Turkish Journal of Range and Forage Science, 2021, 2(2): 63-72
doi: 10.51801/turkjrfs.942253

Review

Turkish Journal of Range and Forage Science

https://dergipark.gov.tr/tr/pub/turkjrfs

The Current Situation, Problems, and Suggestions for Forage Crops in Muş Province

Ayşe Nida KURT[1] Mehmet Kerim GÜLLAP[*]

[1]Muş Alparslan University, Applied Sciences Faculty, 49250, Muş, Turkey

[2]Atatürk University, Agriculture Faculty, 25240, Erzurum, Turkey

A R T I C L E I N F O

Received 24/05/2021
Accepted 09/06/2021

Keywords:

Forage crop
Livestock
Rangeland
Roughage

A B S T R A C T

With this study, the current situation in terms of forage crop cultivation in Muş province and offered solutions for the problems are discussed. The agroecological characteristics of the province and its current situation regarding forage crop cultivation have been investigated. Although most of the roughage requirement is met in the province of Muş, whose economy is based on livestock, it is determined that the number of forage plant species grown in the province is small, and the yield is low. The first thing that should be initiated in the province of Muş is quality and sustainable forage cultivation. All animal breeders should be informed about the importance of roughage to livestock. Concerning the current problems in the province, the solutions of narrowing the fallow areas by increasing forage crop cultivations areas with suitable crop alternations, increasing the use of certified seeds for quality production, reducing the grazing pressure on the meadow range, and providing necessary information at every stage of forage crop cultivation were offered for more and higher quality production.

1. Introduction

Animal farming is a sector that grows the country's economy and provides the highest added value to the unit investment. It plays a key role in society's nutrition and is the main source of income for rural areas. Furthermore, the livestock sector provided the possibility to increase income by transforming forage crops, which are a source of plant protein, into high-quality animal proteins. Animal proteins are essential for organizations to develop, raise, and live a healthy life because of the amino acids they contain. Moreover, it is well recognized that ten essential amino acids, which are not observed in vegetable proteins, are only obtained through sufficient and balanced amounts in animal proteins (THH, 2019; Ataseven et al., 2020). Yet, the lack of quality roughage from the past to the present is one of the most serious problems in livestock production (Soya et al., 2004). It is widely acknowledged that feed costs account for roughly 70% of all animal production costs (Alçiçek et al., 2010; Kuşvuran et al., 2011; Turan et al., 2015; Bıçakçı and Açıkbaş, 2018). As a result, while improving the efficiency and quality of animal products, which are critical in the human diet, is achievable with ideal nutrition, the fundamental principle of ideal nutrition is achievable with quality feeding (Acar et al., 2020). Animal production cannot become possible financially if agricultural enterprises that do not place sufficient emphasis on the feed plants

*Correspondence author: ankayaalp@gmail.com

required by the livestock sector in Turkey, which plays an important role in agriculture (Altın et al., 2009). Roughages, which are fairly affordable and have a crude fiber content of greater than 16-18% in dry matter, are beneficial to ruminant digestion and normally contain more than 14 percent water, come forward in this regard (Anonymous, 2015). At the same time, roughages are suitable for the nutritional physiology of ruminant animals and provide mechanical satiety in animals.

Roughages are primarily made up of rangeland and pasture feeds and herbs produced from forage crops grown in agricultural areas (Gökkuş, 1994). Rangelands are privileged in terms of being a feed source because of their natural vegetation and biodiversity, as well as their characteristics such as gene resource, wildlife habitat, increasing soil fertility, and protecting and developing water resources (Açıkgöz, 2001; Altın et al., 2011). It is reported that there is 14.6 million ha of rangeland in our country (TOB, 2019); regrettably, these areas lose their yield power for various reasons, including the usage habits against the management plans that have existed for a long time and a lack of timely maintenance. In addition, the number of good forage plant species that are enjoyed and eaten by animals is steadily decreasing, and many of them now lack vegetation (Yulafçı and Pul, 2005; Yolcu and Tan, 2008; Alçiçek et al., 2010; Sayar et al., 2010; Altın et al., 2011; Kuşvuran et al., 2011; Temel and Şahin, 2011; Budak, 2013, Severoglu and Gullap 2020). Forage crop farming is the most convenient and cost-effective way of supplying feed predicated on all of these factors (Kuşvuran et al., 2011).

