Range Mgmt. & Agroforestry 37 (1) : 98-103, 2016
ISSN 0971-2070

Assessment of tribal dairy farmers' perceived importance, level of awareness and constraints in the adoption of good feeding practices using exploratory factor analysis

P. Mooventhan[1*], K. S. Kadian[2], R. Senthilkumar[3], A. Manimaran[4], B. S. Meena[2] and C. Karpagam[5]
[1]ICAR-National Institute of Biotic Stress Management, Raipur-493225, India
[2] ICAR-National Dairy Research Institute, Karnal-132001, India
[3]ICAR-Central Institute of Agricultural Engineering, Coimbatore-641007, India
[4]Southern Regional Station, ICAR-National Dairy Research Institute, Bengaluru-560030, India
[5]ICAR-Central Institute for Cotton Research, Coimbatore-641003, India
*Corresponding author e-mail: agriventhan@yahoo.co.in
Received: 26th September, 2015 Accepted: 22nd April, 2016

Abstract
This investigation was undertaken to explore the tribal farmers' perceived importance, awareness, adoption and constraints for good feeding practices (GFPs) of dairy animals in northern hilly zone of Chhattisgarh. To study the perceived importance towards good feeding practices, the pattern matrix of exploratory factor analysis (EFA) was administered. It revealed that the Factor 1 (semi intensive approach) explained maximum variance (35.24%) and had highest eigen value (2.77). Awareness study revealed that about one-fourth (27.67%) of the tribal farmers were aware about green fodder varieties, nearly half (43.0%) of the respondents were aware about the importance of colostrum feeding to calf with proper timing and quantity. The adoption results clearly indicated that about 24.66 per cent of the respondents cultivated cumbu napier green fodder varieties such as CO 3, CO(CN) 4 and CO(BN) 5. Regression analysis showed that the variables like age, occupational status, farm size, milk production and social participation had positive and significant relationship with good feeding practices. Constraints analysis revealed that majority (75.70%) of tribal farmers expressed the higher cost of concentrates, mineral mixtures and vitamin supplements as the major constraints in the feeding management of animals.

Keywords: Awareness, Adoption, Constraints, Exploratory factor analysis, Good feeding practices, Tribal farmers

Introduction

Over the span of four decades, India has transformed from a country of acute milk shortage to the world's leading milk producer with the production exceeding 146 million tonnes, but the productivity is lower than the world average. There are several factors limiting milk production in India. Among them imbalanced nutrition remains the most critical impediment. This situation is still worse in backward states (Biradar *et al.,* 2013). The tribal area of Chhattisgarh in India has good number of cattle population but its milk production is still in primitive stage. It is observed that the rearing of livestock animals especially in villages has focus on draught power rather than milk (Sanjeev *et al.,* 2008).

Ruminant animals need daily supply of recommended nutrients for maintenance and production process like milk, meat, growth and pregnancy. Hence, there is a need to adopt good feeding practices, It has been observed that imbalances of nutrients including minerals adversely affect production of animals and even causes serious infertility disorders (FAO, 2000). Adoption gap was found as highest (70.67%) in improved feeding practices of ruminant animals which is one of the chief reasons behind their low productivity in the country (Yadaw and Sharma, 2012). It is a fact that there is a wide technological gap exists in dairy feeding practices, resulting in low productivity of dairy animals (Roy *et al.,* 2013). The technical efficiency in cattle and buffalo at average level of input use indicated a potential of increasing milk production and the returns by 30 and 25%, respectively by adopting better feeding management practices without incurring additional expenditure (Chand, 2015). But before introducing any intervention in the social system it is inevitable to study the existing pattern of awareness, adoption level, perceived importance and constraints of the target group. This in turn will help to frame the policies and schemes to disseminate the good feeding practices in successful manner. The present study was planned to explore the existing feeding management scenario of tribal dairy farming in northern hilly zone of Chhattisgarh.

Materials and Methods

The present study was conducted during 2014-15 in selected districts of Chhattisgarh. Out of 27 districts in Chhattisgarh, three districts namely Surajpur, Surguja and Balrampur were selected for the study. Stratified simple random sampling method was followed to select the respondents. From each district, four villages were selected and from each village 25 dairy tribal respondents were selected. Thus sample size of the study was 300 respondents. Summated rating scale suggested by Likert (1932) was used to find out the tribal farmers' perceived importance towards good dairy farming practices.

