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Full Length Research Paper

Adoption of innovations and best management practices by goat farmers in eastern Mediterranean Region of Turkey

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Goat farming has traditionally been a major livelihood for many rural families in the mountainous and uphill areas of the Eastern Mediterranean region of Turkey. In recent years, the increased demand for goat products raised the issue of developing a sustainable goat sector in the region. The primary purpose of this study was to determine best management practices and innovations in goat farming and their adoption levels in the Eastern Mediterranean Region of Turkey. For this purpose, 140 goat farmers were surveyed and their socioeconomic characteristics, management practices, problems encountered, levels of applying innovations and best management practices, as well as factors influencing their adoption were investigated. Results of the study revealed that goat farmers face problems with expensive feeds, low governmental subsidies, and cheap prices for goat products. Adoption level of innovations and best management practices were found quite low and it was influenced by farmers' experience, income, travels, and contacts with extension service and private veterinarians.

Key words: Adoption, goat farming, management practices, rural development, Turkey.

INTRODUCTION

Goat farming has traditionally been the main livelihood of many rural families in the Eastern Mediterranean region of Turkey (Jordan et al., 2002). It represents a type of family farming in the mountainous areas of Adana, Osmaniye, Hatay, and Kahramanmaras provinces where farmland has environmental restrictions for cultivation. Using farm machineries such as tractors, cultivators, combines, and seeding machines is both uneconomical and erosion sensitive. As moving from low lands to uphills and mountainous areas the slope of landscape increases and farmlands turn in smaller and fragmented parcels where machinery use is more costly and in some cases technically impossible. If farming practices which require soil operations are insisted without taking adequate measures, they will trigger soil erosion and therefore weaken natural resource base which presently provides livelihood, even not self-sufficient for many rural families.

An agricultural system forcing farmers to cultivate lands in uphills and mountainous areas doesn't provide rural people with income which would make it possible for them and for their children to enjoy at least an averaged quality of rural life (Jordan et al., 2002). This farming system accompanied with lack of regular services of education, health care, and transportation in rural areas, force farmers to migrate big cities where more opportunities are to be found.

There have been at least two major driven forces which encourage goat producers in the uphill and mountainous landscape of the region. One of them is a gradually growing interest in goat meat and milk. According to many consumers in the region, goat is the most frequently consumed meat and is hardly subsidized for weal or muffon. Goat milk is also considered healthier as it is believed to have a lower level of fat (Coşkun and Öndül, 2004).

The second driven force is the continuously growing demand for goat milk which is the major input for internationally well-known "Kahramanmaras ice-cream". At least three large companies, namely, Mado, Edo, and Carpedo have exceeded regional even national borders and they started franchising activities in many cities around the Middle east and the Europe. Not long time ago they were purchasing goat milk solely from farmers around the province of Kahramanmaras. However, they have recently started to raise Saanen goats to produce their own milk, but due to the growing demand for Kahramanmaras Ice-cream, there have been shortages in goat milk and therefore mixing caw milk which inevitably reduces the quality of ice-cream. In order to overcome the goat milk shortage Kahramanmaras ice-cream companies have started to initiate contract farming with goat producers in mountainous areas.

The number of goats in Turkey and in the Eastern Mediterranean Region changes according to economic stability of the country and macroeconomic policies related to animal husbandry. In the last two decades, the sharpest decrease in the number of goats in Turkey and in the East Mediterranean region was in 2009 when the number of goats decreased to 4,9 million and 0,37 million, respectively (Turkish Statistical Institute – TSI, 2013). Later on governmental subsidies and project incentives for animal production gave their positive results and the number of goats for the year 2011 reached to 7,1 millions in Turkey, and 0,56 millions in the East Mediterranean Region (TSI, 2013). The increase rates were calculated as 45%, and 51%, respectively.