Aside from providing feed, which is one of the key elements in livestock production, forage crops have a positive impact on the physical and chemical properties of soils, and thus the yield and quality of the successor cultivated plants (Sağlamtimur et al., 1998; Açıkgöz et al., 2005). That being said, they are critical in terms of being a low-cost source, storing the nutrients required for animal stomach microflora, having important minerals and vitamin resources, capacity to improve animal reproductive performance, and resulting in high-quality animal products (Serin and Tan, 2001). For healthy and profitable livestock breeding, access to high-quality roughage is essential. To do so, we must, first and foremost, increase the production of forage crops in our country, except for rangelands and pastures. Despite the fact that forage cultivation locations have increased in recent years as a result of the initiatives, this rise is still insufficient to meet the roughage needs of our current animal assets.

Forage crop cultivation accounts for 36 percent of total field land in Germany, 31 percent in the Netherlands, 30 percent in Italy, and 25 percent in France and England in countries with developed livestock farming. (Açıkgöz et al., 2005). The ratio of forage crops cultivation area in Turkey's field agriculture is 13.65%, and its ratio to total cultivated areas is 9.10% (TURKSTAT, 2019a). Notwithstanding the aid, the proportion of forage crops in total agricultural production in our country and region is insufficient to meet the quality roughage requisites of animals. According to data from 2019, our country's forage crop production deficit is estimated to be approximately 28.4 million tons of high-quality roughage (Anonymous, 2019a; 2019b). This lack of high-quality roughage unquestionably leads to the animals being fed lower-quality feed (stem, hay, etc.). Field waste products such as hay, only used to fill up animals rather than nourish them and end up causing energy loss due to their daunting digestion, occupies large portions in animal nutrition in our country (Ozkan, 2015). In our country, traditional animal feeding habits include hay as a primary source of roughage and feeding animals with mainly hay and concentrate feed (Altın et al., 2009). As a result, forage crop farming is the critical step towards achieving a constant supply of high-quality roughage (Akman et al., 2006). Working to improve the quality and efficiency of forage crop farming will also help alleviate the overuse of pastures and rangelands. Rangelands and pastures that have deteriorated or are on the verge of deterioration due to increased production will have the chance to regenerate (Koc et al., 2014).

Several studies have been carried out to determine the current status of forage crops and rangeland pastures, the animal assets, and the ratio of fulfilling the needs of forage animals in Turkey's several regions (Sayar et al., 2010, Turan et al., 2015; Sayar 2017; Demiroğlu Topçu and Ozkan, 2017, Bıçakcı and Açıkbaş, 2019; Gülümser et al., 2019; Ozkan, 2020), yet, a comprehensive study has not been conducted in the province of Muş until now. As a result, this study aims to evaluate solution suggestions for forage crop difficulties in Muş province as a whole, taking into account forage crop cultivation areas and production rates,

the number of cattle and ovine animals, feed crop support, and land use ratios.

2. Statistics Related to the Muş Province

2.1. Agroecological Characteristics of Muş and Current Land Status

Muş province, which has Turkey's third-largest plain, is considered the greatest agricultural area of the Eastern Anatolia Region, particularly the Upper Murat Region, owing to its fertile agricultural lands and abundant water resources (Erinç, 1953). In Muş province, which is neighboring Erzurum at the north, Bitlis, Diyarbakır and Batman at the south and southwest, Bingöl at the west, and Ağrı and Bitlis at the east, there are rugged mountainous lands not exceeding 3000 meters and plains at an altitude of 1200-1500 meters (Ersungur and Aslan, 2014; Dölek and Harunoğulları, 2018). Muş province has a continental climate with a sizeable temperature difference between day and night and frosty, cold, and long winters. Annual temperatures are on average -10 °C in winter and above 25 °C in summer. The amount of precipitation is, on average, 765 mm annually (Sönmez, 2010). Although the province's agricultural products are limited in variety, the plants grown are usually cold-resistant. Furthermore, because there is no intensive agriculture in the plain, the soils are very clean (Arslan, 2018).

