Adoption characteristics of livestock farmers and their attitudes to silage making from grass in interior coastal areas of Rize province, Turkey

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Abstract

The research examined the technical and economic feasibility of silage making from pasture grass, adoption characteristics of farmers and their attitudes to silage making in Rize province, Turkey. The bulk of the data were collected from randomly selected 76 farmers by using well-structured questionnaire. Technical feasibility of silage making from pasture grass were explored via Flieg scores calculated by using results of physical and sensorial analysis at laboratory. Partial budget analysis was used for exploring economic feasibility of silage making from pasture grass. Research results showed that the main problem of farms were insufficient workforce for continuing the dairy activities and lacking of basic technical information on dairy. It was clear based on the results of the feasibility analysis that silage making from pasture grass technically and economically feasible and good opportunity to farmers to increase their economic sustainability. It also showed that farmers have positive attitudes towards silage making from grass, which was providing labor and fodder cost savings to the farmers, but adoption and diffusion level of silage was unsatisfactory level. The study suggested training the technical staff on silage making from grass, farmer education programs and extension activities to increase adoption level of silage making.

Keywords: Adoption and diffusion. Grass silage. Sustainability.

1. Introduction

Nowadays, there has been much debate on the sources of total factor productivity increase and sustainability in all sector of the economy worldwide. Innovation and technology transfer is one of the main drivers of the total factor productivity increase and sustainability. That is why, the transfer of innovation and technology comes into agenda of policy makers in nearly all countries. Since the agriculture is mainly based on the biological process of plants and animal, transfer of innovation and technology is vital for sustainability of the agricultural activities. Many researchers, therefore, have focused on technology development and innovation transfer to increase total factor productivity and sustainability in agriculture all over the world, especially in developed country. Most developing countries have tended to import the technology and innovation from developed country ignoring the adoption capacity of the users and risks embedded into the technology to accelerate the economic development, resulting in decrease in the efficiency and total factor productivity in long term. Total factor productivity decrease and low level of sustainability in developing countries has been observed in agricultural sector comparing to other sectors due to low adoption capacity of farmers to technology and innovation. Similarly, the development of total factor productivity is nearly constant and economic sustainability is arguably in Turkish agricultural sector. It is suggested that total factor productivity increased in agriculture by contribution of the innovation and technology transfers during the time period of last 5 development plan, while the total factor productivity increase slowed down and presently stopped. Based on the findings of the report, the main reason of the slowing down in total factor productivity in Turkish agriculture were the risks of technology and low adoption capacity of the farmers. Of course, the shortcomings of the policy makers contribute the poor integration. Hence, not only the economic sustainability of the farms but also social sustainability has priority in many part of the Turkey, especially in the part where the income sources is very limited and highly depend upon small scale dairy. Ignorance of policy makers about the farmers' characteristics and their living standards during the innovations and technology transfer make the farmers more dependent to actors of inputs market. Nowadays farmers have tended to decrease their production cost via cost effective innovation.

In Black Sea region of Turkey, most small scale farms face with economic shortage sourced by high feed cost due to high level of humidity and rainy days. Since the climatic conditions in this region limits the drying season, drying the pasture grass to obtain fodder for husbandry dairy has been very problematic. Therefore, alternative techniques are needed to use pasture grass to minimize feed cost and increase the sustainability of the farmers. Silage

making is one of the alternative techniques to ensure coarse feed production and minimize feed cost for farms.

