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EFFICIENT USE OF SOME AGRICULTURAL RESOURCES IN THE WEST MEDITERRANEAN REGION OF TURKEY WITH SPECIAL REFERENCE TO ISPARTA PROVINCE

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Abstract

In this study, the efficient use of some agricultural resources in the West Mediterranean region of Turkey with special reference to Isparta Province to improve agricultural productivity was examined. The study area has a great agricultural production potential in terms of fruit and animal production. However, it lacks due to the inefficient use of irrigation water resources and grassland areas. The current status of animal production and water and grassland resources is presented. There is a need to create and utilize new natural resource management strategies in the region in order to develop and improve animal production. Therefore, efficient utilization of water and grassland resources and their contributions for improved production level are discussed and suitable grassland and water resource management systems are discussed and some recommendations are made.

Key words**:** *animal production, grassland, irrigation, management, Mediterranean, water*

INTRODUCTION

As world population increases famine became one of the issues world facing and thus using resources efficiently has gained importance. Hence, it is required to improve productivity by implementing recent developments in agriculture. Turkish agricultural sector has several issues facing such as low income, small farm size, low productivity, lack of knowledge using technology. In addition, having less educational level of farmers is an obstacle to follow and use the new technology. In order to reduce poverty in agricultural sector in Turkey it is necessary to introduce and implement some agricultural development programmes and projects which bridge the gap between new technical knowledge and farmer practices.

Isparta, a city located in Mediterranean region of Turkey, with Mediterranean climate and terrestrial climate is a transition sub-region and is close to some major cities and occupies 8933 km^2 area. In terms of development level, Isparta is ranked as 41 among 81 provinces in Turkey. Significant share of population lives in rural area (%43) and work in agricultural sector (%55) in Isparta province. Horticulture, animal production, field crops, and vegetable growing are major agricultural activities in Isparta.

A significant portion of the land area planted in Isparta province consists of very steep and precipitous slopes, and a portion of the land under forest-shrub cover, some of which is pasture or bare rocks. Various factors such as lack of pasture and grassland and feeds for feeding livestock have been effective for under development of livestock sector in the region. But in recent years due to better returns on livestock production the demand for animal husbandry is increasing. Therefore, this study was aimed to evaluate efficient use of some agricultural resources in the west Mediterranean region of Turkey with special reference to Isparta Province.

MATERIALS AND METHODS

The analysis of the efficient use of some resources in Isparta region of Turkey is based

on the own research work, remarks, studies, comparisons and also on various results obtained by other researchers regarding animal production, grasslands, pastures and water resources. Also the remote sensing GIS were used in order to determine the grassland area.

RESULTS AND DISCUSSIONS

Animal Production in the Region

Livestock farming in general are carried out under intensive conditions and seen as very small family businesses. However, extensive animal growing is more common in rural areas. Keeping local and cross breed of animals is very common but using European pure bred animals for animal husbandry has been increasing gradually [1].

Small farmers living mostly around mountainous, hilly, forested terrain and in difficult conditions and utilizing pastures for the need of feed supply for animals prefer local breeds generally. In Isparta the number of local breeds, pure breeds and cross breeds account for 26%, 20% and 54% respectively in total number of cattle[2].

Grasslands, Pastures and Water Resources for Animal Production in the Region

Meadows and pastures are the most important food sources that animals need for feeding. The meadow-pasture areas occupy 82 869 ha in Isparta with a total of 9% represents the whole area, and with very low-quality pasture and rangeland areas [3].

As in other parts of the country, in Isparta also rangeland pastures have been lost due to overgrazing and early grazing and became unable to meet food requirements of the animals [4].

Use of pasture areas in the forest also protects the forest and rangelands from natural disasters such as fires and erosion. The other measure for prevention of erosion that should be taken, without being subject to any rules, is the improvement of grassland, pasture in the area and alpine pasture utilized by domestic and wild animals as food sources [5].