If we look at the usage of land in the province of Muş, there is a total of 866.833 ha of land available in the province, which covers 1.1% of Turkey's land; of them, there are agricultural land (41.2%) 357.342 ha, rangeland (8.3%) 72.099 ha, pasture land (38.8%) 336.062 ha, forest land (9.2%) 79.999 ha, and land area that is unfit for agriculture (2.5%) is 21.331 ha (Table 1). Rangeland and pastures account for 47.1% of the province's total land assets, followed by agricultural lands, which account for 41.22%. (Muş Provincial Directorate of Agriculture and Forestry Briefing, 2020). This province, which is one of the most important livestock centers in the Eastern Anatolian Region, has a high - 80 percent- pasture animal breeding rate (Muş Plain Agriculture and Livestock Workshop, 2017).

2.2. Change in Crop Production Indicators in Muş Province

As shown in Table 2, which depicts the use of agricultural lands in Muş province, grains are the most cultivated product group, accounting for approximately 40% (133.510 ha), followed by forage crops 17.2% (61.612 ha). With 26,139 ha, fallow lands account for 7.3 % of lands in Muş province. The province has a limited amount of vegetables, fruits, industrial oil, and tuber plants in cultivation. In the province of Muş, as in most other provinces in the Eastern Anatolia Region, pasture-based livestock forms a major part of the people's livelihood.

Table 1. Land assets and their distribution in Muş province

Land Type	Amount (ha)	% Of Total Land
Farmland	357.342	41.2
Rangeland	72.099	8.3
Pastures	336.062	38.8
Forest	79.999	9.2
Unfit for Agriculture	21.331	2.5
Total	866.833	100

Mus provincial directorate of agriculture and forestry brief, 2021.

Table 2. Usage status of agricultural lands in Muş province

Product Group	Planting Area (ha)	Ratio (%)
Grains	133.510	37.3
Forage Crops	61.612	17.2
Industrial Oil Crops	6.516	1.8
Vegetables	4.131	1.1
Legumes	2.831	0.79
Fruit	1.331	0.37
Tuber Plants	143	0.04
Fallow	26.139	7.3
Other Agricultural Lands	125.604	35.1
Total	357.342	100

Mus provincial directorate of agriculture and forestry brief, 2021.

2.3. Some forage crops cultivation lands and production amounts in Muş

While forage crops account for 25-30% of total agricultural land in countries with well-developed livestock farming (Semerci and Kurt, 2006), this figure is only 19.8% in the province of Muş, despite the province's unquestionably high forage crop production capacity. In the province of Muş, forage crops are grown on approximately 61 thousand hectares, with clover being the most commonly cultivated forage crop with 49.426 hectares. Muş province ranks first in terms of clover cultivation area and production volume when compared to other provinces, but it ranks almost last when looked at their yield. Sainfoin (5.438 ha) is the province's second most widely planted forage crop, preceded by vetch (3.576 ha) and corn (2.313 ha). With the financial assistance provided, the production of vetch and corn, particularly corn, began to increase significantly in Muş province (Table 3).

Table 3. Forage crops cultivation areas in Muş city center and districts (ha)

District Name		Clover	Sainfoin	Vetch	Silage Corn	Total
Bulanık	Cultivation area	4.389	1.220	250	138	5.997
Hasköy	Cultivation area	5.600	65	100	25	5.790
Korkut	Cultivation area	6.500	350	-	10	6.860
Malazgirt	Cultivation area	2.700	1.500	900	45	5.145
Varto	Cultivation area	8.220	800	350	41	9.411
Center	Cultivation area	22.017	1.503	1.976	2.054	27.553
Total	Cultivation area	49.426	5.438	3.576	2.313	60.753

Turkish Statistical Institute (TÜİK)'s data in 2020.

The total forage crop production amount in Muş province is 1.515.248 tons, and 81% (1.234.224 tons) of them are clover (Table 4). Clover is followed by corn silage (114.190 tons), sainfoin (106.200 tons) and vetch (60.634 tons) (Table 4).

2.4. Cattle and small ruminant assets in Muş Province

The province of Muş is known for its intensive livestock breeding; the total number of cattle/bovine animals is 331.881, and the total number of small ruminants is 1.235.552. Of the bovine animals, 77.225 are European cattle breeds, 181.254 are crossbred cattle, 66.371 are native cattle and 7.031 water buffalo. Of the ovine animals, 999.262 are sheep, and 236.290 are goats. While the total number of cattle is the highest in Bulanik district (125.712 thousand headcounts), the highest number of small ruminants are found in the Central district (565.862 thousand headcounts) (Table 5).