Woodford (1984) defined silage as "the product formed when grass or other material of sufficiently high moisture content, liable to spoilage by aerobic microorganisms, is stored anaerobically". Silage is produced by ensilage, that is, the placing of crop material inside a vessel or structure called a silo. The material may be an entire crop or only part of a crop, such as the grain portion. By placing the material inside a structure the objective is to preserve it and to prevent it rotting as in a compost heap. The crucial difference between a silo and a compost heap is that air moves relatively freely in the compost heap but not in the silo. Bilal (2009) stated that making silage was the cheapest way to meet good quality coarse feed for needs of animals, to improve the ability to digestion of feed, to maintain long-term without compromising quality, to provide space-saving in periods where there were no green fodder. The most common silage is corn silage. Grass is in the second place in terms of suitability for silage making and it is moderately compliance with silage. Making silage from grass was encouraged to handle the problem of cost minimization in this region. However, farmers have no enough knowledge about silage making techniques from pasture grass. Unfortunately, local authority has ignored the importance of the case. The reverse has been the case for developed countries. Producing hay from pasture grass by using appropriate silage technique has been common application in many developed countries having similar climatic conditions like Eastern Black Sea Region. It was evident that silage making from pasture grass by using additives based on the results of the researches conducted by Carvalho et al. (2010) and Arslan and Dinç, (2010). Similarly, Castro et al. (2010) and Genever (2013) proved the technical feasibility of silage making by using pasture grass in nature without using any additives. Since the making silage was such kinds of innovation to minimize feed cost and increase economic sustainability of farmers, the study intended to test the hypothesis of whether silage making from pasture grass was technically feasible, or not and whether silage making from pasture grass diffuses among the local farmers, or not.

Adoption process is the mental process through which an individual passes from first knowledge of an innovation to a decision to adopt or reject and to later confirmation of this decision. Rogers (1995) suggested five stages of adoption process such as awareness, interest, evaluation, trial, adoption. Of course, the characteristics of innovation was also important during the innovation transfer. Rogers and Shoemaker (1971) stated that the adoption of the innovation depended on relative advantage, compatibility, complexity, trainability and

visualize. It has been clear based on the literature that the adoption of innovation in agriculture is often optional decision, If an innovation is take an advantage compared to the previous practice, farmers can be speed up it. (Van den Ban and Hawkins, 1996; Taluğ and Tatlıdil, 1993; Özkaya, 1996; Özçatalbaş and Gürgen, 1998). In spite of the fact that silage making as an innovation has been clear alternative for farmers in developed countries, there has been no healthy information about not only technical and economic feasibility of silage making from pasture grass, but also attitudes of farmers to silage making and their adoption characteristics in Turkey. The purposes of the study, therefore, is to explore the technical and economical feasibility of silage making from pasture grass and to elicit attitudes of farmers to silage making and adoption characteristics of them in coastal areas of Rize province, Turkey.

2. Materials and Methods

2.1. Research area

The study was conducted in Kalkandere and Çamlıhemşin districts of Rize (41°02' N latitudes and 40°31' E longitudes) located along the Black Sea, which is in northern part of Turkey. Rize has special fauna and flora as origin of region' natural beauties. It has also a special culture built by local people in conjunction with the distinctive physical characteristics. Rize has rocky and steep coastline with rivers flowing through deep valleys into the Black Sea. The weather is permanently cloudy and Rize receives immense amounts of rain during the year. The research area is the rainiest region of Turkey with its high amount (1421.1 mm)

of and evenly distributed rainfall. Turkey has average 574 mm amount of rain. (TSMS, 2015). While Turkey's average daily sunny duration is almost 6.8 hours, Rize's average sunny duration is almost 4.5 hours (TSMS, 2014). In the coastal region, summers are warm and humid, and winters are cool and damp. The average temperature is 20℃ in summers and 5 C in˚ winters. Due to the high mountains, there are big climate differences and transportation challenges between inland and the coastal region. On the contrary to coastal region, inland the summers are warm and dry and the winters are so cold.

In Rize, there have been 10.533 farms and small farmers are dominant. Average land size is 1,48 hectares. There is highly lower than average of Turkey (6,1 ha). Farmers tend to produce tea and corn on their farmland. All of the total livestock farms is small scale. There have been 22.427 livestock in Rize and share is %0,15 of total livestock numbers in Turkey

(MFAL, 2015). Rize is one of the most important family based farming areas in the Black Sea region and Turkey. There have been 72.033 ha meadows and pastures areas which is %12,58 of total areas in Rize. There have been 537 endemic plant species in this areas (MEU,2011).

