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Evaluation of Qualitative Land Suitability for Two Crops in part of Fars State

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ABSTRACT

Qualitative land suitability of Two Crops in part of Fars state was done via some control profiles. The region of Saadat Shahr with the areaofapproximately14260hectares is limited to about 80km northeast of Shirazbetween52degreesand 51minutesto 53degrees 13minuteseast longitude and30degrees and 30degrees9minutesnorth latitude. The results indicated relatively good classes and critical suitability. Storie method is preferable because it deals with numbers and can be considered semi-quantitative manner than the simple constraints approach.
KEYWORDS: Qualitative land suitability, Suitability class, environment, soil, wheat and maize.

INTRODUCTION

Soil is one of the blessings of God that should be kept properly in order to remain for the future generations. One of the important aspects of soil science is land suitability that is of great importance to sustainable development because it produces the agricultural or horticultural products with more functions and therefore more profit. On the other hand, it reduces the environmental hazards such as soil erosion, soil contamination, and soil salinity and et cetera by selecting the best product in the fields. Undoubtedly when a suitable product is selected by considering all aspects of planting, it is one of the crucial factors in sustainable development and environmental protection.

Land evaluation may be defined as "the process of evaluating the role of land when it is used for a specific purpose." and it includes all methods that predict the potential ability of using lands. Land Evaluation determines the ground reaction toward specific productivity. With Land Evaluation, the relationship between land and its productivity is determined. Then, based on this relationship, its suitable usage can be found and the estimate of the amount necessary inputs and resulting outputs can be achieved [7]. In today's world, due to the increasing population growth and urban development the possible expansion of the cultivated area is reduced and therefore a strong need for efficient use of available land will be felt.

Objective

The purpose of this experiment is: 1 - Comparison of wheat and corn in terms of environmental sustainability and the lowest risk of attrition and environmental and the highest production yield and 2 - Comparison of land suitability with different methods such as simple constraints and parametric.

Theory and Review of literature

Agricultural land, the need for efficient use of land can be felt more than ever. Sustainable agriculture is realized when the lands are classified in terms of suitability for different types of land uses [4]. The term "land suitability evaluation" was introduced for the first time in 1950 at the first International Congress of Soil Science, Amsterdam in an article entitled "Assessment of future land development" [9]. The main objective of land evaluation is that each land is used efficiently with the study of physical, social and economic aspects [1]. The classification of land suitability is a review of natural resources such as water, air, soil, water and human, economic, social and agricultural resources [7]. Wilson and Becker [10] conducted a Soil survey and land evaluation in Australia with the aim of achieving sustainable development. n this study, climate, geology, hydrology, vegetation and soil characteristics as the main factor of introduction and efficiency of terrain types, including products such as the South American palm, mango, avocado, citrus and other crops such as tea, vegetable, cucurbit, pineapple, etc. were introduced. Kooyama [5] conducted a study to determine land suitability in Mambetso in Japan and examined the land unsuitable for agriculture and land suitability for specific uses. The main objective of this project was to find the best land use for sustainable development

The Brundtl and Commission's brief definition of sustainable development as the "ability to make development sustainable—to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs [8]. Malek Zwaiski [6] conducted a geological and ecological assessment for agriculture in the area with the aim of achieving sustainable development based on planning, land used primarily for urban, regional, environmental, and then fit the capabilities of each region. The main objective of land evaluation is to use each land efficiently with the study of physical, social and economic aspects [1]. Land efficiently consist of wild life, forestry, limited, moderated and intensive grazing and limited, moderated, intensive and very intensive cultivation Qiyasi Shirazi [3] examined the land suitability of Moore plains in Fars

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province and determined the type of soil found in the three physiographic hills, alluvial fans and alluvial plains and specify a range of ten families in the soil for the three physiographic units and Stated that the proportion of families where there are mounds of physiographic units for the cultivation of wheat and barley, inappropriate or out of proportion a crisis. And families, who physiographic units are alluvial fans and alluvial plains range, are suitable for the cultivation of wheat and barley. Choosing the best product with the highest performance yet low environmental impact resulted in the study of land suitability both products irrigated wheat and maize parametric method (Story and square root) and simple constraints in Kamin, Saadat Shahr region. In simple constraints, the table of needs for each product is prepared in which the vertical portion is the land features and the horizontal portion is the classes , Then each factor is compared with the situation on the ground and it is characterized by an agent.

Constraints method with the certain constraints is like the simple constraints.

Lands in the two systems are divided into two categories of proportionate S and disproportionate N. proportionate category is divided into three classes.

S_1: proportionate class, S_2: relatively proportionate class, S_3: proportionate class but with a low profit

Disproportionate category is divided into two classes.

N_1: Currently disproportionate but will be proportionate after removal of the restrictions. N_2: disproportionate.

In this method, a quantitative ranking is given to each index if the characteristics are quite favorable for the plant the maximum degree of 100 is given to it and this evaluation method has two sections.

Assessment of Climate 2 - Assessment of land features

At this stage, the climatic factors that vary for each plant are identified, then the climatic conditions are compared to the climate needs of plant and a rank is given to it according to the table.

In the store method, the index is obtained by the following procedure.

$I = A\times B/100\times C/100\times \ldots$

I: climate index of land suitability

A, B, C: Dedicated degrees to the different features of climate

In the method of the square root(which is used a lot and it has much more accuracy in comparison to storie method) the index is obtained through the following equation.

$I = Rmin\times \sqrt{A/100\times B/100\times\ldots\ldots}$

I: Index

Rmin : minimum degree

A, B… :other degrees

The obtained parameters can be converted to degrees of climate using graphs.