2.5. Cattle/Bovine animal unit (BAU) capacity of Muş province

The coefficients used by Acar et al. (2020) were used to calculate the bovine animal unit in Muş province (Table 6). The BAU was calculated by adding the values obtained by multiplying the number of animals with the animal units. Corresponding to the total number of animals in the province of Muş, BAU was calculated as 371.506.

Table 4. Forage crop production amounts in Muş city center and districts (tons)

District Name		Clover (Green grass)	Sainfoin (Green grass)	Vetch (Green grass)	Corn silage	Total
Bulanık	Production Quantity	109.743	26.840	4.767	6.945	148.295
Hasköy	Production Quantity	151.200	1.560	2.200	1.250	156.210
Korkut	Production Quantity	182.000	9.100	-	450	191.550
Malazgirt	Production Quantity	32.400	16.500	4.050	1.350	54.300
Varto	Production Quantity	164.400	16.128	6.125	1.450	188.103
Center	Production Quantity	594.481	36.072	43.492	102.745	776.790
Total	Production Quantity	1.234.224	106.200	60.634	114.190	1.515.248

Turkish Statistical Institute (TÜİK)'s data in 2020

Table 5. Cattle and small ruminant assets (headcount) in Muş province

District Name	Bovine animal				Small ruminant		
	Cattle	Calf	Water buffalo	Total	Sheep	Goat	Total
Bulanık	97.559	27.660	493	125.712	138.285	20.405	158.690
Hasköy	15.217	5.818	1.730	22.765	27.153	16.659	43.812
Korkut	15.991	5.063	2.447	23.501	82.361	28.680	111.041
Malazgirt	41.978	19.565	99	61.642	45.041	7.111	52.152
Varto	30.411	9.391	20	39.822	276.043	27.952	303.995
Center	39.955	16.242	2.242	58.439	430.379	135.483	565.862
Total	241.111	83.739	7.031	331.881	999.262	236.290	1.235.552

Turkish Statistical Institute (TÜİK)'s data in 2020.

Table 6. Calculation of bovine animal unit (BAU) value for Muş province

Animal Species	Number of animals	Animal Unit	Bovine Animal Unit (BAU)
European Cattle Breeds	77.225	1,00	77.225
Native cattle	181.254	0,75	135.940
Crossbred cattle	66.371	0,50	33.185
Water buffalo	7.031	0,90	6.327
Sheep	999.262	0,10	99.926
Goat	236.290	0,08	18.903
Total	1.567.433	-	371.506

Calculated from the Turkish Statistical Institute (TÜİK)'s data in 2020.

2.6. Muş province roughage production amounts (tons)

The amount of hay was calculated using the green grass production amounts in Muş province and the dry matter rates used by Acar et al. (2020) for forage crops and silage. The amount of hay produced from these areas in Muş province, which has 408.161 hectares of rangeland pastures, was calculated using the value of 100 kg da-1 used by Çaçan and Yüksel (2016), and the quantity of hay generated from these locations in Muş province, which has 408.161 hectares of rangeland pastures was calculated as 408.161 tons (Table 7).

2.7 Current animal asset and roughage need in Muş

Table 7 shows the roughage ratio gained from the province of Muş's forage cultivation areas, rangelands, and pastures to fulfill the demand of the existing animal stock. Rangeland and pasture lands provide 408.161 tons of roughage, while forage crops and silage production provide 458.000 tons of roughage. The value of the animal asset in the province in terms of BAU is 371.506 BAU, and the annual roughage need of the current animal asset (371.506 x12.5 hay x 365 days) is 1.695 million tons. The province's roughage shortfall is 828.839 tons, with a 51.10% ratio of supplied roughage to meet the demand (Table 8).

Table 7. Muş Province Roughage Production (tons)

	Clover	Sainfoin	Vetch	Corn silage	Rangelands and Pastures
Green grass production (tons)	1.234.224	106.200	60.634	114.190	408.161 ha
Dry Matter Ratio (%)	30	30	30	33	100 kg / da
Hay amount (tons)	370.267	31.860	18.190	37.683	408.161

Calculated from the Turkish Statistical Institute (TÜİK)'s data in 2018.

Table 8. The ratio of total roughage produced in Muş to fulfill the needs of the existing animal stock

Fodder/Hay Obtained From Rangeland Pastures	408.161 tons
Hay Obtained From Forage Crops	420.317 tons
Hay Obtained From Silage Cultivation	37.683 tons
Total	866.161 tons
Total Animal Assets	371.506 BAU
Roughage Requirement	1.695 million tons
Roughage Deficit	828.839 tons
The ratio of roughage Produced to Meet the Needs	51.10%

Calculated from the Turkish Statistical Institute (TÜİK)'s data in 2020.