Literature review reveals that there have been studies on the adoption of innovations and best management practices among farmers in different parts of the world. Some of the studies concentrated on innovations regarding dairy farms (Jaisridhar et al., 2013; Barham et al., 2004; Foltz and Chang, 2002); forage crops (Lapar and Ehui, 2004); beef cattle farming (Johnson et al., 2010; Gillespie et al., 2007; Suppadit et al., 2006; Kim et al., 2005; Chaudhry et al., 1993), and sheep producers (Budak et al., 2011). However, there is no study which is directly focused on the adoption of innovations and best management practices in goat farming. Nevertheless, Smith (2010), Kaymakçi and Dellal (2006), and Kaymakçi (2002) gave basic principles and information about goat farming while Ozturk (1999) investigated the problems encountered by goat farmers in Kahramanmaras province of Turkey.

In order to achieve a sustainable goat production sector at large, it is important for goat farmers not only depend on the governmental subsidies and incentives but also the application of best management practices and innovations. Therefore, the overall purpose of the study was to determine the application levels of best management practices and innovations in goat farming and socioeconomic factors and information-seeking behavior influencing their adoption. The specific objectives are:

a. Determine socioeconomic characteristics of goat farmers;
b. Acquire basic information about goat farming in the region;
c. Determine what problems are being encountered by goat farmers;
d. Determine awareness and application levels of selected innovations and management practices
e. Determine the extent to which socioeconomic factors and information-seeking behavior influencing the adoption of management practices and innovations.

MATERIALS AND METHODS

Area of study and sampling procedure

Basic material used for this study was information obtained by administering a questionnaire to 140 goat farmers in the Eastern Mediterranean Region of Turkey. Target population to which the findings of this research were to be generalized was all goat farmers operating in this region. In order to draw an accurate sample to represent this population, first of all an accessible population in which every goat farmers had an equal and independent chance of being included in the sample was determined. For this purpose, 36 villages from four provinces of the region (Adana, Hatay, Kahramanmaras, Osmaniye) were selected with the help of province directorates of the Ministry of Food Agriculture and Livestock.

Lists of goat farmers with their numbers of goats were obtained from district directorate offices. Because some district directorates did not have an updated list of statistics for every village, these villages were visited in advance to determine the goat farmers and the number of animals they owned. Lists of goat farmers from the 36 villages made the accessible population. Based on the number of goats owned by each farmer, the accessible population was divided in three strata.

Then Yamane (2009), stratified sample size determination formula was used accepting 5% error term from the mean and 95% confidence interval.

$$n = \frac{N\sum N_h S_h^2}{N^2 D^2 + \sum N_h S_h^2}, D^2 = \frac{e^2}{t^2}$$

n = Sample size, N = Number of farmers in accessible population, N_h = Number of farmers in each stratum, S_h = Standard deviation within each stratum, D^2 = Desired variance, e = Permitted error from the mean of accessible population, t = t-table value of accepted confidence interval.

The number of sample size was determined as 140. This number was proportionally distributed to each of the three strata and respondents from each stratum were randomly selected.

Data collection procedure

A two section questionnaire was prepared to collect data; the first section included questions about goat farming, management practices, innovations, and animal care; the second section included questions about socioeconomic characteristics and information-seeking behavior of farmers. Kaymakçi (2002), Vincent (2005), Smith (2010), Tölü et al. (2011), Savaş et al. (2012), and Ceyhan (2012) were explicitly utilized for the questionnaires. Questionnaires were mostly filled in respondents' farms or houses. In several cases they were contacted while they were grazing their herd on mountains. Data were collected in January-June 2008 period.

Analitical procedure

Descriptive statistics including frequencies and percentages were used to analyze data regarding objectives 1, 2, and 4 while means and standard deviations were used for objective 3. For the fifth objective the ordered probit method was used to determine the extent to which selected socioeconomic characteristics and information-seeking behavior influenced the application of best management practices and innovations among goat farmers. The dependent variable of the model was constructed with three levels (0 = low level adoption, 1 = medium level adoption, and 3 = high level adoption).

