

Factors Influencing Adoption of Good Dairy farm Practices by the Dairy Farmers in Andhra Pradesh, India

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Abstract: *Good dairy farm practices recommended by the scientists improve the productivity of dairy animals and therefore an attempt is made to understand the level of adoption of these practices and the factors influencing their adoptability. Majority of the farmers (63.3%) had medium level of adoption while 7.1% had high adoption rate with regards to improved animal husbandry practices. Adoption of improved breeding practices was highest (55.65%) followed by improved feeding practices (33.8%). Lowest adoption rates were observed for clean milk production practices. The overall lower adoption of animal husbandry practices at 34.45 percent emphasizes the need of creating awareness among the farmers about the benefits of adoption of good dairy farm practices. Among various socio - economic factors taken into consideration education, landholding size, social participation of the farmers, extension programs, mass media exposure, economic motivation, exposure to training programs and risk orientation of the farmers have shown positive correlation with the adoption behavior of the farmers.*

Keywords: Good Dairy Farm Practices, Adoption of Breeding, Feeding, Clean Milk Production practices

1. Introduction

Dairy farming and livestock production constitute a very important components of the agricultural economy of developing countries. However, the productivity of cows and buffaloes in India is lower than that of European countries and therefore, government of India has developed and implemented many policies for the welfare of farmers and their animals. National breeding policy 2013, propounded by Government of India has identified knowledge gap as one of the constraints in developing the livestock and dairying sectors in India (GOI, 2013). Most of the livestock producers being small and marginal farmers, their capacity to mobilize resources required to absorb the latest technologies developed by research institutions are limited. Absence of effective extension machinery for this purpose compounds the problem (GOI, 2013). Further, livelihood options are shrinking in rural areas in general and more so in eco - fragile regions. In such conditions, livestock rearing is the main source of livelihood in rural areas of India. In the absence of assured irrigation, fertile lands and lack of employment in industries, most of the rural families belonging to socio - economically weaker sections of the society maintain different species of livestock to supplement their income. In rural India, among the dairy farmers about 15 - 20 percent families are landless and about 80 percent of the landholders belong to the category of marginal and small farmers (Bulbul et al, 2015).

The dairy farming in low irrigated and rainy fed regions is mainly taken up under common property resource - based livestock production system and mixed farming system which are characterized by deficiency of feed and fodder, low animal productivity, subsistence nature of production and low level of production intensification (Bulbul et al, 2015). Milk production contributes on an average of 27 percent of total household income and its contribution ranges from 19 percent in case of large farmers and 53

percent in the case of landless category. Therefore, the improvement in animal production is very important particularly in the dry regions of the country and to achieve this, farmers have to face certain constraints. It is evident that milk production of buffaloes and cows declines in the low irrigation zones while it increases with the level of irrigation (Reddy, 2001). If the farmers adopt certain management practices the milk productivity of buffaloes in low irrigation zone could be maintained on par with high irrigation zone. It is observed that the feeds given to dairy animals in all the zones by all types of farmers are devoid of required quantity of protein. Deficiency in protein and excess feeding of other nutrients leads to the release of methane gas into the atmosphere and thus causing climatic impact on dairy farming and also it is the reason for lower productivity of dairy animals (FAO, 2019). Further, animal health also impairs the productivity of animals. India losses Rs.7165.51 crores on account of mastitis disease and it stands second to foot and mouth disease to high yielding dairy animals (Bansal and Gupta, 2009; Varshney and Mukherji, 2002). Therefore, it is imperative to create awareness among the farmers about health and feeding of proper balanced ration to the animals. This awareness could be created through proper extension work about good and scientific dairy farming practices.

Further, climate change affects dairy sector both directly and indirectly. The direct effect of climate change on dairy sector manifest in the form of decrease in productive and reproductive characters of dairy animals, and indirect effects include decline in the feed, fodder and water resources. The majority of the dairy farmers have low to medium level of knowledge about climate variability (Parameswara Naik et al 2017). Thus, the knowledge of the farmers about climate change and its effects needs to be developed so that the farmers can take appropriate measures to control the climatic variability. Climate variability refers to the way climate fluctuates yearly above or below normal temperature. The

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warming trend in India over the past century was estimated to be 0.60°C. The IPCC (2007) predicted that by the year 2100 increase in the global average surface temperature may be between 1.8 and 4.0°C.