2.8. Financial aid provided to some forage crops in Muş province

Every year, the Ministry of Agriculture and Forestry assists farmers in improving agricultural production and ensuring long-term sustainability. Concerning financial aids for forage crop, perennials receive 90 TL per decare, annuals receive 60 TL, corn silage receives 60 TL, and forage crops grown in dry conditions receive 40 TL. The cultivation areas of forage crops in Muş province have increased owing to these subsidies (Harmanşah, 2018). When looking at the amount of state subsidy provided in Muş province over the last three years, it is clear that the funded cultivation area has increased significantly. In the last three years, 23 million TL financial aid was provided to 9.225 farmers for approximately 300 million da land in Muş province (Table 9).

Table 9. Financial aid provided to Muş province forage crops (da)

	Years		
	2017	**2018**	**2019**
Total number of farmers	2.319	3.502	3.404
Total Cultivation area	75.404.704	112.123.829	112.307.433
Clover	39.251.807	73.542.449	78.569.528
Sainfoin	17.051.564	21.862.458	18.943.106
Vetch	15.759.039	13.208.541	9.578.234
Corn Silage	3.342.294	3.450.560	4.690.467
Other plants supported	-	59.821	526.098
Total financial aid (TL)	3.998.824	10.387.889	8.397.127

Mus provincial directorate of agriculture and forestry brief, 2021.

3. Problems of forage crop cultivation in Muş and suggested solutions

To bridge the existing roughage shortfall across the country and mitigate the excessive pressure on rangeland pastures, forage crop agriculture must be given the attention it deserves. Notwithstanding, a few mistakes and issues with forage crop cultivation exist, and all of these correlate to problems in Muş, as well as other provinces. To summarize the missteps and possible solutions, particularly in the province of Muş, first one should ascertain the existence of roughage production by determining the lands where farmers will cultivate forage crops, rangeland pastures, and usability potential as soon as possible in the province of Muş. Implementing comprehensive training on forage crop cultivation, from seedbed preparation to harvest time, will be extremely beneficial in addressing some of the incorrect practices, particularly in Muş, where seeds are small and seedling development is delicate. Furthermore, land fragmentation in Muş province, as well as Turkey in general, impedes agricultural integrity. The farmers can't make good use of the province's treasury lands because they make up most of the land. As a result, the lands should be consolidated as soon as possible.

Even though some forage crop cultivation areas have increased due to forage plant financial aids, these increases have not yet reached the desired dimensions, preventing a profitable yield. Consequently, experts should monitor forage crop areas that are sponsored in terms of sustainability at all stages. Farmers should be informed about these aids, and these aids should be diversified and increased. On the other hand, because our country lacks a healthy seed market, the seed constraint, and is one of the country's most serious bottlenecks, forces farmers to use seeds with low purity that lack seed characteristics. In this case, it directly reduces efficiency and quality. Seeds of sufficient and high quality are in short supply in the Muş province. Because increasing the planting areas without overcoming the seed problems is perceived as a dream. The number of forage plants (clover, sainfoin, vetch, corn) cultivated in the province is quite low.

Producers should be offered breeding training seminars. Local farmers should be instructed on growing forage crops in full compliance with ecological conditions to help solve all of these problems. The technical staff of the relevant

Provincial Directorates of Agriculture and Forestry and faculty members of the Faculty of Applied Sciences Plant and Animal Production and Technologies Departments should support farmers more. Farmers should also be provided practical information through the organization of regular field days at appropriate times to emphasize the importance of forage crops in animal nutrition. To ensure that pastures are used in compliance with management principles and prevent problems providing quality roughage to animals even outside the grazing season, forage cultivation should be incentivized and boosted. New forage crop species adequate for the ecology of the Muş province should be identified, seeds of the cultivated species should be provided after undergoing various adaptation and yield trials, and alternative forage crops for the cultivated species should be identified. Farmers should be encouraged to use certified seed, and they should be informed about new species.

4. Results

With its vast pastures, Muş province is one of the most important livestock centers in Eastern Anatolia. That being said, in the province of Muş, a lack of quality roughage is a major issue due to several factors, including the use of rangeland and pasture areas as the primary source of the province's roughage needs and inadequate forage plant aids, excessive and timeless grazing while not being able to graze these areas with the appropriate number and breed of animals.

