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Study on adoption level of feeding management practices in different agro-climatic zones of western Maharashtra

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Abstract

This study was conducted in different agro-climatic zones of western Maharashtra to analyze different feeding management practices adopted by dairy farmers. Data were collected from randomly selected 240 dairy farmers who had more than five dairy cattle. In ACZ IV, the ratio of mixing green and dry roughages showed complete adoption. The daily use of dry fodder for milch animals was entirely adopted in ACZ IV. The highest adoption rate for the quantity of mineral mixture was 58.33 per cent for 50-70 grams per day in ACZ II. The practice of feeding colostrums to newborn calves was fully adopted in ACZ I, ACZ II, and ACZ III. In ACZ IV, there was a cent percent adoption rate for silage feeding and the silage-making process. All farmers employed harvesting methods, utilized chaff cutters, and operated machines for sowing, harvesting, chaffing, and baling across all Agro-climatic Zones. The mean score suggest that the ACZ IV is the best performing agro-climatic zones while ACZ II is the lowest.

Keywords: Feeding management, adoption, Agro-climatic zones

Introduction

The livestock sector in India, with a population of 512.05 million accounting for 11.6 per cent of the world's livestock population of 996.36 million, which includes cattle at 15.06 per cent (GOI, 2023) [2]. Total number of cattle stands at 192.49 million, comprised of 142.11 million indigenous cattle and 50.37 million crossbred or exotic cattle (Livestock Census 2019) [3].

The dairy and livestock industry relies on four key aspects of animal husbandry *i,e* breeding, feeding, health care, and management. Among these, feeding is the most crucial for achieving optimal production and reproduction from animals. Given that 70 per cent of the costs are associated with animal feed, and it is essential to understand the feeding strategies employed by farmers (Verma *et al.*, 2011) [8]. Nutritional deficiencies, combined with inadequate management practices, result in reduced production by negatively affecting the animals' reproductive and overall health.

The methods of feeding management differ across various agro-climatic zones and lead to direct and indirect effects on the health and productivity of dairy animal. Effective feeding management is essential for a thriving dairy operation and achieving maximum milk production from dairy animals. Examining feeding management practices in dairy farming is essential for several reasons. Nutritional needs of dairy cows and providing balanced diets, farmers can enhance milk output and ensure the economic viability of their businesses.

Materials and Methods

A field survey was conducted in different agro-climatic zones of western Maharashtra and data were collected from randomly selected 240 dairy farmers who had more than five dairy cattle. While choosing respondents, due care was taken to ensure that they were evenly distributed and truly represented feeding management practices in the study areas. The selected dairy farmers were interviewed and the desired information was collected with the help of an interview schedule. To measure the adoption level of respondents their responses were recorded. Data were tabulated and the total score obtained by individual respondent for all the statements was calculated and analyzed. Then with the help of mean the respondents were differentiate zone wise. Adoption level of feeding management practices in different agro-climatic zones of western Maharashtra. Adoption index was determined by using formula given below (Sabapara and Fulsoundar, 2015)

[6].

$$\text{Adoption index (\%)} = \frac{\text{Actual score obtained}}{\text{Maximum score obtainable}} \times 100$$

Results and Discussion

Data in table 1 illustrate distribution of dairy farmers according to adoption of feeding management practices in different agro-climatic zones of western Maharashtra indicated that significant number of dairy farmers in the overall groups engaged in feeding green roughages, dry roughages, mixing ration of dry and green roughages, and daily supply of dry fodder to milch animals, with mean scores of 1.91, 1.82, 1.73, and 1.65, respectively. Most dairy farmers also practiced feeding concentrates to cattle, lactating animals, and pregnant lactating animals, with mean scores of 1.80, 1.85, 1.87, and 1.86, respectively. The practice of providing colostrum to newborn calves within two hours after birth had a mean score of 1.91, while the adoption of feeding silages, and adoption of process of making silage had mean scores of 1.78 and1.70 respectively. All dairy farmers in ACZ I and ACZ IV completely adopted the use of dry roughages, while ACZ I, ACZ II, and ACZ IV reported full adoption of green roughages. In ACZ IV, the ratio of mixing green and dry roughages showed complete adoption. The daily use of dry fodder for milch animals was entirely adopted in ACZ IV. The adoption rates for concentrate feed among cattle are notably high in ACZ I and ACZ II. In ACZ IV, there was a total adoption of concentrate feed for heifers, lactating animals, pregnant lactating animals, and pregnant dry animals, as well as for milch animals according to their milk production. Meanwhile, ACZ I exhibited high adoption rates for feeding concentrate to pregnant lactating animals and milch animals based on milk production.