For this purpose, 30 management practices and innovations regarding goat farming in the region were predetermined considering the literature reviewed and specific characteristics of the region. Considering the frequency distribution of the responses on the questions whether or not farmers applied these practices or innovations, three adoption categories were formed. Those who adopted at least 10 practices or innovations were assigned to the low level adoption category, those who adopted between 11 and 20 were assigned to the medium level adoption category, and finally those who adopted more than 20 were assigned to the high level adoption category. Two separate models (the first one for socioeconomic characteristics and the second one for information-seeking behavior) were run. The ordered probit model can be expressed as follows:

$$y^* = \beta' x_i + \varepsilon, \varepsilon \sim N(0, 1) \quad (1)$$

$y = 0$ if $y^* \leq 0$, $y = 1$ if $0 < y^* \leq \mu_1$, $y = 2$ if $\mu_1 < y^* \leq \mu_2$, where y^* denotes the vector of unobserved dependent variable, β' denotes a vector of coefficients, x_i denotes a vector of explanatory variables, ε denotes a vector of error terms normally distributed N[0,1], y denotes the observed dependent variable with three adoption levels, and finally μ denotes the threshold values which indicate the inclinations of adoption (Greene, 2012). Because the vector of error term is normally distributed, the likelihood of beef cattle farmers falling one of the three categories of the dependent variable can be expressed as:

$$\text{Prob } (y = 0) = 1 - \Phi(-\beta' x), \quad (2)$$
$$\text{Prob } (y = 1) = \Phi(\mu_1 - \beta' x) - \Phi(-\beta' x),$$
$$\text{Prob } (y = 2) = 1 - \Phi(\mu_1 - \beta' x), \quad (2)$$

where Φ denotes the cumulative standard normal distribution and μ_1 is greater than zero. Empirically, this model was similarly used by Boz et al. (2011), Budak et al. (2011), Boz and Akbay (2005), Chen et al. (2002), Abdel-Aty (2001), and McLean-Meyinsse (1997).

Measurement of variables

Income level was asked in the question that "If all farmers at your village were to be divided in three income categories as low, medium, and high income levels which category you would likely to fall in".

For the third objective 23 predetermined items were listed and asked by goat farmers to respresent each item in a five point Likert-scale with 1 = Strongly Disagree (SD), 2 = Disagree (D), 3 = Neutral (N), 4 = Agree (A), 5 = Strongly Agree (A). Respondents were also asked to feel free to express any other problems left out of the questionnaire. Means, standard deviations and response categories wee also calculated. To interpret the means of all the items listed in the table an interpretative scale (0.00-1.49 = SD, 1.50-2.49 = D, 2.50-3.49 = N, 3.50-4.49 = A, 4.50-5.00 = SA) was developed.

For the fourth objective of the study 30 predetermined innovations and best management practices were determined by an extensive use of the literature, explicitly Kaymakçi (2002), Kaymakçi and Dellal (2006) and Veteriner cc. (2012). Respondents were asked if they applied these practices in their own cases.

For the fifth objective, initially respondents were divided in three categories according to the number of applied innovations or best management practices. Of the 30 innovations and best management practices respondents who applied at least 10 items were assigned to the low level category and coded as '0'; those who applied between 11 and 20 items were assigned to the medium level category with a code of '1'; and finally those who applied more than 20 items were assigned to the high level category with a code of '2'.

The independent variables were selected from Table 1 and entered the model as dummies in the following dichotomous categories: Age (older than 35 = 1, 0 otherwise), experience (more than 20 years = 1, 0 otherwise), education (beyond elementary = 1, 0 otherwise), cooperative membership (farmer is a member = 1, 0 otherwise), investment (farmer invested in goat farming in the last three years=1, 0 otherwise), land owned (more than 25 decares = 1, 0 otherwise), and level of income (high level = 1, 0 otherwise).

Several models were run and the one presented was significant at an alpha level of 0.01 or better (Model chi square for socioeconomic factors = 28.313, Degrees of freedom = 7). The estimated threshold value ($\mu 1 = 1.088$) was positive and significant at 0.01 alpha level indicating that there was a natural ordering in the three levels of innovations and best management practices among goat farmers in the region.