According to the completed pasture limitation studies in the province, 4,550 ha area of 12 527 ha grassland area consist of steep and very steep slopes which represents 36.32%of all grassland area [6], these are very important factors increasing the risk of erosion. Isparta region, some of the pasture vegetation structures and the relationships between soil properties and topographic factors were examined in a study [7], pasture lands textured loam and clay loam, respectively. Depending on the elevation, CaCO3% of the decrease (3-9%) and the increase inorganic matter (2.60-3.90%) reported to be associated with the intensity of grazing or climatic conditions. Areas of pasture land in question, they are susceptible to erosion on the basis of dispersion rate property. More over, taken into consideration the size of plant covered area used against erosion, it is stated that varies with the seasons and years, altitude, land use and land status.

Soil and Water Resource

In the province of Isparta, Corine land-use classification system is identified as, artificial surfaces 9910.8 ha, 237 030.8 ha of agricultural areas, 565 738.7 ha of forest and semi-natural areas, 3668 ha of wetlands, 62 719.2 ha of water bodies [8].

Total area of Isparta is 8,983,307 ha. The most common major soil groups in the province are listed as brown forest soils (17.7%), red brown Mediterranean soils (14.5%), chestnut soils (14.4%), noncalcic brown forest soils (9.6%), noncalcic brown soils (7.3%), colluvial (7%) and alluvial soils (6.3%) [8].The amount of irrigatable area was determined as 97,166 ha [9].

The largest water source of the Isparta is Eğirdirlake (907 million m^3/year). Otherwise, surface water potential with the Aksu River emerged in Sütçüler town is 1784 million m^3/year. Furthermore, available groundwater potential is 120 million/year. When added irrigation water received from Beyşehirlake, total water potential of Isparta reaches up to 1989 million m^3/year [10, 11].

Isparta has ten large (>1000 hectar) irrigation scehemes. These are Atabey, Bogazova, Gelendost, Hoyran, Senirkent, Sarkikaraagaç, Uluborlu, Yalvaç, Yenisarbademli, and

Yılanlı irrigation schemes. The total irrigation area of these irrigation schemes are 53,348 ha.

Table 1. Some of the features of the irrigation schemes for the years 2004-2008 in IspartaCounties [12]*.

Irrigation Scheme	Irrigation Area (ha)	Irrigated Area (ha)	Irrigation Ratio	Diverted Irrigation Water (hm^3)	Water Requirement (hm^3)	Water supply of Ratio (RWS)
Atabey	14000	3977	28	56818	16478	3.45
Boğazova	1800	1629	91	16051	9634	1.67
Gelendost	4335	2630	61	23134	13054	1.77
Hoyran	2800	1319	47	11290	4854	2.33
Senirkent	8079	4085	51	36481	16644	2.19
Şarkikaraağaç	13180	1082	8	24362	4740	5.14
Uluborlu	1640	1474	90	8925	5821	1.53
Yalvaç	1800	331	18	5325	1355	3.93
Yenişarbademli	2490	492	20	10453	2369	4.41
Yılanlı	2800	961	34	11181	4482	2.49

*Average values for the years 2004-2008

Irrigation areas, irrigated areas, diverted water volume, irrigation water requirement, irrigation ratio and rate of water supply (RWS) of these irrigation schemes in 2004-2008 are shown in Table 1. Irrigation ratio and RWS are two basic indicators used for efficient land and water use. The lowest irrigation ratio was realized at Sarkikaraagac irrigation scheme (8%), whereas the high irrigation rate was occurred at Bogazova irrigation scheme (91%) in the specified years. According to the total irrigation water requirement, the rate of water supply equals to 1 indicates that water is diverted at a level to meet the requirement, while a water supply ratio smaller than 1 indicates that water less than required is diverted, and if it is greater than 1 indicates that water more than required is delivered. According to this indicator, the most efficient irrigation water use was realized in Uluborlu (RWS: 1.53), Boğazova (RWS: 1.67) and Gelendost (RWS: 1.77) irrigation schemes (RWS: 1.53), respectively. Irrigation water was applied 5.14 and 4.41 times more than needed in Sarkikaraagac and Yenisarbademli irrigation schemes. Therefore, it is impossible to mention in these irrigation schemes an efficient use of water. Related with this study in these irrigation scheme, Uçar (2011) [13] reported thatthe highest Output per Unit Command Area (OUCA) values were in Bogazova irrigation scheme (US$38.724 and US$34.907 per ha, respectively) in 2007 and 2008, followed by Gelendost irrigation scheme (US$23.168 per ha) in 2007. On the other hand, the lowest OUCA values were in the Sarkikaraagaç (US$397, US$450, and US$455 per ha, respectively) in 2004, 2008 and 2006.

