Determinants in Predicting Adoption of Scientific Management Practices Among Osmanabadi Goat Keepers

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ABSTRACT

The present ex-post-facto study was purposively conducted in the home tract of Osmanabadi goat to ascertain the adoption of scientific goat management practices by Osmanabadi goat keepers and factors influencing it. The results revealed that a greater proportion of Osmanabadi goat keepers had never adopted practices like record keeping, insurance, weaning, de-ticking, feeding of the mineral mixture, and concentrate. The adoption of scientific goat management practices was at a medium (44.17 – 52.51 indices) extent among the majority. Training participation, mass media, and flock size significantly contributed in predicting adoption of scientific goat management practices. Training participation had shown the highest direct and indirect effects over adoption. Extension agencies should organize more effective trainings, encourage broad participation, and use intensive mass media to spread technologies to enhance the adoption of scientific goat management practices among Osmanabadi goat keepers belonging to the Latur region.

Key words: Adoption; Determinants; Osmanabadi goat keepers; Management practices.

According to 20th Livestock census, India owned 148.88 million goats. It had shown an increase (10.14%) over the previous census, and this growth was more (25.72%) with the goat population of 10.60 million in Maharashtra *(BAHS, 2019)*. Goat keeping, a preferable activity of rural families, requires minimum initial investment and fewer inputs. Goat is advantageous over cattle and buffaloes due to its higher prolificacy, early sexual maturity, small size, and ease of handling and marketing. Goats can survive in widely different climatic conditions. Goat rearing is one of the most commonly adopted livestock activities in the semi-arid Latur region of Maharashtra and an important source of substantial income, particularly for rural women, landless and marginal farmers. The proportion of Osmanabadi goat breed is 2.27 per cent in overall Indian goat and primarily (2.15 million) distributed in Maharashtra and adjoining states *(DADF, 2013)*. Osmanabad and Latur districts are the home tract of this breed and had a population of around 94 per cent of the Latur region *(AHD, 2007)*. Adopting scientific goat farming practices and technologies has been considered key drivers in improving the socio-economic status of goat-keeping households through better productivity and profitability. Application of best management practices and innovations are essential to achieve sustainable goat production. Understanding factors that influence the adoption of scientific practices is vital to extension

agencies to transfer technologies effectively. With this view, the present study was conducted to assess the adoption of scientific goat management practices followed by Osmanabadi goat keepers in the Latur region and the factors influencing it.

METHODOLOGY

An *ex-post-facto* study was purposively conducted in the home tract of Osmanabadi goat, *i.e.*, Osmanabad and Latur districts of the Latur region in Maharashtra. The multistage random sampling technique was used. In the first stage, two talukas from each district, then five villages from each taluka, and six Osmanabadi goat-keeping households randomly selected from each village, constituted 120 respondents as a sample size for the study. The person belonging to the Osmanabadi goat-keeping household, who had control over the decision and operations of the goat farm, was the respondent. During December-January, 2020-2021, a field survey was conducted using a pre-tested semi-structured interview schedule. Adoption of enlisted 15 scientific goat management practices was recorded on a four-point continuum *viz.* 'regularly adopted,' 'partially

adopted,' 'discontinued after initial adoption' and 'never adopted' with respective assigned codes 4, 3, 2, and 1. The adoption levels of scientific goat management practices were measured based on the 'Adoption Index' with scores ranges from a minimum of 15 to a maximum of 60.

$$\text{Adoption index} = \frac{TAS}{MAS} \times 100$$

Where,
TAS=Total adoption score obtained by respondent
MAS=Maximum obtainable score obtained by respondent

After data collection, the respondents were classified using the cumulative square root frequency method into homogenous groups, *i.e.*, small (2-5.35 standard goat unit), medium (5.35 - 8.70 SGU), and large (8.70 - 18.75 SGU) Osmanabadi goat keepers. The standard goat unit was worked out by assigning one SGU to each adult doe and buck, ½ SGU to each kid between 3 to 6 months, and ¼ SGU to each young kid below three months of age.