Scaling procedure: The scaling procedure started with the collection of items followed by editing the statements as per the principles given by the Likert. Further, the edited raw statements were arranged on three point continuum i.e. agree (A), undecided (UD), disagree (DA). In the item list, for positive items the weights 3,2,1 and for negative items the weights 1, 2, 3 were assigned in order. Totally, 27 items were sent to ninety five judges for justification. Subsequently, Item analysis was carried out. After receiving the judge's opinion on three point continuum, individual judge's score was calculated by summing up the score of each statement given by him/her. Thus, individual scores were arranged in descending order. The top 25 per cent of judges with their total individual scores were considered as high group and bottom 25 percent as the low group. The't' values were worked out in order to discriminate the responses of high and low groups for the individual statements by using the below mentioned formula given by (Edwards, 1969).

$$t = \frac{\bar{X}_H - \bar{X}_L}{\sqrt{\frac{\sum_{i=1}^{n} (X_H - \bar{X}_H)^2 + \sum_{i=1}^{n} (X_L - \bar{X}_L)^2}{n(n-1)}}}$$

$$\sum (X_H - \bar{X}_H)^2 = \sum X_H^2 - \frac{(\sum X_H)^2}{n}$$

Where,

$\bar{X}_H$ = The mean score on a given statement for the high group

$\bar{X}_L$ = The mean score on a given statement for the low group

"X_H^2 = Sum of squares of the individual score on a given statement for high group

"X_L^2 = Sum of squares of the individual score on a given statement for low group

"X_H = Summation of scores on given statement for high group

"X_L = Summation of scores on given statement for low group

n = Number of subject in low and high group

t = The extent of a given statement differentiate between the high and low group.

The 't' value equal to or greater than 3.89 (n_1+n_2 -2 df at 1% level of significance) indicating significant difference in the average response of high and low groups to a statement. Thus, 11 statements on perceived importance on feeding practices (2 negative and 9 positive) with significant discriminating values were retained in the final scale.

Reliability and validity of the scale: In this study, test-retest method was employed to test the reliability of the scale towards good feeding practices. The reliability coefficient (0.84) was highly significant proving the reliability of the scale. For validity, the content of the scale was derived through expert opinion. It was assumed that the scale measured what it was intended to measure. Moreover, the use of item analysis through 't' value for each item assured high discriminating value of the statements. Therefore, reasonably enough, the scale was taken as a valid measure of the desired dimension.

Exploratory factor analysis used for data analysis: Exploratory Factor Analysis (EFA) was employed to identify the latent constructs in the perceived importance towards good feeding practices to ascertain factorial validity of these constructs (Hair *et al.,* 1998). The relative importance of various components of the breeding practices, feeding practices, health care practices, management practices and socio-economic factors were identified through EFA. Since the latent constructs in social science are often interrelated, the maximum likelihood (ML) factor extraction method was used with Promax rotation, which it permits inter-factor correlation. To reduce the number of factors to a manageable level, only the factors with an eigen value exceeding one were selected for rotation (Field, 2000). Since the sample size is 299, a factor loading of 0.298 was used as a lower cut-off value for selection of variables for each factor (Field, 2000). All the analyses were performed using statistical software SPSS (version 17). Frequency and percentage were used to present the results on awareness and adoption of good dairy farming practices. Correlation and regression were administered to find out the influence of independent variables on dependent variables, Constraints analysis was carried out on four point continuum and expressed in frequency and percentages.

Results and Discussion

The data collected to assess the importance of feeding practices were checked for errors. Since the items C^6 and C^9 had significant outliers, they were removed from the analysis. In the EFA analysis, the Kaiser-Meyer-Olkin

(KMO) was estimated as 0.752 which exceeds the minimum level of 0.5 with a significant Bartlett's Chi-square (X^2= 1117.368, P<0.01) indicating the sampling adequacy. The EFA yielded three factors with eigen value more than one together explained 71.78% of the total variance in the data, which was acceptable for further analysis.