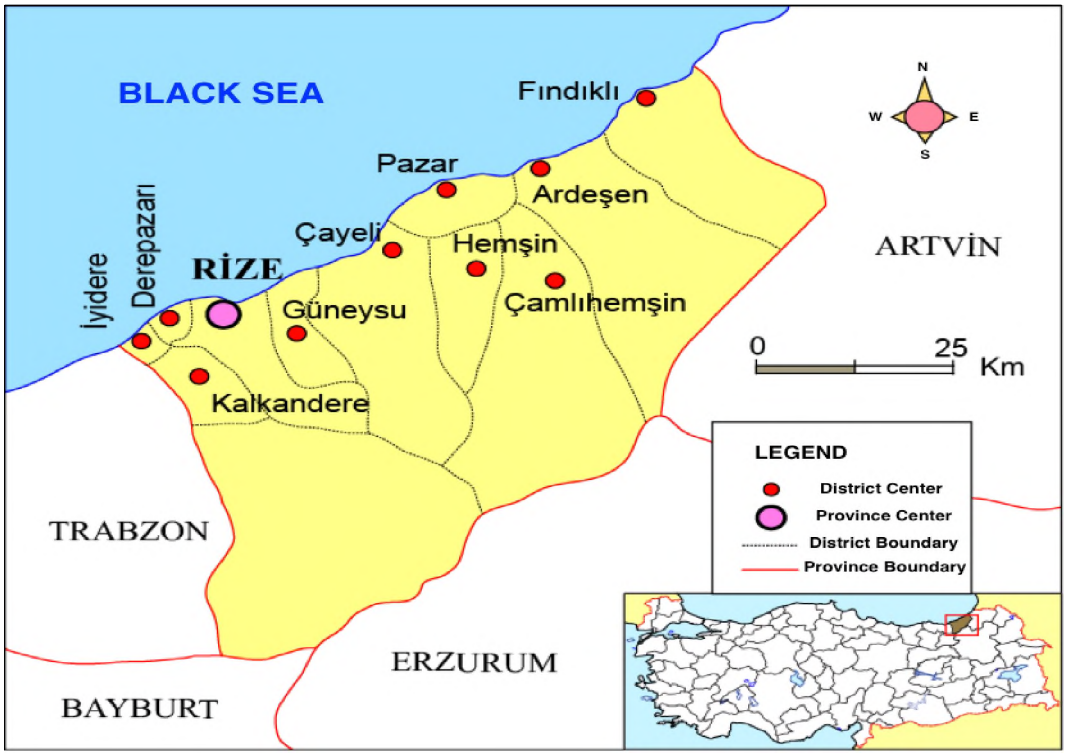

Figure 1: Map of Research Area

2.2. Research data

The main sources of research data were livestock farmers, results of laboratory analysis, directorate of the agricultural ministry and previous research. Since the attitudes and adoption characteristics differed associated with the farms size, farmers' level data were collected from 76 livestock farmers, selected by using stratified random sampling, via well-structured questionnaire. The target population was 910 active livestock farms in Rize. Farms having cattle less than 5 was grouped as a small scale farms, while farms having the cattle between 6 and 23 was defined as a large farms based on the number of cattle as a sampling criteria. Precision level and confidence level were 10% and 95%, respectively when determining the optimum sample size.

Farmers' level variables measured in the study were summarized in three main groups such as personal characteristics of farmers (age, education, experience, family size, the percentage of cooperative membership, etc.); farmers' characteristics (size of land, farm and

non-farm income, use of input and investment credit, etc.) and farmers' relationship with institutions.

2.3. Methodology

In the study, before examining the adoption characteristics of farmers and their attitudes to silage making, technical and economic feasibility of silage making from grass were explored. Flieg scores was used to reveal the technical feasibility of silage making from grass based on the variables of dry matter (%), crude protein (%), NH3-N/TN (%), acidity (pH). The variables of dry matter (%), crude protein (%), NH3-N/TN (%), acidity (pH) and Flieg score (FS) were measured at laboratory in order o explore the quality of the silage from grass.

After harvesting the green grass, were put in 3 liters plastic jars with the pieces of 1-3 cm in size were closed and compressed. At the end of the fermentation period of two months, silages removed from the jar. Classification procedure suggested by Blaser (1964) were followed for exploring some physical classification such as; smell, color and some structural analysis. When the scores calculated for physical classification of green grass was between 10 and 15, it were assigned to the groups of very good. When the calculated scores were between 7 and 8, between 5 and 6, and between 0 and 4, green grass were assigned to the groups of good, medium and useless, respectively.