RESULTS AND DISCUSSION

Adoption of scientific management practices : Most Osmanabadi goat keepers across all categories, *i.e.*, small, medium, and large goat keepers (Table 1), had

Table 1. Adoption of scientific management practices by Osmanabadi goat keepers

Practices	Small (n=38)				Medium (n=50)				Large (n=32)				Mean Score	Rank
	R	P	D	N	R	P	D	N	R	P	D	N		
Cleaning of shed	42.11	57.89	0.00	0.00	36.00	64.00	0.00	0.00	40.62	59.38	0.00	0.00	3.39	I
Clean and fresh water	18.42	81.58	0.00	0.00	20.00	80.00	0.00	0.00	37.50	62.50	0.00	0.00	3.24	II
Colostrum to kids	31.61	52.70	0.00	15.69	26.00	62.00	2.00	10.00	53.13	31.25	3.12	12.50	3.08	III
Deworming of kids	23.68	47.37	5.27	23.68	42.00	40.00	6.00	12.00	37.50	37.50	6.25	18.75	2.94	IV
Vaccination against contagious diseases	2.63	47.37	2.63	47.37	10.00	46.00	8.00	36.00	18.75	50.00	6.25	25.00	2.31	V
Deworming of goat	7.90	36.84	18.42	36.84	10.00	40.00	12.00	38.00	12.50	43.75	9.37	34.38	2.23	VI
Concentrate feeding	5.26	31.58	10.53	52.63	8.00	40.00	6.00	46.00	25.00	25.00	3.12	46.88	2.08	VII
Mineral feeding	5.27	21.05	18.42	55.26	0.00	28.00	16.00	56.00	21.88	34.38	3.11	40.63	1.91	VIII
De-ticking	0.00	15.79	21.05	63.16	0.00	12.00	26.00	62.00	3.11	15.63	9.38	71.88	1.51	IX
Weaning of sick goat from herd	0.00	15.79	0.00	84.21	6.00	12.00	0.00	82.00	9.37	21.88	9.37	59.38	1.49	X
Changing breeding buck after every 2 years	0.00	18.42	0.00	81.58	2.00	10.00	2.00	86.00	6.24	9.38	9.38	75.00	1.36	XI
Grooming of goat	0.00	15.79	5.26	78.95	0.00	8.00	0.00	92.00	0.00	9.38	3.12	87.50	1.24	XII
Quarantine of goat	0.00	2.63	0.00	97.37	0.00	2.00	0.00	98.00	0.00	12.49	15.63	71.88	1.14	XIII
Insurance of goats	0.00	0.00	0.00	100.00	0.00	0.00	0.00	100.00	3.13	6.24	3.13	87.50	1.07	XIV
Record keeping	0.00	0.00	0.00	100.00	0.00	0.00	0.00	100.00	0.00	3.12	0.00	96.88	1.02	XV
Mean rank	52.42				57.72				74.44					

Kruskal Wallis H   7.565*

R-Regularly adopted,   P-Partially adopted,   D-Discontinued after initial adoption and   N-Never adopted

Table 2. Extent of adoption of scientific management practices among Osmanabadi goat keepers

Adoption level index	Small (n=38)	Medium (n=50)	Large (n=32)	Pooled (N=120)
Low (31.67 – 44.17)	11 (28.95)	11 (22.00)	6 (18.75)	28 (23.33)
Medium (44.17 – 52.51)	17 (44.73)	25 (50.00)	8 (25.00)	50 (41.67)
High (52.51 – 73.33)	10 (26.32)	14 (28.00)	18 (56.25)	42 (35.00)
Mean±SE	48.03±1.15	49.10±0.97	53.85±1.74	50.03±0.74

One-way ANOVA $F(2)=5.39**$, $P=0.006$ Figures in parenthesis indicate percentage

either partial or regular adoption of scientific management practices *viz.* cleaning of shed, *ad-lib* fresh and clean water provision for goats. The maximum proportion of large goat keepers (53.13%) regularly adopted colostrum feeding. However, colostrum feeding was by the majority of small (52.70%) and medium (62.00%) goat keepers. Mainstream of large (37.50%) and medium (42.00%) goat keepers had regularly adopted deworming of kids. Large proportions across all groups had partial vaccination adoption against contagious diseases and deworming of adult goats. The majority of respondents in all groups had never adopted scientific management practices like quarantine at the time of arrival, grooming, buck replacement every two years, weaning of sick goats, de-ticking, and feeding the mineral mixture, and concentrate feed. Cent per cent small and medium goat keepers never maintained records and never did insurance to unforeseen risk. About 3 per cent of large goat keepers were regularly doing insurance of goats, while an equal proportion of them partially kept records. Mean score values indicated that cleaning the shed, providing clean and fresh drinking water, colostrum feeding, and deworming of kids were the best-ranked practices, followed by Osmanabadi goat keepers. The least adopted management practices were timely replacement of breeding buck, grooming, quarantine of newly arrived stock, insurance, and record keeping. *Sharma et al. (2007), Mandavkar et al. (2015), Goswami et al. (2019),* and *Paul et al. (2020)* recorded similar observations. Kruskal Wallis analysis showed that the mean rank of adoption in large goat keepers (74.44) was higher than small (52.42) and medium (57.72) goat keepers, which implies higher adoption among large goat keepers than their counterparts.