In this context, Good Dairy Farming Practices (GDFP) as a tool to develop productivity of dairy animals was introduced in 2004 by Food and Agriculture Organization (FAO) and International Dairy Federation (IDF) and it was latter updated in the year 2011 (FAO and IDF, 2011). It delineates six key elements viz., animal health, milking hygiene, nutrition, animal welfare, environment and socio - economic management (Ponnusamy and Lal, 2015). Further, health consciousness, disease burden, productivity of animals, extension services and policy support are the major influencing factors for the adoption of good dairy farming practices. India being the place of small - scale producers, has both limitations and opportunities to produce milk as per growing consumer demand. These practices emphasize the production of safe milk and milk products which are suitable for their intended use and make the dairy farm enterprise as a viable farm enterprise, from the economic, social and environmental perspective (Ponnusamy and Lal, 2015). It is equally important to motivate the farmers to produce safe and quality milk for better market returns.

It is estimated that till 2030 the demand for dairy products is expected to grow at a rate of 9 - 12 percent and industry at a rate of 4 - 5 percent. Thus, Indian industry will struggle to maintain 100 percent self - sufficiency due to huge local demand of 170 million tons of milk by 2030. (Dairy Industry Vision 2030, 2014). In India, at present the average milk yield of dairy animal is 4.2kg/animal per day. Average indigenous cow, buffalo and crossbred cow yield is 2.36, 4.80 and 7.02 kg per animal per day respectively (DADF, 2014). This yield can be increased by focusing on the key areas of good dairy farming practices i. e., animal health, animal nutrition, animal welfare and socio - economic management. However, the major challenges in promoting these practices are lack of awareness among farmers and other stakeholders. Further, several factors tend to influence the adoption of good dairy farm practices which vary depending upon the region, type of farmers and prevailing policy support for the dairy enterprise (Ponnusamy and Lal, 2015). In this context, it is intended to make a study on the awareness of farmers about improved animal husbandry and good dairy farming practices and to elucidate the factors responsible for their adoption by farmers.

2. Materials and methods

The adoption of good dairy farm and improved animal husbandry practices is defined as the continued use of recommended animal husbandry practices by the individual respondent. The methodology for this analysis is taken from the study of Rizwan et al (2015) and Parameswaranik et al (2017) and the relevant aspects/ questions are adopted from the guidelines given by FAO and IDF (2004). Primary data is collected from the sample households using structured schedule having relevant questions regarding good dairy farm practices. Data was collected by personal interview method from all the selected 210 respondents spread over three agro - climatic zones during the year 2019 - 20. It is

computed on a three - point continuum taking answers to the practices as Always, Frequently and Never with 2, 1 and 0 score respectively for each of the recommended practice. The scores of individual items are added to arrive at the total score of an individual respondent. The total score is then divided by the maximum possible score in order to arrive at the final score. It is done for each of the animal husbandry practices taken for the study. The major components in the animal husbandry practices taken for the study could be grouped under the categories of feeding, breeding, health care, clean milk production and general management practices. The final adaption schedule consists of ten items in each category with maximum score of twenty in each area. The overall maximum adoption score is 100 and adoption by individual respondent is calculated using the following adoption index. Adoption Index = Score obtained/ maximum score X 100. Based on this formula dairy farm practices are canvassed to the farmers and the adoption score is calculated.

3. Results and Discussion

3.1 Improved animal husbandry and dairy farm practices

Animal husbandry and dairy farm practices are intended to improve the productivity of animals, proper feeding of animals, animal health and safety of produced milk and milk products. Animal husbandry practices put forward by animal husbandry department as well as by FAO and IDF are taken into consideration in this study as good dairy farm practices or improved animal husbandry practices. These practices include feeding practices, breeding, health care, clean milk production and general management practices. Adoption of feeding practices is aimed at the supply of properly balanced feed throughout the year. These feeding practices improve the productivity of animals, maintain regularity in estrus cycle and also reduce the production cost of milk thereby enhancing the profit margin of the producers. Adoption of recommended breeding practices enables the farmers to get their animals conceived in time and thereby increasing the number of lactations from each dairy animal in the herd which in turn enhances the number of calves born and quantity of milk produced by each animal in its life time. The adoption of health care practices improves the health of the animals thereby increasing productivity of the animals. Clean milk production practices are aimed at enhancing the shelf - life of milk and thereby enabling the farmers to supply good quality milk produced under hygienic conditions. Adoption of general management practices makes the farmer to maintain the dairy farm efficiently with less cost and produce quality milk by healthy dairy animals maintained by healthy workers (FAO and IDF, 2004).