If the climate index is less than 25: climate degree=1/6 × Climate Index

If the climate index is between 25 to 92.5: climate degree= (16.67 × Climate Index) ×0.9

Materials and Methods

The region of Saadat Shahr with the area of approximately 14260 hectares is limited to About 80 km northeast of Shiraz between 52 degrees and 51 minutes to 53 degrees 13 minutes east longitude and 30 degrees north latitude 30 degrees 9 minutes north of the mountain gorge in the mountains and forests of East Arsanjan of south to the mountains of West Mount Sivand. The average height plain from sea level is 1770 meters. In the study area using aerial photographs, satellite and topographic profiles of 8 controls were selected physicochemical properties in the laboratory and on-site features necessary for determining land suitability profile and climate data were collected from the study area for land works will be mentioned later.

Table 1- Climate information for different stage of wheat

Suitability rate	Regional information	
100	292	**Growing season rainfall(mm)**
100	285.82	**Vegetative stage rainfall(mm)**
100	2.65	**Flowering stage rainfall(mm)**
100	0.49	**Ripening stage rainfall(mm)**
97.47	10.03	**Average temperature of vegetation stage(°c)**
96.25	20	**Average temperature of flowering stage (°c)**
93.34	25	**Average temperature of ripening stage (°c)**
100	-0.6	**average minimum daily temperature of the coldest month (°c)**
100	12.7	**average maximum daily temperature of the coldest month (°c)**

Table 2- Relation between land indices and Suitability class

Suitability class	indices
SuitableS_1	75-100
Rather SuitableS_2	50-75
Critical SuitableS_3	25-50
Unsuitable N	0-25

Description: As the result of the wheat crop irrigation method is desired, the first 4 parameters such as rainfall + irrigation artificially supplied, so the maximum amount to be given. Climate index: 1 × 1 × 93.34 = 93.34 with respect to the index is not between 25 and 92/5 it will remain unchanged. The characteristics and the degree of severity of climate and terrain profiles obtained by the two methods are achieved Story and the square root of the index. And the overall grade will be determined according to Table 2.

Table 3- Climate information for different stage of Maize

Suitability rate	Regional information	
100	302	**Annual rainfall(mm)**
95	178	**Number of growing season days 12/19 - 6/22**
100	79.82	**Growing season rainfall(mm) 12/19 - 6/22**
90	20.85	**Average temperature of growing season stage(°c) 12/19 - 6/22**
90	12.05	**Average minimum growing (°c)temperature of season 12/19 - 6/22**
75	37.7	**Relative humidity of development stage 10/4 - 8/9**
94	53.33	**Relative humidity of maturation stage 12/19 - 10/12**
100	0.53	**n/N development stage**
100	0.78	**n/N ripening stage**

Description: As the result of the maize crop irrigation method is desired, so annual rainfall and growing season rainfall like the wheat maximum amount to be given (100)
Climate index: 75 × 0.9 × 0.95 = 64.13. With respect to the index is between 25 and 92.5 it will remain with this formula changed. The formula is (Climate Index × 0.9) + 16.67= Climate rate Climate rate =74.39

Table 4- Profile information

ESP	EC[2]	O.M	B.S	CEC[1]	Gypsum%	C.C.E	Depth (cm)	Gravel and Stony	Soil Texture	Fludity	Slope %	Profile 1
3.91	0.84	1.25	100	23.84	0.057	8.75			Silty Clay Loam			**A**
6.54	1.52	1.07	100	17.38	0.057	44.5			Silty Clay Loam			**B_{kl}**
9.19	1.51	1.01	100	15.80	0.053	46.87		No limitation	Silty Clay	No limitation	2%>	**B_{k2}**
6.92	0.84	0/68	100	12.53	0.052	44.25	130		Silty Clay			**B_{K3}**
6.55	1.09	1.07	100	18.11	0.055	31.45						
98	98	87	100	97	100	82	100	100	99	100	100	**Wheat**
99	99	87	100	89	100	50	100	100	98	100	100	**Maize**

[1] - Cmol (+) Kg^{-1}
[2] - $dS.m^{-1}$

Table5- Index number for wheat and maize

Index number for maize		Index number for wheat		Profile number
Square root	Storie	Square root	Storie	
37.19	27.66	70.96	61.41	**1**
0.84	0.29	3.69	0.91	**2**
33	26.83	65.43	56.98	**3**
16.41	12.25	45.89	37.46	**4**
6.29	5.05	21.53	18.55	**5**
11.71	9.14	42.03	38.98	**6**
20.08	16.12	67.96	62.42	**7**
7.44	2.77	4.03	0.9	**8**

According to Table 2 and having indices, Land Suitability Class for all of profiles easily can be obtained.

The results are available in the table 6.

Table 6- suitability classes for wheat and maize

Suitability Classes for Maize			Suitability Classes for Wheat			Profile numbers
Simple constraints	square root	storie	Simple constraints	square root	storie	
S_2	S_3	S_3	S_2	S_2	S_2	**1**
N	N	N	N	N	N	**2**
S_3	S_3	S_3	S_3	S_2	S_2	**3**
N	N	N	S_3	S_3	S_3	**4**
N	N	N	N	N	N	**5**
N	N	N	S_3	S_3	S_3	**6**
N	N	N	S_2	S_2	S_2	**7**
N	N	N	N	N	N	**8**

DISCUSSION AND CONCLUSION

According to the results we can say that if wheat is planted in the profile (1), we also have more functionality than the corn and also the environmental problems in less or no wheat, no corn, and no profile number 5 is not recommended. Depending on other conditions for wildlife or recreation is highly recommended. Storie method is preferable because it deals with numbers and can be considered semi-quantitative manner than the simple constraints approach. It is recommended to evaluate the future research and quantitative assessment of the economic and many other products in order to have more choice between products, and the economic and quantitative methods to assess.

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