Extent of adoption of scientific goat management practices: The extent of adoption of scientific goat management practices (Table 2) revealed that maximum proportion (41.67%) of 'pooled' respondents had a medium level of adoption (44.17 to 52.51 indices), followed by high (35.00%) and low (23.33%) extent. *Kumar et al. (2015)* and *Gunaseelan et al. (2018)* observed a similar trend in studying the extent of adoption among goat keepers. The majority (56.25%) of large goat keepers had a high level of adoption, whereas the majority of small (44.73%) and medium (50.00%) goat keepers adopted scientific goat management practices to medium extent. The application of one-way ANOVA revealed a highly significant difference in adoption across all groups of goat keepers [$F(2)=5.39$, $P=0.006$].

Bonferroni post-hoc analysis resulted in significant pairwise mean differences between small and large goat keepers, with an average difference of 5.82 adoption indices ($P=0.007$) and between medium and large goat keepers with an average difference of 4.75 adoption indices ($P=0.026$). It implies that large goat keepers adopted more scientific management practices than small and medium goat keepers. *Meena et al. (2011)* reported similar findings in arid zone of the Rajasthan. The probable reasons for average lower adoption indices in small and medium goat keepers might be due to lack of awareness, negligence, or the unfelt need for scientific management practices.

Correlates of socio-economic variables with adoption of scientific goat management practices: The adoption behavior of scientific goat management practices among Osmanabadi goat keepers had a positive and highly significant association with independent variables *viz.* training participation, flock size, and social participation (Table 3). *Kumar (2007)* reported encouraging adoption in trained goat keepers. Adoption of scientific management practices was positively and significantly associated with flock size (*Guntoro et al., 2016*) and social participation (*Roy and Tiwari, 2017*). Further, the goat rearing system showed positive and significant association with

Table 3. Bivariate correlation of socio-economic variables with adoption of scientific goat management practices

Independent variables	Code used	(r)	Sig. (2-tailed)
Age	In years	.025	.790
Gender	Male 1, Female 2	-.118	.201
Caste category	Gen 1, OBC 2, SC 3, ST 4 & NT 5	-.229*	.012
Education	Illiterate1,pri 2,middle 3,sec. 4,higher sec. 5 & degree 6	-.078	.394
Experience in goat farming	In years	.097	.294
Use of informal sources	Never1, sometimes 2 &frequent 3	.105	.253
Use of mass media	Never1, sometimes 2 &frequent 3	.179	.051
Extension agency contact	Never1, sometimes 2 &frequent 3	.082	.372
Training participation	No1 & yes 2	.398**	.000
Social participation	No participation0, member1, secretary2 & chairman3	.241**	.008
Goat rearing system	Semi-intensive 2 & extensive1	.187*	.041
Goat production system	Goat rearing only, goat + crop, goat + cattle/buffalo rearing, goat + sheep rearing & so on	-.166	.070
Flock size	Standard goat unit	.344**	.000

*Correlation is significant at the 0.05 level (2-tailed).　　**Correlation is significant at the 0.01 level (2-tailed)

adopting scientific goat management practices. It implies that Osmanabadi goat keepers who had participated in the training, owned larger goat flock, participated in social organization, followed a semi-intensive system of goat rearing had more adoption of scientific goat management practices. Other studied variables *viz*. age, experience in goat rearing, utilization of informal sources, use of mass media, and extension agency contacts had positive but non-significant correlation with adoption of scientific goat management practices. Caste category was significantly but negatively correlated, while gender, education level, and goat production system were negatively associated with adoption. A negative correlation of caste category with adoption might result from higher adoption among OBC than SC and NT caste categories. The greater adoption among male respondents might be the reason to signify a negative association of gender with adoption. A negative correlation of the goat production system with adoption implies better adoption among goat keepers following mixed production activities integrated with crops or other livestock.

Regression analysis between independent variables and adoption : A regression model fitted using 13

Table 4. Linear estimates of determinants in adoption

Independent variables	Unstandardized Coefficients		Standardized Coefficients	't'	Sig.
	B	S. E.	Beta		
(Constant)	32.134	7.435		4.322	.000
Age	-.074	.098	-.073	-.750	.455
Gender	-.941	1.537	-.058	-.613	.541
Caste category	-.836	.592	-.122	-1.413	.161
Education	-.636	.816	-.077	-.780	.437
Experience in goat farming	.021	.196	.011	.109	.913
Use of informal sources	.210	.424	.047	.495	.622
Use of mass media	1.129	.568	.200	1.989	.049
Extension agency contact	-.052	.587	-.008	-.088	.930
Training participation	7.716	2.281	.315	3.382	.001
Social participation	1.790	6.343	.028	.282	.778
Goat rearing system	.724	.861	.072	.841	.402
Goat production system	-.265	.297	-.078	-.890	.375
Flock size	.662	.234	.282	2.829	.006