As a result, in order to solve the roughage problem in Muş, whose economy is based on agriculture, whose agriculture is based on livestock, and whose livestock breeding is based on rangeland-pasture and forage plants, it is necessary to ensure the use of pastures according to management principles, to increase the cultivation areas of forage crops and implement alternation systems, to diversify and increase the financial subsidies, and providing adequate training, we should overcome obstacles to forage crop agriculture.

References

Acar, Z., M. Tan., Ayan. İ., Ö. Ö. Aşçı., H. Mut., U. Başaran., E. Gülümser., M. Can. and G. Kaymak. 2020. The situation and development possibilities of forage crops agriculture in Turkey. Turkey Agricultural Engineering IX.Technical Congress Proceedings-1, Publication June TMMOB Chamber of Agricultural Engineers, Ankara, 529-553.

Acikgoz, E. 2001. Forage Crops. VIPAS publication number 58, 584p. Bursa. (In Turkish).

Açıkgöz, E., Hatipoğlu, R., Altınok, S., Sancak, C., Tan, A., and Uraz, D., 2005. Forage crops production and problems. Turkey Agricultural Engineering VI. Technical Agriculture Congress, 3-7 January 2005. 503-518, Ankara.

Akman, N., Aksoy, F., Şahin, O., Kaya, Ç. Y. and Erdoğdu, G. 2006. Animal production of Turkey. Turkey Cattle Breeders Central Association, Publication, 4.

Alçiçek, A., Kılıç, A., Ayhan, V., and Özdoğan, M. 2010. Forage production and problems in Turkey. Proceedings of the Turkey Agricultural Engineering VII Technical Congress. 11-15, Ankara, Turkey.

Altın, M., Orak, A. and Tuna, C., 2009. Importance of Forage Crops in terms of sustainable agriculture. Forage Crops, General Department, Ministry of Agriculture and Rural Affairs, General Directorate of Agricultural Production and Development, Volume 1, İzmir, p. 14.

Altın, M., Gökkuş, A. and Koç, A., 2011. Meadow Pasture Management, Volume I (General Principles). T.R. Ministry of Agriculture and Rural Affairs, General Directorate of Agricultural Production and Development, Ankara.

Anonymous, 2015. http://www.tarimgozlem.com/index.php/turkiyede-kaba-yem-ve-ab kurutulmus-kaba-yem-ortak-piyasa-duzenine-uyum-i/.

Anonymous, 2019a. Crop production statistics. Access address: https://biruni.tuik.gov.tr/medas/?kn=92&locale=tr . Access date: 25.04.2020

Anonymous, 2019b. Crop production statistics. Access address https://biruni.tuik.gov.tr/medas/?kn=101&locale=tr . Access date: 25.04.2020

Anonymous, Mus provincial directorate of agriculture and forestry brief, 2021. Erişim adresi https://mus.tarimorman.gov.tr.

Anonymous, Muş Plain Agriculture and Livestock Workshop, 2017. Muş Plain Agriculture and

Livestock Workshop Book, 16-17 May. Muş: Muş Provincial Directorate of Food, Agriculture and Livestock. Access date: 25.04.2020

Arslan, Ö. 2018. A sustainable economic development based on natural agriculture and animal husbandry in the province of Muş. Anemon Mus Alparslan University Journal of Social Sciences, 6(1), 75-90.

Ataseven, Y., Arısoy, H., Gürer, B., Demirdöğen, A., and Olhan, N. Ö. E. 2020. Global agricultural policies and their reflections on Turkish agriculture. Turkish Agricultural Engineering IX. Technical Congress Proceedings Book-1, 11.

Bıçakçı, E. and Açıkbaş, S., 2018. Determination of the adequacy of the roughage production potential in Bitlis province according to animal existence. Bitlis Eren University Journal of Science, 7(1): 180-185.

Budak, F., 2013. The status of meadow-pasture and forage crops in Iğdır province, their importance in animal nutrition. Journal of Agricultural Sciences Research, 6b (2): 49-55.

Çaçan, E. and Yüksel, A., 2016. The effect of meadows and pastures on regional development,

Demiroğlu Topçu G. and Özkan, Ş.S. 2017. An overview of meadow-pasture areas and forage crops agriculture in Turkey and the Aegean region. Journal of ÇOMÜ Faculty of Agriculture, 5: 21-28.