(1)

Model chi square for information seeking behaviour = 38.637, Degrees of freedom = 7. The estimated threshold value ($\mu 1 = 1.162$) was positive and significant at 0.01 alpha level indicating that there was a natural ordering in the three levels of the dependent variable.

The independent variables entered the model as dummies with the following codes: Reading newspaper (At least once a week = 1, 0 otherwise), listening to radio (Every day = 1, 0 otherwise), Watching television (Every day = 1, 0 otherwise), Use of the Internet (Several times a month = 1, 0 otherwise), traveling to city

(At least once a week = 1, 0 otherwise), contacts with extension service (At least once a month = 1, 0 otherwise), contacts with veterinarians (At least once a month = 1, 0 otherwise).

RESULTS

Socioeconomic characteristics of the respondents

Socioeconomic characteristics of the goat farmers were presented in Table 1. From the table it can be seen that 47.9% of the respondents were 35-50 age gap, 21.4% younger than 35 and 30.7% older than 50 years of age. The average age of respondents was 45.67. More than one-third of the respondents (36.4%) had less than 10 years' experience with goat farming while 34.3% had an experience between 10 and 20 years, and 29.3% more than 20 years. The mean of experience with goat farming was calculated as 18.68 years. In terms of education 63.6% held at least an elementary school degree while 20% received an education beyond elementary and 16.4% were illiterate.

Similarly, 39.3% of the respondents were in the medium income category while 30.7% and 30.0% in highy and low categories, respectively. The percentage of those who were members of cooperatives was 18.6% while 16.4% participated in village administration, 35.7% invested on their farms in the last three years buying live animals, land, and/or farm equipment.

The percentage of farmers owning farm land of smaller than 25 decares was 48.6% while the percentages of landless farmers was 27.1% and those who owned more than 25 decares made 24.3%. Average farmland of the respondents was 16.73 decares. Those who owned improved breeds of goats were 16.4% while those who owned native breeds were 87.9%. The average goat keeper in the region owned 16.4 improved breeds, and 64.7 native goats.

Selected management practices

The results on goat management practices are presented in Table 2. Based on the sales of milk and its products, it was established that 42.9% of the respondents sold teir milk daily while, 17.9% every 2-3 days and 12.1% weekly. Twenty-seven percent reported that they process goat milk into cheese or butter and sold it later. Majority of the farmers (51.4%) sold their milk to milkmen and 37.9% to traders. Similarly, majority of the respondents (76%) sold their animals to dealers and 51% sold goat hair to traders.

Almost half of the respondents (49.3%) carried out disease surveillance in their herds and monitored other livestock management problems while 27.1% practiced this duty yearly. Majority of the farmers (71.4%) thought that pasture lands around their village had been grazed properly. They stressed that lack of strict law and regulations cause early and excessive grazing which lowers the quality of pasture and degrades the fragile landscape leading to environmental problems such as erosion. Twenty-one percent reported that there was no publicly owned pasture land around their villages. Thus, they had to graze their herds in the pastures and bush areas owned by neighbor villages.

In addition cotton and grain harvested fields provide a good grazing opportunity especially around Kirikhan and Hassa districts of Hatay. However, it was qualitatively noted that respondents from these districts reported that large land owners in the area cannot stand any longer their harvested cotton and grain land to be grazed for free by goat farmers. Especially close to cotton harvest time they use some chemicals to drop the leaves of the crops due to a more convenient and economical harvest. Because many goat and sheep deaths have been reported in harvested cotton fields, herders abstain from grazing their animals in these fields.

Another restriction reported was that as long as farmers harvest their crops they burn residues to prepare soil for the upcoming crops leaving no grazing opportunity for herders. Although, there have been a strict regulation for residue fires, little success has been achieved so far.

Manure is considered very important fertilizer. More than half of the respondents (52%) sell their goat manure while 29.3% use it on their farm and 18.6% use it for heating their houses during the winter season. Majority of respondents (75.7%) used natural breeding methods and more than half of the respondents (57.1%) reared goats with after half-milking the mother.

Although, there have been improved breeding and rearing methods which enable goat farmers to increase their income, they seem not familiar with these methods.