On the other hand, the dry matter contents of silage samples and their pH values were measured. For determining dry matter contents, after fermentation period, grass silage were dried in drying oven at 105 0C and were incinerated in ash oven during the 4 hour at 525 0C. Nitrogen content of grass silage were determined by Kjeldahl (1883) method. Crude protein contents calculated by N x 6.25 formula (Jones, 1941). PH value of silages were measured by digital pH meter at the 0.01 accuracy. Ammoniacal-N was determined by the method of Steen (1989). Then, Flieg scores of silage samples by using the formula presented below3 (Flieg, 1938):

$$\text{Flieg Score} = 220 + (2 \times \%\ \text{Dry Matter} - 15) - 40 \times \text{pH}$$

Based on the calculated Flieg score, silage samples were classified 5 different categories such as very good, good, satisfactory, medium, and bad. When the calculated scores of silage samples were between 81 and 100, between 61 and 80 and between 41 and

60, silage samples were assigned to the groups of very good, good and satisfactory, respectively. However the silage samples having the scores of 21- 40 and less than 20 constituted to medium and bad groups.

Partial budget analysis was used for exploring economic feasibility of silage making from pasture grass. Partial budgeting is a tool used to assess the costs and benefits associated with a specific change in an individual enterprise within the business operation. Partial budget approach specifically focuses on the implications of the intended change in a business operation by comparing the benefits and costs resulting from implementing the alternative with respect to the current practice, partial budget, like an enterprise budget, is based on a unit but it is different from an enterprise budget in the type of costs used (Horton, 1982; Kay et al., 2008; Cinemre, 2010). Partial budget analysis was performed assuming mean cattle weight was 350 kg, daily milk yield 10 liters per cow, feeding period was 6 months and silage requirement per cow was 1170 kg. When performing the partial budget analysis, scenario based procedure was followed. In first scenario, it was assumed that farmers purchased the grass chopping machine for using themselves and renting to other farms. Based on the local market information, farmers had opportunity to rent out grass chopping machine to other farmers by € 10 during the 20 day period in a year. Half of the purchasing budget of grass chopping machine was formed by credit with the 7% interest rate and a year payback period, while another half came from own capital. Depreciation cost, repair and maintenance costs, loss of interest (4%) were also considered in partial budget analysis. Straight line depreciation calculation procedure was followed in the study. The production cost of grass silage was € 0,02.

In the second scenario, it was assumed that farmer rented the grass chopping machine having 900 kg cutting capacity per hour from outside the farm for 1.3 hours. Rental charges were included labor fee. Loss of interest (4%) were also considered in partial budget analysis. The production cost of grass silage was € 0,014.

In the third scenario, it was assumed that farmer rented the grass chopping machine having 900 kg cutting capacity per hour from cooperative the farm for 1.3 hours. Rental charges were included labor fee. Loss of interest (4%) were also considered in partial budget analysis. The production cost of grass silage was € 0,014.

For all scenarios, average daily ration per cow included 8 kg of dry grass and 2 kg of commercial fattening feed. To meet the cattle dry matter requirement, 2 kg of hay was included to the ration due to low level of dry matter content of grass silage. Milk yield would

increase by %10.6, if the grass silage was added into the feed ration (Mitsopoulos, 2015; Karaman, 2010, Fitzgerald and Murphy, 1999). It was assumed that daily milk yield increased 1,06 liters and reduction in fattening feed consumption was provided by 1 kg per day when grass silage included the ration. In the study, first of all the cost of dry grass was calculated. Then dry grass was removed from the daily ration for calculating the difference in other scenarios. Drying losses were considered in these calculation. In economic feasibility analysis, it was supposed that silo was founded to storage grass silage with almost 1170 kg capacity and its cost included the analysis.

When eliciting the farmers' attitudes to silage making, we used specially developed Likert type scales.

Farmers' information was obtained about attitudes and behaviors related to livestock activities and grass silage making, communication behaviors.

