Land suitability survey and different planting dates for farming of burley 21 tobacco in Marivan

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Abstract
In the present study and research work, an experiment land suitability evaluation for tobacco burley 21 was performed in 13200 ha total area in the Marivan plain and near Zaribar Lake. Marivan is located 130 km of west of Sanandaj, the capital of Kurdistan province. The present research fulfilled in pedology at a semi-detailed study level using climatological information. Tobacco edaphic and climate requirements have been taken from Sys Tables (1993). After necessary calculations with the Simple Limitation Method (SLM), the Limitation Method regarding Number and Intensity (LMNI) and the Parametric Method (PM) such as Storie and Square-root methods, a qualitative classification has been prepared for production and maps have been drawn. Also, land suitability evaluation calibration and determination of suitable dates for cultivation, tobacco sampling has been examined at the zone level at 24 farms and acquired outputs have been compared. According to this calibration, proportional output of sampling zones has been compared to results of land suitability theoretical classification. The present research has shown that the study zone is suitable from climate point of view and determination of suitability final class depends on land, type of cultivation, and management of production for cultivation of tobacco. Land classes in the zone with the Simple Limitation Method for cultivation of tobacco are included as moderately suitable (S_2) and marginally suitable (S_3) and Storie and Square root methods non-suitable (N) and marginally suitable (S_3) respectively. Also suitability classification maps have been prepared for cultivation of tobacco in the study zone. According to these, 25 % of the land is moderately suitable (S_2) and 75 % marginally suitable (S_3).

Key Words
Suitability, climate, planting date, Marivan plain, parametric method, tobacco.

Introduction
Soil is as one of the most important factors of production in agriculture and its exploitation in a manner that it does not damage it for future usages in addition to reaching to the maximum of production is required type. Land suitability evaluation for common crops of a zone is one of the methods for achieving this purpose (Ayoobi 2006). If soil and climate limiting factors and product special limitations are observed and each land type will be exploited according to its ability and each climate according to its potenial and as a result we will have the most production with highest quality. Land suitability studies have been done according to the FAO method using land characteristics and their comparison with a plant requirements table which has been adapted from Sys tables. In this research, the Marivan Plain zone with an area of 13200 has been studied for qualitative evaluation of land suitability for the determination of the most suitable land for cultivation of tobacco according to the land characteristics which have been acquired by soil climatic studies and topography, related to the plans and determination of suitable cultivation dates.

Methods
Marivan zone lies between 45°59' and 46°16' latitudes and between 35°27' and 35°41 longitudes. The altitude of the region is about 1287 m above sea level. The average annual total rainfall is 700 mm and it is more in winter. The minimum and maximum temperatures are 2°C on January and 28°C in July respectively. The slope varies between 1% and 4%. The comprehensive information and reliable data from climatic and agricultural condition has been acquired by reference to State Water and Soil Institution and State Meteorology Organization (Marivan synoptic meteorological station). Also the study zone has soil units and land units in pedology maps and by usage of GPS. Soil samples of soil unit have been examined. Collected soil samples have been examined in laboratory by physical and chemical tests according to the Water and Soil Research Institute common methods. By consideration of geomorphology and physiographic status of the zone and also soil characteristics, 5 soil series have been distinguished which are included as: Zaribar Soil, Veleh Zhir Soil, Marivan Soil, Ghezelsu Soil and Lanjabad Soil. 24 farms with equal condition and

similar agricultural operation have been evaluated for cultivation dates. Row spaces are 1 m and plant spaces on the rows have been considered 50 cm. The date of cultivation was three different times, Mar.10, Mar. 24, April 8.

Equations

The parametric land evaluation consists in numerical rating of different limitation levels of land characteristics according to a numerical scale between the maximum (normalised as 100%) and the minimum value. Finally, the climatic index, as well as the land index, is calculated from these individual ratings. In our case, the indices were calculated following two alternative procedures, The Storie method (Storie 1976) and Square-root method (Khiddir 1986). The index was taken as a product of individual ratings:

$$I = A \times \frac{B}{100} \times \frac{C}{100} \times \ldots \quad (1)$$

I – index (%)
A, b, C etc. – ratings (%)

$$I = R_{min} \times \sqrt{\frac{A}{100} \times \frac{B}{100} \times \ldots} \quad (2)$$

I – index (%)
R_{min} – minimum rating (%)
A, b, C etc. – remaining ratings (%)

Results

Characteristics of land units are in Table1.