Determination of Grassland Areas by Remote sensing and GIS

Using today's technology will ease the time and labor for the identification of grassland and pasture areas. In this respect, the Geographic Information System (GIS) built on computer technology enhances research, planning and management and the decision-making capabilities. In recent years, estimation of biomass production of pasture using remote-sensing (RS) techniques is developing very fast. RS and GIS are being used increasingly as tools to assist in grassland resource inventory and integration of data and as a mechanism for analysis, modeling, and forecasting to support decision-making [14].

Integration of these technologies has been reported to be used in many areas of agriculture as well, especially for land use and grassland management. Excessive grazing of pastures and meadows and incorrect land utilisation are major causes of depletion of grazing land which is a critical resource for animal production. For this reason determination of grazing lands within the province becomes very important issue to be used for animal production and effective

grazing management. Therefore, it is possible to determine the grassland types and grazing systems using satellite images and to evaluate grassland quality using GIS and RS techniques [15]. RS and GIS have played an active role in monitoring and determining changes in environment (Erdin et al., 2002) 16].

Recommended Grazing Systems in the Region

There is evidence that some rotation grazing systems give equal or superior vegetation, livestock, and financial performance to continuous grazing [17].The division of the grassland into paddocks through electrical fencing allows for the splitting of herds into various groups. Furthermore, the short grazing periods applied in the rotational grazing are beneficial because they can increase the carrying capacity of the pasture without grasses being damaged. Moderate stocking rates would be appropriate for the pastures in the grassland areas which can provide better vegetation for grazing purposes. As suggested by [18] selection, design and implementation of best proper irrigation methods based on land characteristics and implementation of proper irrigation programs will provide an effective water resource utilization and preservation. With the implementation of pressurized irrigation systems water loses and excessive water use and consequent negative effects on environment will be prevented. Water pricing should be based on volumetric consumption instead of crop-area basis.

CONCLUSIONS

The rangelands in the area are of great importance for the people of the region who engage in livestock production. The existing pastures can be utilised by the implementation of rotational grazing as an efficient grazing system.

Determination of the grazing areas by using geographic information system and remote sensing technology will certainly create a new food source for the improvement of both livestock sector and rural socio-economic situation of the farmers in the province, and will contribute to the protection of cultivation areas and soil from erosion and fire disasters.

Since the land consolidation, leveling and drainage like in-land development services are not completed over the land resources, a sustainable water management is not achievedThe regionis not at the desired level in terms of the effective use of water resources, especially in terms of rates of irrigation and water supply rate. Moreover, irrigation canals, canalets, architectural structures and gauging facilities are exposed to external conditions (precipitation, flood, wind, ice, temperature) and damages caused by the users, they get out of order in short time and they require maintenance and repair. Since there are intermediate storages in canal networks and night irrigations are not made during the irrigation season except the peak seasons some water diverted to network flows to discharge. Fulfillment of these deficiencies may increase water use efficiency in the region.

It can be concluded that in this region where the economy is based on animal and horticultural production, determination of grazing areas, water resources stocking rates, estimation of biomass available for grazing, the length of vegetation period and monitorring the change in those areas must be included in Regional Development Plans for the improvement of agricultural development in the Region.

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