Tables were created using descriptive statistics to perform the objectives of the research. In this tables are shown mean, frequency, percentage and standard deviation. Likert-type scale was used in survey and it was calculated total score for data of significance level measured. Starting with variable of the highest score was made importance rankings.

3. Results and Discussion

3.1. General characteristics of farmers

In the research area, the mean age of farmers was about 50 years old and they had approximately 35 years of experience. Sample farmers had over 6 years of education and all of them had social security. %32 of sample farmers had a cooperative membership. Average family size was 3.3 persons and they mainly contributed to agricultural activities. In the research area, 30.30% of sample farmers contributed the village administration. (Table 1).

The sample farms had 2.2 hectares of land, on average, and this farm size was about one-third of the Turkish average value (Anonymous, 2014). Farmers' annual agricultural income was € 2718 per capita and it constituted 51% of their household income. Regarding the livestock income, sample farmers gained the € 297 per capita by feeding 3 cattle and their livestock income was 26% of their total agricultural income. In the research area, almost 22% of farms used credit for the purpose of input procurement, while 13% of sample farms benefited from investment credit (Table 1).

It was clear based on the research findings that the main motivation factors of sample farmers to raise cattle were traditional habit and request of meeting family needs. The percentage of the farmers raising cattle for the purposes of traditional habit and family needs were the same, which was 36%, while that of mixed one was 28%. Interestingly, 71% of the sample farmers expected that the number of livestock decreased due to insufficient family labor, high feed costs, low profitability and inadequacy of capital.

In the research area, 68% of farmers provided the stocks themselves at the farm, while the percentage of farmers who provided their stocks from outside the farm was 25%. The rest used these two strategies together. In general, farmers were scrupulous for health of their animals and 92% of the sample farmers checked the animals routinely by taking technical assistance.

Table 1: Socio-economic characteristics of sample farmers

	Mean	Standard deviation
The age of operator (year)	49.76	14.72
Schooling (year)	6.28	3.70
Agricultural experience (year)	34.62	17.06
Family size (person)	3.3	1.07
Farm size (ha)	2.21	0.38
The number of cattle (head)	3.08	1.95
Total family income per capita (€/year)	2717.70	4921.88
Agricultural income per capita (€/year)	1353.36	3142.67
Livestock income per capita (€/year)	297.47	796.16
Participation to village administration (%)	30.30	-
Cooperative membership (%)	31.60	-
Credit use for procurement (%)	22.40	-
Investment credit use (%)	13.20	-
Social security (%)	85.50	-

Based on the opinions of sample farmers, pasture was protected and enhanced in the research area. 62% of sample farmers indicated that farmers benefited from the pasture equally in research area. When feeding the live stocks, 21% of the sample farms preferred to use dried grass solely as a fodder. However, the percentage of farmers preferred to get fodder

from both farms and outside the farms was 63%. The rest bought all necessary roughage from the local market. The most difficult stage of producing dried grass were harvesting and drying due to the hilly land structure, which was the basic barrier machinery use harvesting method. Total loss of harvested grass in drying stage was 25%. It was also deterioration in dry grass by 5%. Almost all the sample farmers (92%) provided the concentrate feed from local market, indicating that the feed cost was the key factor for sustainable animal husbandry. However, farmers were unconscious about technical information such as feed ration mixture rate (TMR), crude protein (CP) and metabolic energy (ME).

Research results also showed that the most important information sources for farmers were Directorate of Food Agriculture and Livestock and private veterinary. In addition, sample farmers widely used media and television when providing necessary technical information related animal husbandry. However, newspapers, internet and radio usage were rare in the research area. It was clear that the some problems arise concerning social relations among farmers in the research area. Approximately 57% of farmers had satisfactory level social relations, while the rest had poor social relations.

3.2. Feasibility of silage making from grass

It was clear based on the results of laboratory analysis that silage making from grass was technically and economically feasible in the research area. The mean Flieg score of silage samples was 56.15, indicating that silage samples were in satisfactory group with the dry matter contents of 9.94 and pH values of 4.72. Similarly, physical and sensorial analysis revealed that silage samples were assigned the very good group with the physical classification score of 10.46. The values of CP and NH3-N/TN were 6.53 and 9.88, respectively.