Problems encountered by goat farmers

Problems encountered by goat farmers are presented in Table 3. According to the interpretative scale given in the analytical procedure and measurement of variables section of this study, respondents agreed with five items, remained neutral with ten items and disagreed with eight items. There were no items in SA and SD response categories.

The most seriously encountered problems in goat farming were expensive feeds, lack of governmental subsidies, lack of concentrated feeds, and lack of fodder crops, and low milk yield. From the farmers' point of view these can be considered as the immediate measures which will affect their cash income and therefore well-being. They offered simple solution for their problems which they focused on cheaper and abundant inputs, higher governmental subsidies, and higher prices for goat products.

It seems interesting that the respondents disagreed with the problems that lack of training and extension

Table 1. Socioeconomic characteristics of goat farmers.

Socioeconomic characteristics		
Age	**N**	**%**
Below 35	30	21.4
35-50	67	47.9
More than 50	43	30.7
Experience	**N**	**%**
Less than 10 years	51	36.4
10-20 years	48	34.3
More than 20 years	41	29.3
Educational level	**N**	**%**
İlliterate	23	16.4
Elementary school	89	63.6
Beyond elementary	28	20.0
Income level*	**n**	**%**
Low income	42	30.0
Medium income	55	39.3
High income	43	30.7
Cooperative membership	**n**	**%**
Yes	26	18.6
No	114	81.4
Participation in village administration	**n**	**%**
Yes	23	16.4
No	117	83.6
Invested in farm	**n**	**%**
Yes	50	35.7
No	90	64.3
Farm land	**n**	**%**
No land	38	27.1
25 or less decares	68	48.6
More than 25 decares	34	24.3
Improved goad breeds	**n**	**%**
Yes	23	16.4
No	117	83.6
Native goat breeds	**n**	**%**
Yes	123	87.9
No	17	12.1
Total	140	100.0

*Income level was asked in the question that “If farmers at your village were divided in three income categories such as low, medium, and high income categories, which category would you fall in”.

activities, care of the doe at kidding, rearing of baby goats, mating, animal insurance, keeping farm records, hygiene of barns, and trimming and keeping goat hair. During the interviews, it was figured out that almost no training and extension programs regarding small ruminants had been implemented in the region. Also, no animal insurance was observed. In general they indicated that they are conventionally knowledgeable about the items with which they disagreed and therefore they do not see them as problems.

Table 2. Selected management practices regarding goat farming.

Selected practices with goat farming	Number	Percent
Frequency of milk selling		
Every day	60	42.9
Every 2-3 days	25	17.9
Weakly	17	12.1
Milk is processed in cheese and sold later	38	27.1
Total	140	100.0
Milk is sold to		
Milkman	72	51.4
Trader	53	37.9
Farmer markets milk by his own	9	6.4
Neighbors or relatives with no animals	6	4.3
Total	140	100.0
Live animals are sold to		
Local live animal market	6	4.3
Dealer	107	76.4
Slaughterhouse	24	17.1
Animal board	3	2.1
Total	140	100.0
Goat hair is sold to		
Used in the family or given free to relatives	30	21.4
Neighbors	38	27.1
Traders	72	51.4
Total	140	100.0
How often are animals carefully observed for diseases		
Daily	16	11.4
Weekly	5	3.6
Monthly	12	8.6
Seasonal	69	49.3
Yearly	38	27.1
Total	140	100.0
Do you believe that publicly owned meadow and pasture land is properly grazed and protected?		
No publicly owned pasture and meadow land	30	21.4
Yes	100	71.4
No	10	7.1
Total	140	100.0
Where do you use manure?		
In my own land	41	29.3
Sell	73	52.1
Use it heating the house	26	18.6
Total	140	100.0
Breeding methods applied		
Hand breeding	32	22.9
Separate breeding pens	2	1.4

Table 2. Contd.

Natural breeding	106	75.7
Total	140	100.0
Methods of rearing goats		
Natural rearing	56	40.0
Artificial rearing	11	7.8
Rearing after half milking does	73	52.1
Total	140	100.0

Table 3. Problems encountered with goat farming.