The pattern matrix: Pattern matrix (Table 1) indicated that the factor 1 (Semi intensive approach) explained maximum variance (35.24 %) and had highest eigen value (2.77). The items namely, dry fodder is the basic feed for dairy animal (C^2), chopped feed and fodder improves digestibility (C^3)), feeding the animal according to their age, production is important (C^{10}) and calf starter is essential to produce healthy animals (C^{11}) represented factor 1. The other items such as mineral mixture improves the animal productivity as well as reproductive ability (C^5), milch animals do not necessarily need green fodder (C^8) and feeding the animal according to their age, production is important (C^{10}), which represented factor 2 (intensive approach). Among factor 2 items, C^8 had negative loading. The factor 3 (traditional approach) composed items *viz*., grazing alone is sufficient for enhanced milk production (C^4) and feeding the animal while milking will increase milk quantity (C^7) but the latter (C^7) had negative relationship. But it is interesting to note that item C^{10} (feeding the animal according to their age and production is important) had multiple loadings (factors 1 and 2). Item C^1 (concentrate feeding is essential for better milk production) didn't have any factor loadings thus removed from analysis. From the results it could be concluded that the items which are loaded in factor 1 (semi intensive approach) contributed more in their perceived importance towards good feeding practices followed by factors 2 and 3. Further, the low input system of production required financial assistance to convert into semi intensive and intensive systems of production. The pattern matrix indicated that any intervention that demands expertise and considerable monetary support is highly suitable for intensive production system than for semi intensive and extensive system. After completing the exploratory factor analysis to estimate the factorial validity, the reliability was assessed through Cronback alpha, which is a measure of variance in the test. Cronbach's alpha is used as a (lower bound) estimate of the reliability of a psychometric test (Cronbach, 1951). It represents internal consistency by averaging all possible combinations of split-half reliability *i.e*. splitting the test by every possible combination of items (Giles, 2002). Cronbach alpha was calculated following the given formula:

$$Cronbach\ alpha = \frac{N^2 * M(COV)}{SUM(VAR/COV)}$$

Where N = No of items, M = Mean covariance between items, SUM (VAR/COV)= Sum of all the elements in the variance- covariance matrix.

Scale reliability: The developed scale on good feeding practices (Table 2) showed high internal consistency (>.60). In general the lower limit agreed upon for Cronbach's alpha is of 0.7 (Nunnally, 1978), but this may decrease to 0.60 in exploratory research (Robinson *et al.,* 1991). Cronbach's alpha considered to be a measure of scale reliability and also has a theoretical relation with factor analysis. In this study, internal consistency was computed using Cronbach's alpha in SPSS statistics.

Level of awareness: Awareness analysis (Table 3) revealed that nearly half (43.0%) of the tribal farmers were aware about the importance of colostrum feeding to calf with proper timing and quantity. One third of the respondents (35.67%) were aware about green fodder varieties. Importance of providing concentrate feeds with appropriate quantity and timing was known to 31.0% of the respondents. Respondents aware about recommended green fodder production practices were 29. 67%, mineral and vitamin supplementation were 20.33%, silage making were 18.0% and very less percentage (15.33) of respondents were aware about balanced feeding ration concept. Respondents had strong belief that forages from the forest provides high nutrient to cattle, protect from diseases and increase milking capacity as well. The cattle rearing system has been extensive grazing and low input cost based. Throughout the state, majority of the livestock rearers are marginal producers having 4-6 animals per households. Indigenous breeds are pretty common in the state (Sanjeev *et al.,* 2008). The results indicates that, more than half (56.33%) of the tribal dairy farmers falling under the category of subsistence level of dairy production system and about half (44.67%) of the respondents possessing medium herd size. Non-descript lactating cows had 1.24 litres/animal as an average milk production with the maximum of 2 litres and minimum of 250 ml. Hence, the cattle rearing system is mostly extensive and subsistence in nature, the farmers were aware about the existing feed resources which are available in low cost.