3.2 Socio - economic profiles of the dairy farmers (respondents)

Adoption of improved animal husbandry practices depend on the socio - economic characters of the farmers. Socio - economic factors such as landholding size, education, age, exposure to different types of media etc., influence the farmers to a great extent to adopt various types' animal husbandry practices that determine the returns from dairy

farming. Table - 1 explains various socio - economic traits of the respondents belonging to various landholding categories spread over different agro - climatic zones. It is believed that the works related dairy farming including fodder collection, feeding, removal of dung from the sheds, cleaning of animals and sheds etc., are generally treated as menial jobs and therefore, uneducated persons, poor families as well as households belonging to lower strata of the society take up the task of rearing of cattle and buffaloes. The results of the study show that this assumption is not valid for social category while it is valid for level of education. Among the total respondents, more than half belong to general category, while households belonging to BC category accounts for 25.7 percent, SCs account for 16.19 percent and the share of STs are very nominal as 1.42 percent (Table - 1). A majority of the dairy farmers belong

to middle aged group and have good experience in dairy farming.

It is interesting to note that there is a negative relationship between education and dairy farming. Among the respondents, 9.5 percent of the households are illiterates. About 36.3 percent of households had primary education, 21.9 percent had middle education, 12.8 percent had secondary education, 11.9 percent had higher secondary and 7.6 percent had higher education (Table - 1). It is quite apparent that when level of education increases the participation in dairy farming decreases. In other words, people having higher education are less likely to take up dairy farming as their livelihood activity and thus it may become as a bottleneck to the growth of dairy farming in India in future.

Table 1: Socio - economic profiles of the respondents

S. No.	Variable	Categories	Frequency	Percentage to total	Mean
1	Category	SC	34	16.19	--
		ST	03	1.42	--
		OBC	54	25.71	--
		General	119	56.67	--
2	Age (years)	Young (upto 35)	46	19.38	--
		Middle (36 - 50)	109	56.34	--
		Old (above 50)	55	24.38	--
3	Education	Illiterate	20	9.5	--
		Primary	76	36.3	--
		Middle	46	21.9	--
		Secondary	27	12.8	--
		Higher secondary	25	11.9	--
		Higher education	16	7.6	--
4	Experience in farming (in years)	Low (1 - 10)	32	15.24	--
		Medium (10 - 20)	74	35.24	---
		High (more than 20)	104	49.52	---
5	Herd size	Small (up to 4)	34	16.2	3.2
		Medium (5 - 9)	131	62.4	7.4
		High (10 and above)	45	21.4	13.8
6	family size	Small (less than 5)	36	17.1	3.8
		Medium (5 - 7)	112	53.4	6.4
		Large (more than 7)	62	29.5	8.2
7	Annual family income	Low (Rs.50, 000)	02	0.95	47, 560
		Medium (50, 001 - 1, 00, 000)	26	12.38	78, 750
		High (more than 1, 00, 000)	182	86.67	1, 42, 240
8	Social participation	Low (less than 2.41)	149	70.96	--
		Medium (2.41 to 5.95)	43	20.47	--
		High (more than 5.95)	18	8.57	--
9	Mass media exposure	Low (less than 4.52)	75	35.71	--
		Medium (4.52 to 7.23)	122	58.09	--
		High (more than 7.23)	13	6.20	--
10	Trainings attended	Attended	23	10.95	--
		Not attended	187	89.05	--

