

## Adoption characteristics of livestock farmers to making grass silage in Ordu province of Turkey

Reception of originals: 11/30/2016  
Release for publication: 11/05/2017

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### Abstract

The research examined adoption characteristics of livestock farmers to making grass silage in Ordu province, Turkey. The bulk of the data were collected from randomly selected 79 farmers by using well-structured questionnaire. Descriptive statistics were used for data analyses. Research findings showed that smallholder cattle owners are mostly older people and operate in conventional ways. They face severe problems with drying their grass and lack information about grass silage. It also showed that farmers have positive attitudes towards silage making from the grass. To adopt grass silage, farmers must be aware of its benefits, and extension work is needed for this purpose.

**Keywords:** Grass silage. Diffusion of innovations. Adoption of innovations.

### 1. Introduction

The use of advanced technology in agriculture, particularly in disadvantaged areas and regions make remarkable contributions to the income and welfare of farmers. Advanced techniques, depending on the area they are used, make it possible for farmers to reduce production costs, save labor, and play a role in increasing the quality and quantity of agricultural production. While contributing to the prosperity of the people of a region for the

first time, any use of technology can be considered as an innovation for the region (Rogers, 1995). In this context, grass silage technology is an innovation for the Eastern Black Sea region, while the region is considered as a disadvantaged region due to a lack of sunny days during the harvest season. Grass silage is not a conventional technology that is being applied by farmers in the region. Even in Turkey, corn is the first crop that comes to mind in silage making. Although grass silage is used widely in developed countries, it is not common in Turkey, even in the areas where the most intensive farming structures prevail.

Since animal husbandry in the interior coastal areas of Ordu province based on family farming and mostly on traditional methods, any innovation providing economic viability and productivity would make contributions to the region regarding increasing farmers' well beings. Due to environmental restrictions, particularly in the heavily sloppy and fragmented landscape, it is almost impossible to use tractors and other similar machinery for soil operations. Thus, farmers have solely the option of utilizing the naturally grown grassland. They have little opportunity to change the grass varieties already exist but have the chance of fertilizing and increasing the productivity of the present varieties.

Although earlier studies such as Steinshamn and Thuen (2008), Frame (1989), Frame and Harkess (1987), Yıldırım et al. (2016), and Boz et al (2017) conducted research to determine productivity of various grass species to give farmers the best alternative for animal feeding, in the research area farmers have almost no option to change native varieties by land cultivation because of environmental restrictions. If the soil is operated to search out the best alternative among the forage crops for ensilaging, it has a high probability of exposing to soil erosion which will ultimately cause to lose the entire land. For this reason, the best alternative for the region is to seek opportunities of ensilaging with the present native forage crops, and if it is possible to increase their productivity by using fertilizers, particularly manure. Also, proper management practices such as avoiding early and excessive grazing, and amelioration of pastures and meadows should be applied. Research showed that making grass silage is possible with the present native grass species (Boz et al. 2016). However, subjects such as how much information farmers in the locality have about this practice, and what are the possibilities of adoption and diffusion of this innovation in the region should be investigated.

Ordu province is located in the Black Sea Coastal region of Turkey with a population of 728.949 and surface area of 6.001 square kilometers. It is bordered by the provinces of Giresun from the east, Samsun from the west, and Sivas and Tokat from the south. The total area is 16.5% plateau and 83.5% hills (Eliçalışkan, 2016).

Grass silage is expected to make two important contributions to animal husbandry in the region. The first one is it will provide sustainable roughage feed production which cannot be provided by the current farming system. This is because during the harvest season the weather is quite rainy in the research area and therefore, it is quite difficult- some seasons impossible because of continuing rainy days- to dry harvested grass for winter feeding. If the grass is harvested in a sunny morning and it begins raining in the afternoon, grass cannot be dried. Some farmers collect and cover it by nylon until the sun appears again. But this time it is necessary to spread harvested grass in the sun and let it completely dry. This procedure requires too much hard work and labor, and therefore, grass silage making will make another contribution to farmers which is labor saving. In some years rainy days take so long that (a couple of weeks) and it becomes impossible for farmers to get dried grass from their field. This lack of roughage feed results in selling the animals or purchasing roughage feed from other regions.

The primary purpose of this study was to investigate adoption characteristics of farmers and their attitudes to silage making in Ordu province, Turkey. The results are expected to provide useful information for the Ministry of Food, Agriculture, and Livestock, researchers, extension personnel and scientists and farmers.

## 2. Materials and Methods

The target population for this study was defined as smallholder cattle owners in Ordu province of Turkey. Two districts from this area, namely Çamaş and Gürgentepe districts and three villages from each district (entire six villages) were selected based on their agricultural potential, proximity to city center, socioeconomic characteristics of rural communities, and potential of livestock production. Yamane's (2001) stratified sample size determination formula was used, and a sample size of 79 farmers was determined for data collection.