Table 1. Pattern matrix of importance of good feeding practices (n=299)

Item code	Items	Factor 1	Factor 2	Factor 3	't' value
C^{2}	Dry fodder is the basic feed for dairy animal	.623	-	-	4.52**
C^{3}	Chopped feed and fodder improves digestibility	.975	-	-	3.91**
C^{4*}	Grazing alone sufficient for enhanced milk production	-	-	.957	9.35**
C^{5}	Mineral mixture improves the animal productivity as well as	-	.971	-	5.21**
	reproductive ability	-	-	-.472	6.38**
C^{7}	Feeding the animal while milking will increases the quantity of milk	-	-.475	-	7.67**
C^{8*}	Milch animals do not necessarily need green fodder	.458	.414	-	5.12**
C^{10}	Feeding the animal according to their age, production is important	.598	-	-	4.01**
C^{11}	Calf starter is essential to produce healthy animals	35.24	20.98	15.56	
	Percentage of variance explained	2.77	1.49	1.00	
	Eigen value				

*Negative statements; ** Significant (P<0.01)

Table 2. Reliabilities and associated statistics

Scale	Number of items	Internal consistency reliability (Cronbach alpha)	Scale mean	SD
Good feeding practices	9	.61	32.92	4.19

Table 3. Distribution of respondents according to their awareness and adoption level towards good feeding practices (n=300) #

Good Feeding practices	Aware (f)	%	Rank	Adoption (f)	%	Rank
Providing concentrates feed (quantity and timing)	93	31.00	III	67	22.33	III
Green fodder varieties	107	35. 67	II	74	24.66	II
Recommended green fodder production practices	89	29. 67	IV	38	12.66	IV
Silage making	54	18.00	VI	23	7.66	VI
Mineral and Vitamin supplementation	61	20.33	V	19	6.34	VII
Balanced feeding ration	46	15.33	VII	29	9.66	V
Colostrum feeding to calf (timing and quantity)	129	43.00	I	82	27.33	I

Multiple response obtained (MRO)

Table 4. Influence of socio-economic variables on adoption level of good feeding practices (n=300)

Variable No.	Variables	Regression coefficient	Standard error	't' value	Sig.
#	Constant (Intercept)	2.169***	.814	2.664	.005
X_1	Age	.210**	.082	2.560	.037
X_2	Educational status	-.029 NS	.131	-.221	.642
X_3	Occupational status	.269**	.122	2.204	.564
X_4	Farm size	.178**	.036	4.944	.023
X_5	Farming experience	-.233**	.081	-2.876	.021
X_6	Annual income	-8.71E-06***	.000	-5.414	.000
X_7	Mass media exposure	-.053 NS	.127	-.471	.821
X_8	Herd size	-.375***	.055	-6.818	.000
X_9	Milk production	.424*	.285	1.487	.084
X_{10}	Milk consumption	.007 NS	.134	.052	.861
X_{11}	Milk sale	-.461**	.188	-2.452	.058
X_{12}	Innovativeness	.003 NS	.438	.006	.880
X_{13}	Social participation	.623*	.357	1.745	.062
		R^2 = 0.791		F = 17.806	

*** (P<0.01), ** (P<0.05) and *(P<0.10). NS: Non-significant

Table 5. Perceived constraints in adoption of good feeding practices (n=300)

Feeding constraints	MC	SWC	NC	Rank
Non availability of green and dry fodders	118(39.30)	131(43.70)	51(17.70)	VIII
Inadequate knowledge about nutrient requirement of different physiological stages of dairy animals	194(64.70)	31(10.30)	75(25.00)	III
Unavailability of concentrates and mineral mixtures in villages	215(71.70)	69(23.00)	16(5.30)	II
Higher cost of concentrates, mineral mixtures and vitamin supplements	227(75.70)	70(23.30)	3(1.00)	I
Unavailability of quality seeds and fodder	97(32.3)	203(67.70)	0(3.30)	IX
Lack of irrigation for fodder crops during summer	173(57.70)	107(35.70)	20(6.70)	IV
Less availability of grazing/pasture land	145(48.30)	112(37.30)	43(14.30)	VI
Shrinkage of agricultural land for fodder production	147(49.00)	102(34.00)	51(17.00)	V
Overall higher production cost of feed and fodder	144(48.00)	141(47.00)	15(5.00)	VII

MC: Most constraints, SWC: Some what constraints and NC: No constraints, Figures in parenthesis indicate percentage

Rate of adoption: Adoption analysis (Table 3) indicated that 27.33 percent of the farmers adopted colostrum feeding practices to the new born calf with appropriate timing and quantity, 24.66 percent of the respondents cultivated cumbu napier green fodder varieties such as CO 3, CO (CN) 4 and CO (BN) 5. Further, 22.33 percent of the respondents followed feeding of concentrates, 12.66 percent of the farmers cultivated green fodder crops scientifically, 9.66 percent of the farmers followed balanced feeding ration, 7.66 percent of the farmers adopted silage making, and only 6.34 percent of the farmers adopted mineral and vitamin supplementation for their dairy cow. The adoption results clearly indicated that the dairy farming is in primitive stage and there is a greater scope to disseminate good dairy farming practices through effective extension strategies.