Dölek, İ., Avcı, V. and Harunoğulları, M. 2018. Change of population and settlements according to altitude: The case of Muş province. Anemon Mus Alparslan University Journal of Social Sciences, 6(6), 1011-1022.

Erinç, S. 1953. Eastern Anatolian Geography (Vol. 15). Istanbul University Institute of Companyography.

Ersungur, Ş., and Aslan, M. 2014 Examination of the development potential of Muş province with SWOT analysis. Atatürk University Journal of Economics and Administrative Sciences, 28(4), 213-235.

Gülümser, E., Mut, H., and Meşe, A. 2019. Current status of forage crops in Bilecik province. BŞÜ Journal of Science. 6 (2), 336-343.

Harmanşah, F. 2018. Quality roughage production problems and suggestions in Turkey. TURKTOB Journal, (25), 9-13.

Koc, A., A. Kaya., M.K. Gullap., H.I. Erkovan., M. Macit and M. Karaoglu. 2014. The effect of supplemental concentrate feed on live weight gain of yearling heifers over grazing season in subirrigated rangelands of East Anatolia. Turk J Vet Anim Sci. 38:278-284.

Kuşvuran, A., Nazlı, İ.R. and Tansı, V., 2011. The current situation of meadow-pasture areas, animal existence and forage crops agriculture in Turkey and the Western Black Sea Region. Journal of Gaziosmanpaşa University Faculty of Agriculture, 28(2): 21-32.

Ozkan U. 2015. Toxic substances arise from forage plants and solution proposals. Turkish Journal of Scientific Reviews 8 (2): 01-05.

Ozkan, U. 2020. Comparative overview and evaluation of forage crops agriculture in Turkey. Turkish Journal of Agricultural Engineering Research, 1(1), 29-43.

Sayar, M.S., Anlarsal, A.E and Başbağ, M., 2010. The current situation of forage crops agriculture in the Southeastern Anatolia Region, problems and solutions. Harran Univ. Faculty of Agriculture Journal, 14 (2): 59-67.

Sağlamtimur, T., V. Tansı and H. Baytekin, 1998. Forage Crops Cultivation. Çukurova University Faculty of Agriculture Textbook No: C-74. 3rd Edition, 238s., Adana.

Semerci, A. ve Kurt, C. 2006. Türkiye'de yem bitkileri tarımının önemi. Hasad Hayvancılık Dergisi, 21, 42-49.

Serin, Y. and Tan, M. 2001. Introduction to forage crops culture. Atatürk University Faculty of Agriculture Publications, 206.

Severoglu, S. and M.K. Gullap. 2020. Effects of animal grazing on allowed forage yield and quality of rangelands with different slope. Turk Jorunal of Field Crops 25:168-173.

Soya, H., Avcıoğlu, R., and Geren, H., 2004. Forage Crops (II. Edition), Textbook, Harvest Publishing Ltd. Sti., Istanbul, 223s.

Sönmez, M. 2010. Causes and results of population movements in Muş province. Turkish Journal of Geography, (55), 45-57.

Temel, S. and Şahin, K., 2011. Current status of forage crops in Iğdır province, their problems and solutions. Centenary University. Journal of Agricultural Sciences, 21 (1): 64-72.

THH, 2019. Turkey Livestock; Target 2023- Problems, Solutions and Policy Searches. http://www.zootekni.org.tr/upload/File/Hayvanclk%20Rapor-Sonhali.pdf. TÜİK, 2020. Agricultural Statistics. Ankara. Access date: 25.04.2020.

Turan, N., Özyazıcı, M.A., and Tantekin, G.Y., 2015. The roughage production potential obtained from meadow pasture areas and forage crops in Siirt province. Turkish Journal of Agricultural Research, 2(1): 69-75.

TOBB, 2019. Ministry of Agriculture and Forestry. https://www.tarimorman.gov.tr/Konular/BitkiselUretim/Cayir-Mera-ve-Yem-Bitkileri. Access date: 10.05.2020.

Yolcu, H., Tan, M., 2008. An overview of forage crops agriculture in our country. Journal of Agricultural Sciences, 14 (3): 303-312

Yulafçı, A. and Pul, M., 2005. Determination of the problems limiting roughage production in Samsun province. Gaziosmanpasa Univ. Faculty of Agriculture Journal, 22 (1): 73-80.