Of the total respondents, as many as, 62.4 percent of households have medium herd size with an average of 7.4 animals per household. Similarly, about 53.4 percent of households have medium family size with 6.4 persons per household. Though there is no relationship between family size and herd size, it is clear from the results that households having medium family size dominate the scene of dairy farming with medium herd size. Further, it is more interesting to note that dairy farming households having higher income i. e., more than Rs.1, 00, 000 per annum, are as large as 86.67 percent while the proportion of households having low income (less than Rs.50, 000) is as low as 0.95

percent (Table - 1). It may indicate that the households having dairy animals earn more income thus emphasizing the importance of dairy farming in alleviating rural poverty. Among the other socio - economic traits, respondents have low social participation, lower mass media exposure and have lower participation in dairying related training programs. All these three traits are expected to have negative impact on the adoption of improved dairy farming practices.

Dairy farming is a simple livelihood activity which can be managed easily by any person, because it requires no qualification, no special skill - set and needs low investment.

Thus, dairy farming can be taken up as main occupation or as subsidiary occupation. However, main occupation of the farmers determines the quantum of returns from dairy farming and also the adoption of different modern dairy farming practices. Among the total respondents, 40.5 percent of the households have agriculture as the main occupation while 30 percent taken up dairy farming as main occupation and 25.7 percent of households depend primarily on wage labour (Table - 2). On the other hand, about three - fourth of the households (74.3%) have dairy farming as the subsidiary occupation followed by 15.2 percent have agriculture and 10.5 percent have wage labour as subsidiary occupation. Majority of the households have taken up dairy farming as subsidiary occupation under mixed farming system. Thus, it is evident that dairy farming is an important livelihood activity in the rural areas. However, it could be hypothesized that the adoption of scientific dairy farm practices would be low because only 30 percent of the households have dairy farming as main occupation.

Table 2: Distribution of respondents on the basis of occupation

S. No.	Occupation	Main occupation (Frequency)	Percentage to total households	Subsidiary occupation (Frequency)	Percentage to total households
1	Agriculture	85	40.5	32	15.2
2	Livestock rearing	63	30.0	156	74.3
3	Service	3	1.4	0	0.0
4	Business	5	2.4	0	0.0
5	Daily wage Labour	54	25.7	22	10.5
	Total	210	100	210	100

3.3 Trends in the adoption of good dairy farm practices:

Few of the good dairy farm practices suggested by FAO and IDF (2004) are presented in Table - 1 and these include five categories of practices such as feeding, breeding, health care, clean milk production and general management practices. Each category has ten practices and adoption of each practice scores two pints and thus under each category 20 points could be scored if all the ten suggested practices are adopted by the farmers and this can be called as maximum possible score. Based on the dairy farm practices adopted by the farmers, actual adoption score of each set of practices is presented in Table - 3. The results indicate that the adoption index of total practices is 34.45 which mean the farmers have adopted 34.45 percent (one - third) of all the recommended practices under five categories (Table - 3). It is needless to say that the adoption of good dairy farm practices recommended to improve the returns from dairy farming is low in the study area i. e., in the state of Andhra Pradesh. However, the adoption level of practices under different categories varies with the total. Under the category of general management practices, the mean adopted score is 5.51 in the observed range of 3.8 to 7.8 and with the adoption index of 29.05 (Table - 3). The results showed that all the farmers have scored 5.51 points out of 20 points showing 29.05 percent (Adoption index) adoption of general management practices by the farmers. A close perusal of adoption index of all the dairy farm practices reveals that adoption of breeding practices is higher with adoption index

of 55.65 percent followed by feeding, general management and health care practices. Higher rate of adoption of breeding practices indicates that farmers are giving more emphasis for genetic improvement in order to improve the milk productivity of their animals. Further, the adoption index of feeding practices is 33.80 indicating only 33 percent of adoption of recommended feeding practices by the farmers. Adoption of health care practices is also low at the adoption index of 29.0. Adoption of clean milk production practices is lowest compared to other practices at 26.15 percent indicating that safety of milk is given least preference. On the whole it could be recorded that adoption of good animal husbandry practices is low with 34.43 percent of the total recommended practices (Table - 3) which needs concerted efforts to enhance the adoption of these practices. Further, it could be observed that a large proportion of respondents, about 63.3 percent, have shown medium level of adoption. On the other hand, only 7.1 percent of respondents have shown higher level of adoption while 29.6 percent exhibited lower adoption (Table - 4). The overall lower adoption of animal husbandry practices at 34.45 percent emphasizes the need of creating awareness among the farmers about the benefits of adoption of good dairy farm practices.