The incorporation of mineral mixtures into feed was adopted by 61.66 per cent of dairy farmers in ACZ IV. The highest adoption rate for the quantity of mineral mixture was 58.33perr cent for 50-70 grams per day in ACZ II. The practice of feeding colostrums to newborn calves was fully adopted in ACZ I, ACZ II, and ACZ III. In ACZ IV, there was a cent percent adoption rate for silage feeding and the silage-making process, while in ACZ III, 80 per cent of farmers adopted hay feeding and hay-making practices. The feeding of calcium and phosphorus had an adoption rate of 78.33 per cent in ACZ I. Practices such as urea treatment, feed additives, bypass fats and proteins, molasses feeding, Azolla feeding, and hydroponics were not adopted by farmers across all four zones. This finding lines up with Atkare (2016) [1], Mannivannan & Mathialagan (2016) [4], Singh (2018) [5], and Sivaji (2018) [7] reported that the majority of farmers engaged in feeding green roughages, dry roughages, mixing ratios of dry and green roughages, and supplying dry fodder to milch animals daily. Most dairy farmers also practiced feeding concentrates to cattle, lactating animals, and pregnant lactating animals. The practice of providing colostrums to newborn calves within two hours after birth, while the adoption of feeding silages, the process of making silage, and the types of fodder used for silage production.

Table 2 illustrates the distribution of dairy farmers according to adoption of fodder production practices in different agro-climatic zones of western Maharashtra indicated that a significant number of farmers implemented weeding techniques, along with specific frequencies, harvesting methods, conservation practices, and crop storage techniques, as well as the use of chaff cutters and machinery for sowing, harvesting, chaffing, and baling, achieving an average score of means at 2, 1.99, 1.85, 2, and 2, respectively.

All farmers employed harvesting methods, utilized chaff cutters, and operated machines for sowing, harvesting, chaffing, and baling across all Agro-climatic Zones I, II, III, and IV. Likewise, cent percent of farmers adopted conservation methods and crop storage practices in Agro-climatic Zones I, III, and IV.

The data in table 3 presents the distribution of dairy farmers according to overall Adoption of feeding management practices indicated that 70.41 per cent dairy farmers showed a medium level of adoption of these practices, whereas 13.33 per cent displayed a low level, and 16.25 per cent exhibited a high level of adoption. The most significant level of adoption was noted in the medium category, with rates of 71.66, 68.33, 71.66, and 70 per cent in ACZ I, ACZ II, ACZ III, and ACZ IV, respectively.

Mean score of different agro-climatic zone indicated that critical difference in different agro-climatic zone indicated that ACZ IV is significantly better than ACZ I, ACZIII AND ACZ II. ACZ I is significantly better than ACZ III, and ACZ II but not as much as ACZ IV. ACZ III is better than ACZ II, but the difference is smaller compare to other agro-climatic zones. The mean score suggest that the ACZ IV is the best performing agro-climatic zones while ACZ II is the lowest.

Table 1: Distribution of dairy farmers according to adoption of feeding management practices in different agro-climatic zones of western Maharashtra

Sr. no	Parameter	Category	Agroclimatic Zones				
			ACZ I	ACZ II	ACZ III	ACZ IV	Overall
Feeding management practices							
I Roughages							
1	Feeding of dry roughages	A	60(100)	46(76.66)	31(51.66)	60(100)	197(82.08)
		PA	00(00)	14(23.33)	29(48.33)	00(00)	43(17.91)
		NA	00(00)	00(00)	00(00)	00(00)	00(00)
	Mean		2	1.76	1.51	2	1.82
2	Feeding of green roughages	A	60(100)	60(100)	40(66.66)	60(100)	220(91.66)
		PA	00(00)	00(00)	20(33.33)	00(00)	20(8.33)
		NA	00(00)	00(00)	00(00)	00(00)	00(00)
	Mean		2	2	1.66	2	1.91