Problems	Mean	Standard deviation	Response category
1. Feeds are expensive	4.15	0.753	A
2. Lack of governmental subsidies	4.11	0.754	A
3. Lack of concentrated feeds	3.80	1.575	A
4. Lack of fodder crops	3.64	1.579	A
5. Low milk yield	3.51	1.050	A
6. Milk harvesting and hygiene	3.46	1.801	N
7. Lack of pasture and grazing land	3.39	1.679	N
8. Lack of organization among goat farmers	3.21	1.292	N
9. Marketing of milk	3.10	1.875	N
10. Proper goat breed selection	3.06	1.906	N
11. Selection of goat kept for raising	3.06	1.911	N
12. Marketing of live goats	3.01	1.801	N
13. Dealing with diseases	3.00	1.468	N
14. Goat nutrition	2.95	1.955	N
15. Lack of information on doe raising	2.60	1.736	N
16. Lack of training and extension activities	2.45	1.429	D
17. Care of the doe at kidding	2.44	1.183	D
18. Rearing of baby goats	2.43	1.780	D
19. Mating	2.36	1.788	D
20. Animal insurance	2.09	1.603	D
21. Keeping farm records	1.67	1.322	D
22. Hygiene of barn	1.65	1.344	D
23. Hair cutting and keeping the hair	1.53	1.233	D

It was observed that except the immediate income generating measures such as lower input prices, higher governmental subsidies and output prices; goat farmers paid less attention and saw little benefits in other management practices which must be considered crucial to increase competitiveness and keep it up with changing market conditions.

Respondents' application of management practices and innovations

Results of the management practices and innovation applied by the respondents are presentad in Table 4. Majority of the respondents (91.4%) indicated that they practice goat pen proper cleaning and disinfection. Similarly, 83.6% indicated supplementary feeding before and during mating and 82.6% practice vacination against foot and mouth diseases.

More than half of the respondents took proper care of udders and nails, and trimmed goat hooves. They had hay feeders, separate pens, and feed storages in their shelters. In addition they vaccinated their animals against foot and mouth diseases, contagious caprine pleuropneumonia, goat prox, anthrax, and rabies (vaccine for dogs). Of the 30 selected innovations or best

Table 4. Awareness and application level of selected innovations and management practices.

Innovations-management practices	Yes		No		Unaware	
	n	%	n	%	n	%
1. Using separate breeding pens	2	1.4	106	75.7	32	22.9
2. Supplementary feeding before mating	117	83.6	19	13.6	4	2.9
3. Tie-up the umbilical cord with dental floss	16	11.4	51	36.4	73	52.1
4. Using machine for cutting goat hair			140	100.0		
5. Proper care of goat udders	109	77.9	15	10.7	16	11.4
6. Trimming goat hooves	82	58.6	42	30.0	16	11.4
7. Disbudding baby goats	80	57.1	52	37.1	8	5.7
8. Deodorizing bucks	10	7.1	38	27.1	92	65.7
9. Neutering males not planned on breeding	12	8.6	40	28.6	88	62.9
10. Using hybridization methods to improve the herd	23	16.4	107	76.4	10	7.1
11. Hay feeders	86	61.4	54	38.6	0	0
12. Combine feeders	16	11.4	124	88.6	0	0
13. Grain feeders	49	35.0	91	65.0	0	0
14. Silage feeders	3	2.1	137	97.9	0	0
15. Mineral feeders	7	5.0	133	95.0	0	0
16. Separate pens	80	57.1	60	42.9	0	0
17. Feed storage	102	72.9	38	27.1	0	0
18. Milking pens	66	47.1	74	52.9	0	0
19. Hair cutting pens	50	35.7	90	64.3	0	0
20. Bathroom	52	37.1	88	62.9	0	0
21. Care and selection pens	3	2.1	137	97.9	0	0
22. Proper cleaning and disinfecting goat shelter	128	91.4	2	1.4	10	7.1
23. Vaccine against foot mouth disease	116	82.9	18	12.9	6	4.3
24. Vaccine against goat pox	107	76.4	21	15.0	12	8.6
25. Vaccine against Ecthyma Contagiosum	55	39.3	40	28.6	45	32.1
26. Vaccine for dogs against rabies	71	50.7	49	35.0	18	12.9
27. Vaccine against Brusella Melitensis	86	61.4	33	23.6	21	15.0
28. Vaccine against contagious caprine pleuropneumonia (CCPP)	108	77.1	15	10.7	17	12.1
29. Vaccine against pseudo tuberculosis	58	41.4	19	13.6	63	45.0
30. Vaccine against anthrax	98	70.0	28	20.0	14	10.0