Table 3: Adoption of good dairy farm practices by the dairy farmers (respondents)

S. No.	Area of Improved animal husbandry practices	Possible range	Observed range	Mean	Standard deviation	Adoption index
1	General management practices	0 - 20	3.8 - 7.8	5.51	1.82	29.05
2	Clean milk production	0 - 20	3.2 - 8.1	5.23	1.12	26.15
3	Feeding	0 - 20	4.6 - 8.4	6.76	1.32	33.80
4	Breeding	0 - 20	9.8 - 12.6	11.13	1.54	55.65
5	Health care	0 - 20	4.1 - 7.4	5.80	0.94	29.00
6	Total score of all practices	0 - 100	25 - 44	34.43	3.84	34.43

Table 4: Adoption level of dairy farmers based on adoption scores

Category	Low adoption (28)	Medium (28 - 40)	High (40 - 60)	Mean
No. of respondents adopted	62 (29.6%)	133 (63.3%)	15 (7.1%)	
General management practices	3.86	4.82	7.86	5.51
Clean milk practices	3.22	4.34	8.14	5.23
Feeding	4.62	7.23	8.43	6.76
Breeding	9.86	10.88	12.64	11.13
Health care	4.12	5.84	7.44	5.80
Total score of all practices	25.68	33.11	44.51	34.43
Adoption index	26	33	45	34

3.4 Correlation between socio - economic factors and adoption of dairy farm practices:

The study indicates that the farmers of the region have shown poor adoption of recommended dairy farm practices at 34.43 percent. In order to trace the possible reasons for

this lower level of adoption correlation between various socio - economic factors of the farmers and recommended dairy farm practices is studied (Table - 5). Among various socio - economic factors taken into consideration education, landholding size, social participation of the farmers, extension programs, mass media exposure, economic motivation, exposure to training programs and risk orientation of the farmers have shown positive correlation with the adoption behavior of the farmers. On the other hand, age of the farmer, occupation and herd size have exhibited negative correlation with the adoption of various dairy farm practices. If the dairy farming is taken as the

main occupation, the farmers would have shown higher level of adoption of important farm practices in order to enhance their income. However, proportion of farmers having dairy farming as main occupation accounts for only 30 percent while 74.3 percent of farmers have taken dairy farming as subsidiary occupation (Table - 2) and therefore there is negative correlation with occupation and overall lower adoption. As exposure to training has positive impact on the adoption of good dairy farm practices, it is necessary to impart appropriate training to dairy farmers (Sankala and Chand, 1999; Rizwan et al 2015).

Table 5: Correlation coefficients of independent variables and adoption

Independent variable	General management practices	Feeding practices	Breeding practices	Health care practices	Clean milk production	Overall adoption
Age	- 0.21*	- 0.18*	- 0.19*	- 0.31*	0.12	- 0.27*
Education	0.42**	0.24**	0.18	0.37**	0.22*	0.43**
Occupation	- 0.24*	- 0.23*	- 0.055	- 0.22*	0.25*	- 0.26**
Herd size	- 0.27**	- 0.28**	0.12	- 0.40**	0.16	- 0.33**
landholding size	0.28*	0.22**	0.25**	0.32**	0.31**	0.27**
Social participation	0.15	0.24*	0.13	0.15	0.42**	0.24*
Extension contact	0.21*	0.15	0.32*	0.44**	0.22*	0.38**
Mass media exposure	0.24*	0.23*	0.16	0.32**	0.26*	0.22*
Economic motivation	0.10	0.06	0.12	0.12	0.21*	0.11
Exposure to training	0.36**	0.32**	0.18	0.38**	0.28*	0.39**
Risk orientation	0.15	0.19	0.12	0.16	0.12	0.18*

Note= ** indicates significant correlation at 0.01, * indicates significant correlation at 0.05.