Data were collected by conducting face to face interviews with farmers during which a questionnaire was administered. Technically the questionnaire included both open-ended and closed-ended questions. Respondents' opinions and comments were noted for the open-ended questions. Genever (2013), Budak et al., (2012), Güven (2011), Castro et al. (2010), Arslan and Dinç (2009), Bilal (2009), Gebremedhin (2003), and Rogers (1995) were utilized for preparing the questionnaire. Data were collected in March and April 2015. It took approximately half an hour to complete a survey.

Descriptive statistics including frequencies, percentages, means, and standard deviations were used to analyze quantitative variables. For the items collected on a five-point Likert scale, an interpretive scale was developed by the researchers. During data collection process many notes were taken by the researchers from respondents' comments in a given issue related to their farming system. If many farmers concerned about similar problems and made comments accordingly, these were also considered in data analysis process.

### 3. Results and Discussion

Results and discussion of the research are given in the order of socioeconomic characteristics, communication behaviors, farming practices applied in the region, the reasons for decreasing cattle numbers, problems encountered with roughage feeds, farmers' awareness of grass silage, the reasons for farmers not making silage from grass, and possible contributions grass silage will make in the region.

**Table 1: Socioeconomic characteristics of farmers**

	Mean	Standard deviation
The age of farmers (year)	54.84	11.35
Schooling (year)	2.53	0.96
Agricultural experience (year)	38.54	14.43
Farm size (ha)	2.04	16.22
The number of cattle (head)	3	2.53
Total family income (€/year)	12730.48	7122.98
Agricultural income (%)	70.23	-
Livestock income (%)	19.78	-
Participation to village administration (%)	26.60	-
Cooperative membership (%)	13.90	-
Credit use for input (%)	34.20	-
Investment credit use (%)	24.10	-
Social security (%)	78.50	-

Socioeconomic characteristics of sample farmers are presented in Table 1. From the table, the mean age of farmers was about 55 years old. They also had 38.54 years of

agricultural experience. They had approximately 2.53 years of education. The sample farms had 2.04 hectares of land and 3 head of cattle, on average. Farmers' annual agricultural income was € 12.730,48 of which 70.23% was agricultural income, and 19.78% of agricultural income was livestock income. 13.90% are cooperative members, 26.6% participate in village administration, 78.5% had social security, 34.20% used credit for inputs, 24.10% used bank loans for investments.

**Table 2: Communication Behaviors**

	n	%
Stronger communication behaviors	42	53.16
Weaker communication behaviors	37	46.84
Total	79	100

Communication behaviors of farmers are presented in Table 2. It was calculated from reading a newspaper, listening to the radio, watching TV, awareness, and use of the Internet, travels to district and province center, meeting with extension agents, seeking farming advice, participating farming educational organization data. If a farmers' score is higher than the average score, that farmers have a stronger communication behavior. From the table, it can be seen that 53.16% of farmers had stronger communication behavior while 46.84% of them had weaker communication behavior.

**Table 3: Farming practices**

Variable	n	%	Variable	n	%
Livestock provided			Meadows grazed properly		
Own production	32	40.5	Yes	24	30.4
Purchase	30	38.0	No	55	69.6
Own production+purchase	17	21.5	TOTAL	79	100.0
TOTAL	79	100.0	Manure used		
Dry grass provided			Own field	79	100.0
Own production+purchase	46	58.2	TOTAL	79	100.0
Own production	3	3.8	Change in number of animals recently		
Purchase	30	38.0	Decrease	67	84.8
TOTAL	79	100.0	No change	12	15.2
Concentrate feed provided			TOTAL	79	100.0
Purchase	58	73.4	% of grass properly dried		
Own production /purchase	2	2.5	0-40%	13	16.5
Own production	19	24.1	%41-%60	17	21.5
TOTAL	79	100.0	%61-%80	16	20.2
Livestock sold			%81-%100	33	41.8
Butchers	32	40.5	TOTAL	79	100.0
Ritual slaughter	15	19.0	Grass can be made silage without drying		
No sales	10	12.7			
Neighbors / market	22	27.8			

TOTAL	52	100.0	Yes	38	48.1
Observing animals for diseases			No	41	51.9
Monthly	31	39.2	TOTAL	79	100.0
Yearly	11	14.0			
Seasonal	35	44.3	Roughage concentrate feed ratio applied		
Never	2	2.5	Never	67	84.8
TOTAL	79	100.0	1/2 - 1/2	5	6.3
Type of barn	N	%	1/3 - 2/3	1	1.3
Concrete	71	89.9	1/4 - 3/4	3	3.8
Wooden	8	10.1	2/3 - 1/3	3	3.8
TOTAL	79	100.0	TOTAL	79	100.0
Criteria of slaughtering time			Considering protein content of feeds		
Live weight	25	31.6	Never heard of it	47	59.5
Market price	11	13.9	No	32	40.5
Age of animal	27	34.2	TOTAL	79	100.0
External appearance	15	19.0			
Others	1	1.3	Considering metabolic energy of feeds		
TOTAL	79	100.0	Newer hearth of it	56	70.9
Source of information about diseases			No	23	29.1
Extension service	19	24.0	TOTAL	79	100.0
Private veterinarians	56	70.8			
Family and neighbor	4	5.2			
TOTAL	79	100.0			