management practices only 3 were applied by more than half of the respondents while the remaining 16 items had quite lower application levels. Among the all respondents 65.7% had no information about 'deodorizing bucks', 62.9% about 'neutering males not planned on breeding', and 52.1% about 'tie-up the umbilical cord with dental floss'. On the other hand, 4.3% of the respondents were unaware of vaccine against foot mouth disease while 45% were unaware of vaccine against pseudo tuberculosis.

Socio-economic factors ınfluencing the adoption of ınnovations and management practices

The results obtained through ordered probit procedure are presented in Table 5. It can be seen from the results that 52.1% of the respondents were in low category, 32.1% in medium and 15.7% in high category of the innovations adoption. Of seven socioeconomic characteristics entered in the ordered probit model, 'experience' ($p = 0.064$) at 0.1 alpha level, and 'income' ($p < 0.01$) at 0.01 alpha level was found significant. Both variables had positive signs indicating that as experience and income level of farmers go up they tend to adopt more innovation and best management practices. However, adoption level was not affected by education, cooperative membership, investments, and farm size. The marginal effects for the significant socioeconomic variables showed that as farmers have more experience their likelihood of being in the low level adoption category decreases by 0.0057 percentage point while the likelihood of being in the medium and high level adoption categories increases by 0.0028 and 0.0029 percentage points, respectively. As farmers have higher income their likelihood of being in the low level adoption category

Table 5. Socioeconomic factors influencing the adoption of innovations and best management practices and their marginal effects.

Variable	Coefficient	Standard error	P	Marginal effects		
				Low level	Medium level	Advanced level
Constant	-1.8150***	.549114	.0009			
Age	.00250	.009193	.7831	-.0010	.0005	.0005
Experience	.01440*	.007801	.0649	-.0057	.0028	.0029
Education	.40706	.271642	.1340	-.1611	.0661	.0950
Cooperative membership	-.27743	.284215	.3290	-.1611	.0661	-.0510
Investments	-.07974	.225538	.7236	.0317	-.0156	-.0161
Farm size	-.00047	.005760	.9341	.0002	-.0001	-.0001
Income	.68116***	.145561	.0000	-.2711	.1322	.1389
µ1	1.0885***	.141216	.0000			
Log likelihood function	-125.1670					
Restricted log likelihood	-139.3237					
Chi squared	28.31335					
Degrees of freedom	7					
Prob[ChiSqd > value] =	0.00192					

Table 6. Information-seeking behavior influencing the adoption of innovations and best management practices and their marginal effect.

Variable	Coefficient	Standard error	P	Low level	Marginal effects	
					Medium level	High level
Constant	-.6512	.25214	.0098			
Redding newspaper	-.0373	.23953	.8760	.0149	-.0078	-.0071
Listening to radio	.1355	.22153	.8280	-.0539	.0286	.0253
Watching TV.	-.0456	.26290	.8622	.0182	-.0093	-.0089
Use of the Internet	-.4589	.32864	.1626	.1772	-.1062	-.0710
Traveling to city	.9519***	.25916	.0002	-.3590	.1204	.2387
Contacts with extension service	.6363***	.24303	.0088	-.2492	.1098	.1394
Contacts with veterinarians	4679*	.23453	.0460	-.1850	.0903	.0947
µ1	1.16201	.15182	.0000			
Log likelihood	Function	-120.0051				
Restricted log likelihood		-139.3237				
Chi squared		38.63718				
Degrees of freedom		7				
Prob[ChiSqd > value] =		0.00002326				

decreases by 0.2711 percentage points and being in the medium and high adoption categories increases by 0.1322 and 0.1389 percentage points, respectively.