It is observed that majority of the farmers (63.3%) had medium rate of adoption while 7.1 percent had higher and 29.6 percent had lower adoption rate with regards to improved animal husbandry practices. Similarly, it was reported that the adoption of respondents was highest (58.45%) for improved breeding practices followed by improved feeding practices (32.85%) (Rizwan et al 2015). Lowest adoption rates were observed for improved management practices (24.52%) and for improved health care practices (26%). Parameswari Naik et al 2017 reported that only 21.67 percent of the farmers have high level of knowledge while 42.50 percent possess low level and 35.83 percent possess medium level of knowledge about climate variation and its impact on productivity of dairy animals.

Among all the recommended dairy farm practices, poor adoption of clean milk production practices is a matter of serious concern. The consumers are increasingly becoming conscious of what they eat and drink. Health and food quality are the major drivers for the market and food safety is the key consumer concern (FSSAI, 2011). Thus, consumers in India want access to safe, tasty and healthy milk and its products at affordable price where good dairy farm practices could play a significant role in producing hygienic milk with good quality (Ponnusamy and Lal, 2015). Further, adoption of proper breeding, health care and feeding practices would improve the existing production potential of the animals with minimum feed intake resulting in lower methane gas emissions into the atmosphere (FAO, 2019).

Despite the fact that India is the highest milk producer in the world, the average milk production per animal is about 26% less than the attainable yield. If proper dairy farm management practices are followed the productivity of the animals could be raised with the same level of inputs. One of

the predominant contributing factors for this poor yield is inadequate supply of feeds and fodders to meet the nutrient requirements of dairy animals. (Maheshand Thakur, 2015). Therefore, one of the major constraints is inadequacy of feed, both quality and quantity, to sustain milk production, particularly during dry season. There is shortage of feed and fodder required for livestock in India. Further, there is scarcity of land for fodder cultivation giving rise to a deficit of 25 percent dry fodder, 20 percent green fodder and 32 percent of concentrate mixture and the gap of requirement and availability is predicted to rise further (Sonali et al, 2014). The concentrate feed requirement at 2020 has been estimated to be 81 million tons on dry matter basis while the availability is around 45 million tons leaving a gap of 45 percent in India. Although significant quantities of crop residues are produced their quality cannot meet the nutritional requirements of dairy cows (Srivastava, 2017). Addition of fats or fatty acids to the diets of ruminants can improve milk production with decrease in enteric methane emissions by both decreasing the proportion of energy supplied from fermentable carbohydrates and changes in the microbial population of the rumen (Llonch et al., 2017). According to Knapp et al. (2014) practices aimed to increase forage quality have shown potential enteric methane reduction of about 5 percent per unit of fat protein corrected milk with concomitant increase in milk yields of dairy animals. Physical processing of forages, such as chopping, grinding, and steam treatment, also improves forage digestibility thus enhancing animal productivity and mitigating enteric methane production in ruminants (Hristov et al., 2013). Therefore, it is necessary to adopt scientific feeding practices in order to realize the full potential of dairy animals and it is true in the existing lower level of adoption of feeding practices.

Repeat breeding and relatively low conception rate are the major constraints perceived by most of the farmers and therefore adoption of better breeding practices is necessary (Kamala Kanth et al 2015). The National Livestock Policy, 2013 has been formulated to have a policy framework for improving productivity of the livestock sector in a sustainable manner, taking into account the provisions of the National Policy of Farmers, 2007 and the recommendations of the stakeholders, including the States. The study indicates that farmers are developing their animals as envisaged by the National Breeding policy proposed by the government of India but with a slower rate. Due to the adoption of recommended breeding practices the productivity of the animals i. e., number of milking cows and milk production per cow also changed (FAO, 2019). To achieve a reasonable genetic progress in the target animal population, national breeding policy planned to raise the percentage of breedable cattle and buffaloes inseminated from the present level of 20 percent to 50 percent by 2021 - 22. Consequently, the percentage of breedable animals served naturally would go down from the current level of 80percent to 50 percent by 2021 - 22 with simultaneous increase in artificial insemination using superior quality semen (Trivedi, 2010). Thus, the breeding policies of the government shall be in such a way that the semen or bulls of superior quality should be made available to the farmers so that the farmers produce and maintain strong and healthy animals meeting their requirement on a sustainable basis in the farmer's environment and resource conditions (Trivedi, 2010). However, when the government is aiming to improve the production through genetic improvement, the genotype must be matched with proper environment including feeding to harness maximum genetic potential of the animal (Srivastava, 2017). Improving the genetic potential of animals through planned crossbreeding or selection within the breeds, and achieving this genetic potential through proper nutrition is imminent (FAO, 2019).