3	Mixing of green and dry roughages	A	37(61.66)	43(71.66)	37(61.66)	60(100)	177(73.75)
		PA	23(38.33)	17(28.33)	23(38.33)	00(00)	63(26.25)
		NA	00(00)	00(00)	00(00)	00(00)	00(00)
	Mean		1.61	1.71	1.61	2	1.73
4	Dry fodder for milch animals per day	A	33(55)	38(63.33)	26(43.33)	60(100)	157(65.41)
		PA	27(45)	22(36.66)	34(56.66)	00(00)	83(34.58)
		NA	00(00)	00(00)	00(00)	00(00)	00(00)
	Mean		1.55	1.63	1.43	2	1.65
II concentrate							
1	Feeding of concentrate to cattle	A	60(100)	35(58.33)	39(65)	60(100)	194(80.83)
		PA	00(00)	25(41.66)	21(35)	00(00)	46(19.16)
		NA	00(00)	00(00)	00(00)	00(00)	00(00)
	Mean		2	1.58	1.65	2	1.80
2	Feeding of concentrate to Heifer	A	36(60)	12(20)	37(61.66)	60(100)	145(60.41)
		PA	24(40)	30(50)	23(38.33)	00(00)	77(32.08)
		NA	00(00)	18(30)	00(00)	00(00)	18(7.5)
	Mean		1.6	0.9	1.61	2	1.52
3	Feeding of concentrate to lactating animals	A	47(78.33)	50(83.33)	49(81.66)	60(100)	206(85.83)
		PA	13(21.66)	10(16.66)	11(18.33)	00(00)	34(14.16)
		NA	00(00)	00(00)	00(00)	00(00)	00(00)
	Mean		1.78	1.83	1.81	2	1.85
4	Feeding of concentrate to pregnant lactating animals	A	60(100)	40(66.66)	50(83.33)	60(100)	210(87.5)
		PA	00(00)	20(33.33)	10(16.66)	00(00)	30(12.5)
		NA	00(00)	00(00)	00(00)	00(00)	00(00)
	Mean		2	1.66	1.83	2	1.87
5	Feeding of concentrate to pregnant dry animals	A	30(50)	22(36.66)	44(73.33)	60(100)	156(65)
		PA	30(50)	38(63.33)	16(26.66)	00(00)	84(35)
		NA	00(00)	00(00)	00(00)	00(00)	00(00)
	Mean		1.5	1.36	1.73	2	1.65
6	Feeding of concentrate to milch animals as per milk production	A	60(100)	47(78.33)	41(68.33)	60(100)	208(86.66)
		PA	00(00)	13(21.66)	19(31.66)	00(00)	32(13.33)
		NA	00(00)	00(00)	00(00)	00(00)	00(00)
	Mean		2	1.78	1.68	2	1.86
III Mineral Mixture							
1	Addition of the Mineral mixture to feed	A	30(50)	39(65)	33(55)	37(61.66)	139(57.91)
		PA	30(50)	21(35)	27(45)	23(38.33)	101(42.08)
		NA	00(00)	00(00)	00(00)	00(00)	00(00)
	Mean		1.5	1.65	1.55	1.61	1.57
2	Addition of mineral mixture 50-70 gm/d/h	A	00(00)	35(58.33)	19(31.66)	27(45)	82(34.16)
		PA	60(100)	25(41.66)	41(68.33)	33(55)	158(65.83)
		NA	00(00)	00(00)	00(00)	00(00)	00(00)
	Mean		1	1.58	1.31	1.45	1.34
IV Urea treatment							
1	Urea treatment to straw	A	00(00)	00(00)	00(00)	00(00)	00(00)
		PA	00(00)	00(00)	00(00)	00(00)	00(00)
		NA	60(100)	60(100)	60(100)	60(100)	60(100)
	Mean		0	0	0	0	0
2	Urea treatment for hay-making	A	00(00)	00(00)	00(00)	00(00)	00(00)
		PA	00(00)	00(00)	00(00)	00(00)	00(00)
		NA	60(100)	60(100)	60(100)	60(100)	60(100)
	Mean		0	0	0	0	0
3	Feeding of urea molasses mineral blocks to milch animals	A	00(00)	00(00)	00(00)	00(00)	00(00)
		PA	00(00)	00(00)	00(00)	00(00)	00(00)
		NA	60(100)	60(100)	60(100)	60(100)	60(100)
	Mean		0	0	0	0	0
V Colostrum feeding							
1	Feeding of colostrum to newborn calf within two hours after parturition	A	60(100)	60(100)	60(100)	50(83.33)	220(91.66)
		PA	00(00)	00(00)	00(00)	10(16.66)	20(8.33)
		NA	00(00)	00(00)	00(00)	00(00)	00(00)
	Mean		2	2	1.83	1.83	1.91
VI Silages							
1	Feeding of silage	A	43(71.66)	41(68.33)	44(73.33)	60(100)	188(78.33)