Selected farming practices applied by smallholder cattle owners in the region are presented in Table 3. From the table 40.5% of the respondents provided their cattle by their production, 58.8% provided dry grass from both their production and purchasing from the market, 73.4% provided concentrated feeds by buying from the market. 40.5% of the respondents sold their cattle to butchers. 44.3% of the respondents seasonal observed their cattle for diseases and other problems, 89.9% had a concrete barn, 34.2% of the respondents considered age of the animals as a criteria when decided the selling time, 70.8% used private veterinarians as information source about animal diseases, more than three-third reported that meadows were not grazed properly, almost all respondent used manure in their land, 84.8% experienced a decrease in their cattle numbers. 41.8% of the respondents could properly dry 81% or more of their grass, 51.9% disbelieved that grass can be turned in silage without drying, 84.8% didn't consider roughage to concentrated feed ratio in feeding their animals, 59.5% never heard of protein content of feeds while 70.9% of the respondents never heart of metabolic energy content of feeds (Table 3).

**Table 4: Reasons for decreasing cattle numbers**

Reasons for decreasing cattle numbers	Order	Score
Feed prices high	1	249
Lack of family members dealing with animals	2	225
Low income	3	212

Lack of governmental support	4	186
Lack of capital to purchase live animals	5	179
Low meat prices	6	167
Illegal animal entries	7	133
Low milk prices	8	123
Lack of pasture and meadows	9	114

Research finding of this study showed that 84.8% of farmers reported that their number of cattle decreased (Table 3). Reasons for this decrease was investigated on a five-point Likert scale. It was calculated score to determine important of factors from this data. According to this score, most important factor is feed prices high, the second one is lack of family members dealing with animals, and the third one is obtaining low income from animal husbandry. (Table 4). Farmers must produce own roughage feeds for their cattle. But farmers have some problems in this process. In the area, one of the most critical issues is drying problem caused by climatic conditions. Transportation and harvesting were the other significant problems, respectively (Table 5).

**Table 5: Problems encountered with roughage feeds**

Problems encountered with roughage feeds	Order	Score
Drying	1	146
Transportation	2	134
Harvesting	3	131
Temporary storage in the field	4	129
Storage in the farm building	5	96

Findings of this study showed that the majority of farmers in the research area have awareness about grass silage (Table 6). But poor farm conditions is the reason for not making silage from grass until now. The other reasons are insufficient information and thought of would be useless, respectively (Table 7).

**Table 6: Farmers' awareness of grass silage**

Awareness of grass silage	n	%
Unawareness	10	12.65
Awareness	69	87.35
TOTAL	79	100.0

**Table 7: Reasons of farmers do not make a silage from grass**

Reasons	n	%
Insufficient information	25	36.23
Inadequate farm conditions	26	37.68

Thought of would be useless	18	26.09
TOTAL	69	100.0

Grass silage provides some advantage for farmers. According to farmers, the most crucial benefit is drying problem disappear, the second one is reduced feed wasted and third one is it will provide more nutritious feeding (Table 8).

Results of this study showed that awareness rate of grass silage in the region is high. To accelerate adoption of grass silage in the region, first of all it must be introduced and even promoted in the area.

**Table 8: What can grass silage provide for farmers**

What can grass silage provide for farmers	Order	Score
Drying problem will disappear	1	267
Reduces feed wastes	2	249
It will provide more nutritious feeding	3	240
Labor save	4	235
Livestock production would be better occupation	5	219

#### 4. Conclusion

In the research, attitudes of farmers toward making silage from harvested grass have explored in Ordu province. As a general result, sampled farms were small, and they had little land used together for crops and livestock production. It was also found that farmers had to deal with high feed prices and lack of family members involved in animal husbandry. Even farm conditions were poor, and farmers received insufficient information about animal husbandry. Moreover, social and economic sustainability of the farms is decreasing day by day. Concerning communication behavior, 53.16% of farmers showed stronger communication behavior.

Improving economic sustainability of livestock farms depends on increase in their incomes. In this context, it is great importance that using grass silage for raising cattle to reduce costs of feed has the biggest share of livestock production costs.

Most of the farmers were aware of grass silage. In general, farmers have positive attitudes towards making grass silage. But, they need technical information on silage making and cattle husbandry. For this reason, organizing farmer education programs and extension work is essential. To be successful in organizing these programs, technical personnel of the ministry of Food Agriculture and Livestock, as well as independent veterinarians must be trained in this regard. Especially, if training and extension activities are started from leader

farmers who have more animals and more technical capacity, the adoption of grass silage making can be accelerated.

In the research area, there must be technical personnel who are trained about silage and, also, leaflets, brochures, booklets, etc. documents must be prepared and regularly delivered to farmers. This procedure will probably accelerate the adoption and diffusion process of grass silage in the region.

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### **Acknowledgment**

This study is part of a project which was supported by TUBİTAK TOVAG (Project No: 1130307).