Influence of socio-economic variables on adoption: The variables such as age, occupational status, farm size, milk production and social participation had positive and significant relationship with adoption of good feeding practices (GFPs) (Table 4). This showed that a unit increase in the occupational status, farm size, milk production and social participation, *ceteris paribus* would increase the adoption level by 0.210, 0.269, 0.178, 0.424 and 0.623 units, respectively. Increased milk production directly indicated the adoption of few good feeding practices at field level. Subsequently, higher returns from dairying will motivate the farmers to learn and adopt the recommended GFPs. More social participation among the respondents will provide the platform for effective learning and information exchange. The R^2 value (0.791) clearly indicated that total variation in adoption of good feeding practices was explained by the selected socio-economic variable to the extent of 79.1 per cent.

Perceived constraints: Three fourth of the tribal farmers (75.70%) expressed higher cost of concentrates, mineral mixtures and vitamin supplements as the major constraint and it was ranked first (Table 5). This was followed by the constraints such as unavailability of concentrates and mineral mixtures in villages (71.70%), inadequate knowledge about nutrient requirement of different physiological stages of dairy animals (64.70%), lack of irrigation for fodder crops during summer (57.70%), shrinkage of agricultural land for fodder production (49%), less availability of grazing/pasture land (48.3%), higher production cost of feed and fodder (48%), non availability of green and dry fodders (39.3%) and non availability of quality seeds of fodder (32.3%). The perceived constraints in the adoption of good feeding practices were almost similar to the findings reported by Kumar *et al.* (2015).

Conclusion

It was concluded that majority of the respondents in the study area had low level of awareness and thus low level of adoption in good feeding practices. However, the tribal dairy farmers expressed their keen interest to adopt in future. Notably, the socio economic variables such as age, educational status, occupational status, mass media exposure, social participation, farm size and milk production were found to be critical towards adopting GFPs. Majority of the tribal farmers expressed that higher cost of concentrates, mineral mixtures and vitamin supplements as the main feeding constraints in study area.

References

Biradar, N., P. Sharma, S. Pandey, Satyapriya, M. Singh and S. Radotra. 2013. Livelihood analysis of livestock farmers in arid region of Deccan Plateau. *Range Management and Agroforestry* 34: 131-136.

Chand, K., B. L. Jangid, P. P. Rohilla and V. Kumar. 2015. Economics of bovine production reared on common pasture lands. *Range Management and Agroforestry* 36: 211-216.

Cronbach, L. J. 1951. Coefficient alpha and the internal structure of tests. *Psychometrika* 16: 297-334.

FAO. 2000. Feed Requirements for Dairy Cows. http://www.fao.org/ag/agp/agpc/doc/ publicat/PUB6/P620.htm (accessed on Apr. 11, 2016).

Field, A. 2000. *Discovering Statistics using SPSS for Windows*. London-Thousand Oaks. Sage Publications, CA, USA.

Giles, D. C. 2002. *Factor Analysis in Advanced Research Methods in Psychology*. Hove, East Sussex. Psychology Press, Routledge, London.

Hair, J. F., R. E. Anderson, R. L. Tatham and W. C. Black. 1998. *Multivariate Data Analysis*. 5th Edition, Prentice Hall, Upper Saddle River, New Jersey.

Kumar, M., R. P. Singh and A. K. Misra. 2015. Adoption level of green fodder production practices and constraints faced by the farmers of Rajasthan. *Range Management and Agroforestry* 36: 217-220.

Likert, R. 1932. A technique for the measurement of attitudes. *Archives of Psychology* 22: 1-55.

Nunnally, J. C. 1978. *Psychometric Theory.* 2nd edition. McGraw-Hill. New York.