Information seeking behavior ınfluencing the adoption of ınnovations and management practices

The model for information-seeking behavior is presented in Table 6. Of the seven explanatory variables entered the model ‘traveling to city’ and ‘contacts with extension service’ were significant at 0.01 alpha level while ‘contacts with veterinarians was significant at 0.05 alpha level. From this finding we can conclude that as goad farmers have more travels to cities, and have more contacts with extension service and veterinarians they tend adopt management practices and innovations. The marginal effects for the significant variables showed that as farmers have more travels to cities their likelihood of being in the low level adoption category decreases by 0.359 percentage point while the likelihood of being in the medium and high level adoption categories increases by 0.1204 and 0.2387 percentage points, respectively. As farmers have more contacts with extension service their

likelihood of being in the low level adoption category decreases by 0.2492 percentage points and being in the medium and high adoption categories increases by 0.1098 and 0.1394 percentage points, respectively. Finally, as farmers have more contacts with veterinarians their likelihood of being low level adopters decreases by 0.1850 percentage points and while the likelihood of being medium and high level adopters increases by 0.0903 and 0.0947, respectively.

DISCUSSION AND CONCLUSIONS

The discussion of findings can be focused on four significant issues regarding goat farming in the region. First of all from the socioeconomic characteristics and selected practices with goat farming it can easily be said that goat farming in the region is quite conventional. Comparing with national indicators, goat farmers' levels of education and income were quite low. Almost one-third of them had no land, and the ratio of owning improved goat breeds was even lower than one-fifth. Goat farming in the region can be classified as a traditional livelihood passing from generation to generation with minimal changes both in the family and rural community. The landless goat farmers are even poorer and they have to graze their goats in public pastures and forest areas which many times create lagal problems. It was observed that most of the farmers operating in a traditional way were willing to quit goat farming and change occupation if they had an opportunity in the other sectors of the economy. However, this seems quite difficult due to their low level of education and lack of skills required for other occupations, especially in industrial and services sectors.

The second issue was that according to goat farmers' point of view the most important problems they encountered were market oriented. Inputs they needed, especially, concentrated feeds and fodder crops were seemed quite expensive. Farmers expected higher governmental subsidies for goat farming. On the other hand, practices that assumed to make significant contributions to sustainable goat farming in the region, such as training and extension activities, care of the doe at kidding, rearing of baby goats, mating, animal insurance, keeping farm records, hygiene of barn, and trimming weren't seen as serious problems. The emergency needs they stressed were cheaper inputs and higher prices, as well as higher governmental support.

The third issue is that in the research area application of innovations and management practices in goat farming was quite low. Unawareness rate of some practices such as 'tied up the umbilical cord with dental floss', 'deodorizing bucks', and 'neutering males not planned on breeding' was even higher than 50%. In addition many farmers had no information about vaccines. These findings indicate that in order to provide a sustainable goat farming in the region, farmers need to adopt innovations and best management practices, and unawareness rates must fall to zero. For this reason, reliable, affordable and easily accessible extension advisory services for goat farming are essential/vital/necessary.

Finally, results of this study confirmed that goat farmers with more experience and higher income had higher adoption levels as compared with farmers without these attributes. In terms of information-seeking behavior, those who had more travels to cities and had more contacts with extension service and veterinarians had also higher level of adoption. Economic possibilities and adoption of innovations and best management practices can be considered as complementary factors.

Concentration on one side will probably influence the other side. However, what is crucial is how the goat farmers can access sustainable financial support from the limited governmental sources, and how to establish a two-way information exchange linkage between extension organizations and farmers. Therefore, proper use of limited governmental support and increased rate of adoption among goat farmers depends largely on continuous capacity building which includes training and extension programs of farmers. The high level adopters can be utilized as catalyzers to reach the other farmers, especially the hard to reach.

Conflict of Interest

The authors have not declared any conflict of interest.

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