		PA	17(28.33)	19(31.66)	16(26.66)	00(00)	52(21.66)
		NA	00(00)	00(00)	00(00)	00(00)	00(00)
	Mean		1.71	1.68	1.73	2	1.78
2	Adoption of silage-making process	A	37(61.66)	34(56.66)	39(65)	60(100)	170(70.83)
		PA	23(38.33)	26(43.33)	21(35)	00(00)	70(29.16)
		NA	00(00)	00(00)	00(00)	00(00)	00(00)
	Mean		1.61	1.56	1.65	2	1.70
3	Readymade purchase of silage	A	35(58.33)	01(1.66)	25(41.66)	17(28.33)	78(32.5)
		PA	25(41.66)	59(98.33)	35(58.33)	35(58.33)	154(64.16)
		NA	00(00)	00(00)	00(00)	08(13.33)	08(3.33)
	Mean		1.58	1.01	1.41	1.15	1.29
VII Hay							
1	Hay-making	A	13(21.66)	48(80)	32(53.33)	10(16.66)	103(42.91)
		PA	47(78.33)	12(20)	21(35)	42(70)	122(50.83)
		NA	00(00)	00(00)	07(11.66)	08(13.33)	15(6.25)
	Mean		1.21	1.8	1.41	1.03	1.36
2	Feeding of hay to animals	A	00(00)	00(00)	23(38.33)	00(00)	23(9.58)
		PA	60(100)	59(98.33)	30(50)	60(100)	209(87.08)
		NA	00(00)	01(1.66)	07(11.66)	00(00)	08(3.33)
	Mean		1	0.98	1.26	1	1.06
VIII Feed additives							
1	Feeding of feed additives (pro-biotic, pre-bionics etc.)	A	00(00)	00(00)	00(00)	00(00)	00(00)
		PA	00(00)	00(00)	00(00)	00(00)	00(00)
		NA	60(100)	60(100)	60(100)	60(100)	60(100)
	Mean		0	0	0	0	0
IX Calcium and phosphorous							
1	Feeding of calcium and phosphorous	A	47(78.33)	12(20)	39(65)	23(38.33)	121(50.41)
		PA	13(21.66)	25(41.66)	21(35)	29(48.33)	88(36.66)
		NA	00(00)	23(38.33)	00(00)	08(13.33)	31(12.91)
	Mean		1.78	0.81	1.65	1.25	1.37
X Bypass fat							
1	Feeding of bypass fats	A	00(00)	00(00)	00(00)	00(00)	00(00)
		PA	00(00)	00(00)	00(00)	00(00)	00(00)
		NA	60(100)	60(100)	60(100)	60(100)	60(100)
	Mean		0	0	0	0	0
XI Bypass protein							
1	Feeding of bypass proteins	A	00(00)	00(00)	00(00)	00(00)	00(00)
		PA	00(00)	00(00)	00(00)	00(00)	00(00)
		NA	60(100)	60(100)	60(100)	60(100)	60(100)
	Mean		0	0	0	0	0
XII Molasses							
1	Feeding of molasses to animals	A	00(00)	00(00)	00(00)	00(00)	00(00)
		PA	00(00)	00(00)	00(00)	00(00)	00(00)
		NA	60(100)	60(100)	60(100)	60(100)	60(100)
	Mean		0	0	0	0	0
XIII Azolla							
1	Feeding of Azolla as a feed supplement	A	00(00)	00(00)	00(00)	00(00)	00(00)
		PA	00(00)	00(00)	00(00)	00(00)	00(00)
		NA	60(100)	60(100)	60(100)	60(100)	60(100)
	Mean		0	0	0	0	0
XIV Hydroponics							
1	Adoption hydroponics feeding	A	00(00)	00(00)	00(00)	00(00)	00(00)
		PA	00(00)	00(00)	00(00)	00(00)	00(00)
		NA	60(100)	60(100)	60(100)	60(100)	60(100)
	Mean		0	0	0	0	0