Table1. Index characteristics amounts in existence land units

Land Units	Slope (%)	Text. Class	Depth	Gravel (%)	pH	$CaCO_3$ (%)	ECe (dS/m)
1	1 1	SICL	>100	15	7.33	1.68	0.51
2	2 1	SICL	>100	34	7.18	1.98	0.49
3	1 1	C	>100	15	7.03	1.5	0.66
4	2 1	CL	>100	15	6.5	1.66	1.36
5	3 2	CL	>100	15	7.08	4.2	0.49

Land units located at Zaribar, Veleh Zhir, Marivan were indentified by the simple limitation method, the, Square root method identified a marginally suitable class (S_3) its limitations are related to acidity (pH), texture and structure of soil. Separate unit No. 4 located at Gezelsu in the SLM and LMNI was moderately suitable (S_2) and PM belongs to the marginally suitable class (S_3) and had acidity limitation (pH). Separate unit No. 5 located at Lanjabad is marginally suitable (S_3) and had acidity and $CaCO_3$ limitations.

Table 2. Results of evaluation by different methods of land units for tobacco

Land units	SLM	LMNI	PM	
			Storie	Square Root
1	S_{3f}	S_{3f}	S_{3f}	S_{3f}
2	S_{3f}	S_{3f}	N_f	S_{3f}
3	S_{3f}	S_{3f}	N_f	S_{3f}
4	S_{2fc}	S_{2fc}	S_{3f}	S_{3f}
5	S_{3f}	S_{3f}	N_f	S_{3f}

Three date of cultivation associated with growth period have been identified. For tobacco, cultivation of tobacco should be done near to Mar. 18 in the reservoir region. Generally, land suitability tables for utilization in different zones need a suitable classification. Varieties may have special ecological needs. As a result it is necessary to evaluate production for different zones with different climates and at least for a common variety in relation to climate status and other factors. For modification of pH limitation, addition of acid and sulfur fertilizers is necessary.

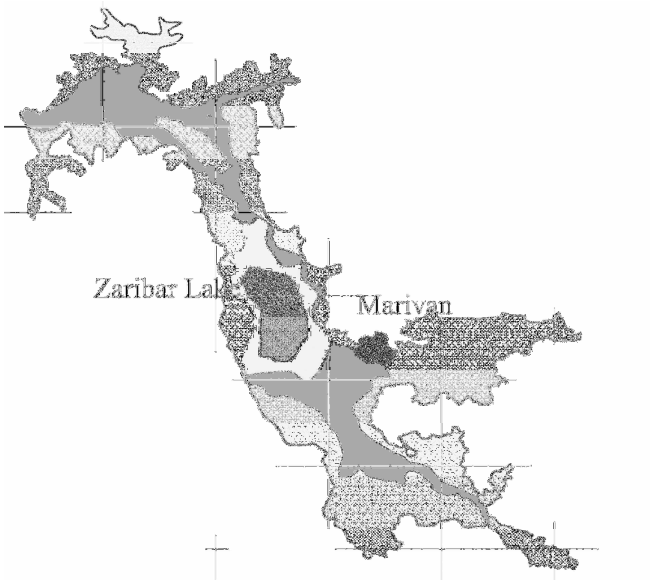

Figure 1. Marivan plain in the current experiment and the parametric methods shows that is belong to the marginally suitable class, (▦) and to the other areas non-suitable classes.

Conclusion

In general, the area is highly suitable from the climatic point of view for tobacco. However, the soil fertility characteristics make the lands in the area marginally suitable. Based on these results (especially on those obtained with the parametric square-root method, which seems to be the best), the cultivation of tobacco burley can be recommended for suitable soils in the area.

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