R=0.580　　　　　　　　$R^2 = 0.336$　　　$F = 4.12***$　　(P=0.000, df=13)

**Table 5. Optimal regression analysis between selected independent variables
and adoption of scientific goat management practices**

Independent variables	Unstandardized Coefficients		Standardized Coefficients	't'	Sig.	Collinearity Statistics	
	B	S.E.	Beta			Tole-rance	VIF
(Constant)	28.178	5.486		5.14	.000		
Caste category	-1.081	.537	-.168	-2.01	.046	.975	1.025
Mass media	1.034	.442	.183	2.34	.021	.979	1.021
Training participation	8.286	1.919	.338	4.32	.000	.973	1.027
Flock size	.740	.184	.316	4.02	.000	.969	1.032

R=0.559 R^2=0.312, R^2 change = -0.008 F=13.05***   (P=.000, df=4)

independent variables (Table 4) to explain the variability of each variable in predicting the adoption of scientific goat management practices. Training participation and flock size contributed positively with high significance. Similar findings were reported by *Gunaseelan et al. (2018)*. The use of mass media contributed positively and significantly (P=.049) in explaining variability in adoption. Therefore, these variables would be considered good contributors, predictors, and determinants in adopting scientific goat management practices. Social participation, use of informal sources, goat rearing system, and experience in goat farming had positive but non-significant regression coefficients. In contrast, age, gender, caste category, education, extension agency contacts, and goat production system had negative regression coefficients and contributed non-significantly in explaining the variability of adoption.

All the variables together could explain 33.60 per cent variability in determining the adoption of scientific management practices of goat keepers. It indicated that other important variables that might influence adoption were excluded from the model. However, it showed statistically significant variation.

Optimal regression and path analysis : A stepwise multiple regression (Table 5) was used following backward elimination procedure to identify a set of independent variables contributing maximum in adopting scientific goat management practices. Out of 13 variables, four variables *viz.* caste category, mass media,

training participation, and flock size were the most contributing factors in adoption. Applied collinearity diagnostics to determine variance inflation factors (VIFs) as it quantifies the extent of correlation between one predictor with another. Variance inflation factors (VIFs) were below recommended five (*Rogerson 2001, Akinwande et al. 2015*). It implies that independent variables included in the regression model were moderately correlated, but it is not severe enough to warrant corrective measures. These identified variables, excluding caste category, were used for path analysis following the procedure suggested by *Akintunde (2012)* to estimate direct and indirect relationships.

The highest direct effect on adoption of scientific goat management practices among Osmanabadi goat keepers was exercised by their participation in goat-related training (0.352), followed by flock size (0.334) and mass media utilization (0.180) as depicted in Table 6. Obviously, due to training exposure, participants might be better aware, acquired knowledge and skills about scientific management practices, and subsequently used them in goat farms. Large flock size and mass media use had a significant influence on adoption. Training participation ranked first in direct as well as in total indirect effect. While, mass media ranked second in total indirect effect, followed by flock size. Path analysis indicated that training participation was the most crucial variable affecting adoption among Osmanabadi goat keepers both directly and indirectly. However, training participation

Table 6. Direct and indirect effect of selected independent variables on adoption of scientific management practices

Independent variables	Direct effect		Total indirect effect		Largest indirect effect through single variable effect
	Effect	Rank	Effect	Rank	
Training participation	0.352	I	0.044	I	0.027
Flock size	0.334	II	-0.007	III	0.027
Mass media	0.180	III	-0.002	II	0.017

showed the largest indirect effect on adoption through goat flock size. The largest indirect effects of both flock size and mass media use were mediated through participation in goat-related training. It implies that the goat keepers who owned large flocks and used more mass media had higher adoption of scientific goat management practices through their training participation.

CONCLUSION

Most Osmanabadi goat keepers had never adopted practices like record keeping, insurance, weaning, de-ticking, feeding of the mineral mixture, and concentrate. They had a medium extent of adoption of scientific goat management practices. Training participation, mass media, and flock size were the most contributing factors in adopting scientific goat management practices. Training participation had shown the highest direct and indirect effects over adoption. Efforts are needed to enhance adoption of scientific goat management practices by modulating contributory factors among Osmanabadi goat keepers. Extension agencies shall organize more effective trainings, encourage broader participation, and widely use mass media to spread goat specific technologies in the home tract of Osmanabadi goat breed.

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