The livestock production system is sensitive to climate change and at the same time itself is a contributor to the phenomenon of climate change. High ambient temperature negatively impacts the efficiency of dairy animals. Reduction in milk production is one of the major economic impacts of climatic stress in dairy cattle. Decrease in milk yield due to thermal stress is more prominent in Holstein than in Jersey cattle (Acharya, 2011) and in buffaloes (Upadyay et al, 2010). Actually 35% of reduced milk production is due to decreased feed intake while remaining 65% is attributable to direct effect of thermal stress (Bajgai, 2011). In this context, adoption of recommended general management practices enables the farmers to avoid the heat stress on the animals. Management of herd structures to reduce the number of non - productive animals through improved animal and herd fertility and reproduction is an effective tool to maintain dairy farm sustainably. Further, reducing the prevalence of diseases and parasites would generally improve productivity of animals and reduce emissions intensity as healthier animals are more productive and thus produce milk with lower emissions per unit of output (FAO, 2019).

Adoption of good dairy farm practices paves way for enhancing the productivity of the dairy animals in the

existing feed scarcity conditions and also reduces the green - house gas emissions. There are complex multiple interacting components which determine the best approach to reduce thermal effects and GHG emissions depending on the specific local conditions and objectives of each individual farm including farmer skills and knowledge. Although there are guidelines for clean milk production, farmers try to adopt most of the practices at production points, issues arise when vendors or middlemen try to do illegal and unhygienic practices. (Ponnuswamy and Lal, 2015). However, this study shows that the adoption of clean milk production practices is lowest compared to other practices. In the midst of numerous challenges and limitations for the production of hygienic milk with higher productivity of animals, a strong policy support is required with sensitization of all stakeholders, complementary extension delivery system, credit support to practice GDFPs and convergence of efforts of various agencies.

4. Summary and Conclusions

Scientific dairy farm practices recommended by the scientists improve the productivity of the animals and therefore an attempt is made to understand the level of adoption of these practices and the factors influencing their adoptability. The good dairy farm practices include feeding practices, breeding, health care, clean milk production and general management practices. Generally, the adoptability of any new practice depends upon the socio - economic characters of the farmers. Among the total respondents, 40.5 percent of the households have agriculture as the main occupation while 30 percent have taken up dairy farming as main occupation. On the other hand, about three - fourth of the households (74.3%) have dairy farming as the subsidiary occupation while only 15.2 percent have agriculture as subsidiary occupation. Though there is no relationship between family size and herd size, the households having medium family size constitute about half of the dairy farmers with medium herd size. It was observed that majority of the farmers (63.3%) had medium rate of adoption of good dairy farming practices while 7.1% had high adoption rate. Among all the good dairy farm practices, adoption of improved breeding practices was highest (55.65%) followed by improved feeding practices (33.8%). Lowest adoption rates were observed for clean milk production practices. The overall lower adoption of animal husbandry practices at 34.45 percent emphasizes the need for awareness among the farmers about the benefits of adoption of good dairy farm practices.

It is quite apparent that there is an inverse relation between and level of education and ownership of dairy farm. When level of education increases the participation in dairy farming decreases. In other words, people having higher education are less likely to take up dairy farming as their livelihood activity and thus it may become as a bottleneck to the growth of dairy farming in India in future. Among various socio - economic factors taken into consideration education, landholding size, social participation of the farmers, extension programs, mass media exposure, economic motivation, exposure to training programs and risk orientation of the farmers have shown positive correlation with the adoption behavior of the farmers. Therefore, it is

necessary to strengthen dairy extension programs in order to create awareness about improved animal husbandry practices and to enhance the productivity of dairy animals. Further, the constraints faced by the farmers which were mentioned by National Livestock Policy in 2013 are still exist and thus it is necessary on the part of the government to take appropriate action to implement the policy effectively.

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