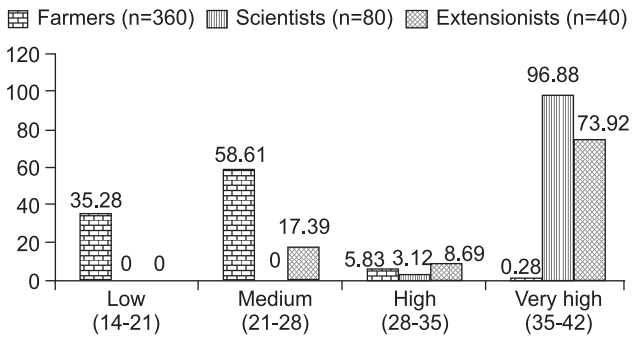

Fig. 4. Perception of multi-stakeholders towards sustainability of CMP.

majority of the scientists fell under very high and high sustainable categories. Majority of the extensionists were under very high and medium sustainable score categories (Fig. 4).

Constraints in adoption of CMP as perceived by dairy farmers: The group discussion with farmers depicted following constraints in practicing CMP in dairying.

- Lack of knowledge/information
- Difficult to follow the practice at field conditions
- High cost of disinfectants/sprayers etc.
- Price of milk is based on fat and SNF but not on microbial count (lack of incentives)
- Difficult to maintain animal sheds scientifically
- High labour involvement
- Reduced let-down of milk if the animal is washed
- Poor economic condition of farmers
- Many times vendors or middle men adulterate milk
- Poor transport facilities

The group discussion with farmers depicted various problems or constraints in practicing CMP in dairying leading to poor adoption at field conditions. The poor adoption of CMP at field conditions was also reported by Patil *et al.* (2009) and Radder and Bhanj (2011) due to lack of dairy farmers' awareness about CMP. Khatkar (2007) suggested that proper education to the farmers regarding importance of clean milk production from health, marketing and animal health point of view was very essential.

Suggestions proposed by dairy farmers for effective transfer of CMP: The suggestions proposed by dairy farmers for effective transfer of CMP at field conditions in dairying are enlisted below.

- Requires knowledge/information about CMP
- Efforts to simplify the practice at field conditions is necessary
- Low cost disinfectants/sprayers etc. required
- Good quality milk having less microbial count must be promoted and such farmers must be given incentives or high price for quality milk.
- Fat and SNF should not be continued as sole criteria for pricing but also should include microbial count.
- Need to study the effect of animal washing on reduced milk let-down.
- Need for a strict government mechanism to control illegal and adulteration of milk and milk products in the market.
- Simple tests must be developed by scientists so that farmers can test milk at their farm before selling it to market.

It is argued that farmers generate and use knowledge, and constantly experiment to manage risks and improve their operations. They should therefore be considered as natural partners of researchers (Smith *et al.* 2004) for a mutual exchange and reconciliation of modern and traditional knowledge. Gray *et al.* (2012), during a study on deworming technology, depicted that it was essential for farmers, extension workers and scientists to jointly decide what technologies to try, what the results mean and, if successful, how to sustain their use.

Per cent gap among multi-stakeholders about practice of CMP in dairying: There was a wider per cent gap between farmers-scientists and farmers-extensionists, while the per cent gap between scientist-extensionists was very low with regards to relevance, profitability and sustainability of CMP (Table 5).

This study reaffirmed the fact that there was a weak linkage among the farmers, scientists and extensionists with regard to CMP at field conditions. On similar lines, Thomas (2012) also reported that, for research to be more relevant to the farmers, there is a need to create a participatory approach that emphasizes research and extension linkage and allows farmers to choose appropriate technologies from research stations, thereby eliminating the perception that extension system is separate from the research system. Further, Moran (2014) also reported that poor acceptance rates by the small farmers for majority of these technologies or practices was attributed to the lack of extension facilities, unavailability of inputs and the time and labour involved under small farm situations. All these previous studies also depicted that there was a poor linkage among the

Table 5. Per cent gap among multi-stakeholders about CMP in dairying

Variable	Category	Percent gap among the stakeholders		
		Farmers–scientists	Scientists-extensionists	Farmers - extensionists
Relevance	Irrelevant	64.18	0.58	65.56
	Undecided	26.77	12.88	13.89
	Relevant	91.85	12.30	79.45
Profit-ability	Non-profitable	7.75	2.92	5.83
	Undecided	72.7	5.2	68.5
	Profitable	80.45	7.12	73.33
Sustain-ability	Low (14-21)	35.28	0	35.28
	Medium (21-28)	58.61	17.39	41.22
	High (28-35)	2.71	5.57	2.86
	Very high (35-42)	96.60	22.96	73.64

stakeholders.

The study revealed that perception of scientists and extension experts was more favorable towards relevance, profitability and sustainability of CMP in dairying, while the perception of dairy farmers was less favourable towards CMP. The study also observed that there was a wide gap among farmers-scientists and farmers-extensionists with regards to relevance, profitability and sustainability, while the gap was very narrow among scientists and extensionists for perception towards CMP in dairying. It was concluded that researchers and extension experts need to make farmers more aware about the practice of CMP and its advantages for the farmers and the consumers. A need based long-run study under field conditions must be undertaken to determine the relevance, profitability and sustainability of CMP in dairying by involving farmers as the partners of research and extension based on the suggestions proposed by dairy farmers.

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