The results of the partial budget analysis showed that the positive effect was larger than that of negative one in both profit and cash calculation, indicating that the initiating the silage making from grass was economically feasible in first scenario. In first scenario, positive effect was approximately € 972 and 89% of it constituted by income increase, while the rest came from cost reduction. The negative effects of initiating the silage making from grass was around € 146 in first scenario. The positive difference sourced by initiating the silage making was about 61% of annual agricultural income per capita and 2.8 times higher than annual livestock income per capita of sample farms. Similarly, initiating the silage making from

grass in both second and third scenarios were economically feasible due to positive effects was larger than negative ones. However, the positive difference was 6 times smaller comparing to first scenario. In second and third scenarios, the net benefit sourced from silage making were € 105.69 and € 111.15, respectively, which were 7% of annual agricultural income per capita 36% of annual livestock income per capita. (Table 2).

It was clear based on the results of partial budget analysis that the best option for the research area was purchasing the grass chopping machine for simultaneously using it in farm and renting it to outside the farm.

Table 2: Partial Budget Analysis

	1.Scenario		2.Scenario		1.Scenario	
Positive Effects	**Profit**	**Cash**	**Profit**	**Cash**	**Profit**	**Cash**
Increases in income						
Increase in milk yield[1]	62.96	62.96	62.96	62.96	62.96	62.96
Rent revenue[2]	800	800				
Decreases in costs						
Dry grass cost: (16 kg[3])(€ 0.017)(180 days)	48.96	48.96	48.96	48.96	48.96	48.96
Fattening feed (1 kg/day)(€ 0.33)(180 days)	59.4	59.4	59.4	59.4	59.4	59.4
Increases in incomes+Decreases in costs	*971.32*	*971.32*	*171.32*	*171.32*	*171.32*	*171.32*
Negative Effects	**Profit**	**Cash**	**Profit**	**Cash**	**Profit**	**Cash**
Increases in costs						
Grass silage(6.5kg/day)(€ 0.02[4])(180 days)	23.4	23.4				
Grass silage(6.5kg/day)(€ 0.014[5])(180 days)			16.38	16.38	16.38	16.38
Hay (2 kg/day)(€ 0.1)(180 days)	36	36	36	36	36	36
Grass chopping machine *(€ 473) 50% credit - 50% capital stock*						
Depreciation (10 years)	42.6	42.6				
Interest (7%)(5 years)	5.19	10.39				
Repair and maintenance (5%)	23.67	23.67				
Grass chopping machine rental charges (900kg/h)(1.3 hour) rent from private sector (€ 10[6]/h) rent from cooperative (€ 5.80[6]/h)			13	13	7.54	7.54
Decreases in income						

Loss of interest 4% (machinery+silo)(€236.67+€6.25)	9.72	9.72				
Loss of interest 4% (silo) (€ 6.25)			0.25	0.25	0.25	0.25
Increases in costs+Decreases in income	*140.58*	*145.78*	*65.63*	*65.63*	*60.17*	*60.17*
Net Change(*Positive effects-Negative effects)*	***830.74***	***825.54***	***105.69***	***105.69***	***111.15***	**111.15**

[1]It was calculated assuming that milk yield increased by 10,6% kg/head and 1.06 liter per day, price of milk were € 0,33 and lactation period was 180 days.
[2]Rent revenue was calculated assuming machine was rented 4 hours per day throughout the 20 days by € 10 per day and it was included cost of labor and fuel.
[3]The amount of consumption amount was 8 kg; loss of drying stage and weight were 8 kg.
[4]It was included cost of silo construction, labor and fuel. [5]It was included cost of silo [6]It was included cost of labor and fuel.

3.3. Adoption characteristics of farmers and their attitudes to silage making from grass

Based on the research results, almost 32% of the sample farmers recognized the silage making process by using grass, though majority of farmers (68.40%) have never hearth about this practice (table 3). They stated that the most important information source were television, Directorate of Food Agriculture and Livestock and neighbors or relatives, respectively. Interestingly, none of the sample farmers tried to make silage from grass due to lack of technical information about silage making process. Having negative attitudes towards silage making and scale problems were the other barriers for initiating silage making from grass. However, some farmers believed that making silage from grass might create some advantages for their farms. They also believed that problems arise in drying stage would be eliminated by using silage technology. It was clear from the upper evidence that making silage from grass was still innovation in Rize and dissemination of silage technology was highly depend upon the quality of extension activity and adoption characteristics of sample farmers.