(Figure in parenthesis expressed in percentage), ACZ I - High rainfall Zone, ACZ II - Ghat Zone, ACZ III- Transition Zone, ACZ IV - Scarcity Zone

Table 2: Distribution of dairy farmers according to adoption of fodder production practices in different agro-climatic zones of Western Maharashtra

Sr. no.	Parameter	Category	Agroclimatic Zones				
			ACZ I	ACZ II	ACZ III	ACZ IV	Overall
Fodder production practices							
1	Variety of new crops taken in your farm for feeding	A	00(00)	00(00)	00(00)	00(00)	00(00)
		PA	00(00)	00(00)	10(16.66)	00(00)	10(4.1)
		NA	60(100)	60(100)	50(83.33)	60(100)	230(95.83)
		Mean	0	0	0.16	0	0.04
2	Weeding method and frequency time	A	60(100)	60(100)	60(100)	60(100)	240(100)
		PA	00(00)	00(00)	00(00)	00(00)	00(00)
		NA	00(00)	00(00)	00(00)	00(00)	00(00)
		Mean	2	2	2	2	2
3	Methods of harvesting (first cutting and subsequent cutting)	A	60(100)	60(100)	60 (100)	60 (100)	238 (99.16)
		PA	00(00)	00(00)	00(00)	00(00)	02(0.88)
		NA	00(00)	00(00)	00(00)	00(00)	00(00)
		Mean	2	2	1.96	2	1.99
4	Conservation methods and storage adopted (silage, hay, fodder block) of crops	A	60(100)	25(41.66)	60(100)	60(100)	205(85.41)
		PA	00(00)	35(58.33)	00(00)	00(00)	35(14.58)
		NA	00(00)	00(00)	00(00)	00(00)	00(00)
		Mean	2	1.41	2	2	1.85
5	Use of chaff cutter	A	60(100)	60(100)	60(100)	60(100)	240(100)
		PA	00(00)	00(00)	00(00)	00(00)	00(00)
		NA	00(00)	00(00)	00(00)	00(00)	00(00)
		Mean	2	2	2	2	2
6	Use of machines for sowing, harvesting, chaffing, and bailing	A	60(100)	60(100)	60(100)	60(100)	240(100)
		PA	00(00)	00(00)	00(00)	00(00)	00(00)
		NA	00(00)	00(00)	00(00)	00(00)	00(00)
		Mean	2	2	2	2	2

(Figure in parenthesis expressed in percentage), ACZ I - High rainfall Zone, ACZ II - Ghat Zone, ACZ III- Transition Zone, ACZ IV - Scarcity Zone

Table 3: Distribution of dairy farmers according to overall Adoption of feeding management practices

Parameter	Category	Agro-climatic zones				
		ACZ I	ACZ II	ACZ III	ACZ IV	Overall
Adoption of feeding management practices	Low	08(13.33)	07(11.66)	09(15)	08(13.33)	32(13.33)
	Medium	43(71.66)	41(68.33)	43(71.66)	42(70)	169(70.41)
	High	09 (15)	12 (20)	8 (13.33)	10 (16.66)	39 (16.25)
	(Mean±SD)	(67.5±1.9)	(63.8±2.9)	(67.2±3.4)	(70.7±2.1)	(67.3±3.6)

(Figure in parenthesis expressed in percentage), ACZ I - High rainfall Zone, ACZ II - Ghat Zone, ACZ III- Transition Zone, ACZ IV - Scarcity Zone

Conclusion

The study found that the adoption of feeding management practices is generally at a moderate level. Certain agro-climatic zones, such as ACZ IV, show higher levels of adoption. This indicates that while some regions are more proactive and have better support in terms of resources and training.

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