Table 3: Farmers' awareness of grass silage

	Frequency	%
Unawareness	52	68,40
Awareness	24	31,60
Total	76	100,00

About 48,50% of informed farmers have not enough information to make silage from grass. While almost 29% of informed farmers don't believe this practice will be useful, one quarter of informed farmers' farm conditions are unavailable (Table 4).

Table 4: Reasons of farmers do not make a silage from grass

	Frequency	%
Insufficient information	11	45,80
Inadequate farm conditions	6	25,00
Thought of would be useless	7	29,20
Total	24	100,00

According to farmers the grass silage making can be provide some benetif to themselves (Table 5). The first advantage is drying problem will disseppear because of climatic reasons, the second one is reduces feed wastes, and third one is livestock would be better occupation. This finding showed that farmers lack information about grass silage and they need to be informed. They believe that grass will make livestock a better livelihood in the region.

Table 5: What grass silage can provide for farmers

What grass silage can provide	Score	Order
Drying problem will disappear	302	1
It will provide more nutritious feeding	278	4
Reduces feed wastes	300	2
Labor save	261	5
Livestock would be better occupation	281	3

4. Conclusıon

In the research, attitudes of farmers toward making silage from harvested grass silage have explored in Çamlıhemşin and Kalkandere district of Rize. As a general, sampled farms' size are small, they have small land produced together crop and livestock production. It was found that main problem of farms are insufficient workforce numbers and lack of technical information on basic cattle husbandry. Moreover, social and economic sustainability of the farms are decreasing day by day.

To improve economic sustainability of livestock farms depend on increase in their incomes. In this context, it is great importance that using grass silage of raising cattle in order to reduce costs of fodder has biggest share in livestock production costs.

According to research results, it is technically possible to make silage with grass and silage for animal husbandry. If farms use this method to feed cattle, their incomes will increase. This technology is not contradict with the habits of farmers. Its practice and testing

easier than drying process and this is also simple and understandable. And all, its benefit is proved with previous research.

Even if farmers invest to necessary equipment for making silage by themself, they can be increased their income and their cattle welfare. If their capital are insufficient enough to get the necessary equipment for making silage, especially for smaller farms, they can choose to rental option. The positive effect of silage making on farmers will further increase with contribution of cooperatives. But, in the research area, farmers are unaware of cooperative organizations important. They did not hitherto provide benefit as much as they want. It might be a solution for farmers and there can be many benefits from cooperatives if it is established new cooperatives or made some administrative reform of existing cooperatives. Cooperative can buy required equipments and farmer can rent it from cooperative. By the way, provided job opportunities for eager young people. That's why, input costs of farms are reduce and farmers can be self-sufficient in terms of roughage needs. At the same time, farmers will get rid of the problem of climatic drying and better quality feed will be used.

Most of farmers have informed about grass silage by means of this research. As a general, farmers have positive attitudes towards making grass silage. But, they needs technical information on silage making and cattle husbandry. For this reason, organizing farmer education programs and extension work is very important. To be successful in organized programs, technical personal of Food Agriculture and Livestock Ministry as well as independent veterinarians must be trained well in this regard. Thus, it is reduced to loss of confidence against the technician. Especially, if it is started to training and extension from leader farmers who have more animals and more technical capacity, it can be accelerated the adoption of grass silage making.

It can be provided that all farmers are informed about training and extension activities via media. Especially, television is most effective media tool in the research area. After informed stage of this new technic, it is very important that technical information provided to interested farmers to improve their technical information level. Unless it is successful this stage, adoption and diffusion of silage is failure. At this point, to use of group methods or individual methods can be more effective. In the research area, there must be technical personal who trained about silage and, also, there must be leaflets, brochures, booklets, etc. documents prepared as a professional related to silage making.

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