CLASSIFICATION OF TALEGHAN RANGELANDS FOR MEDICAL PLANTS USE AND SUSTAINABLE DEVELOPMENT

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Abstract: Rangeland suitability is usually determined for recognition and assessment of its potential for apt utilization of this resource. This research performed to determine the capability of Taleghan rangelands for medical plants use in a sustainable utilization manner and to prepare the model of rangelands' suitability for medical plants. This model is based on the methodology introduced by FAO [1], considering the effective factors on each land use. Sampling process was done by stochastic-systematic method with four transects parallel with local slope and two transects perpendicular with the slope and using one square meter plots along with the transects in each vegetation type. All of the data had prepared by field surveys. Results show that in the medical plants sub-model, 28.9 percent of lands are located in the suitability class of S1, 33.5 percent in S2 class, 36.9 percent in S3 class and 0.7 percent in non-suitable class. These results could be used in land use planning, which may decrease the utilization risk, make the utilization units economic, increase the income of beneficiaries, and improve rangelands' condition.

Keywords: Range suitability model, Medical Plants, FAO, GIS, Taleghan

INTRODUCTION

Because of various climate and environmental condition (13 types of climates), Iran is one of the eight dominant countries that is noting in genetic potential and byproducts. Therefore, Iran flora is one of the richest plant sources in the world. This potential can be noteworthy as specify to multipurpose use of rangelands in this country. The first step in this direction is identifying these plants and their characteristics and distribution. One of the most important factors of natural fields' destruction and specially rangelands in recent decades is disorient of equivalence between land potential and level of its utilization. Following population growth and increasing human demands of rangelands, increase utilization of these sources daily and gradually decreases the ecological potency. FAO and UNDP [2] expressed, almost all the pasturelands have been under heavy grazing by domestic livestock or agricultural use. In attend to the complexity of rangeland natural ecosystems, any use and utilization of these lands should be based on scientific criteria and well grounded on study. The necessity of this matter clarified when the natural ecosystems of region has been destructed because of any reason like specific environmental and physical conditions, economical and social developments, and doing development activities in the region. According to FAO [1, 3] definition, range suitability is capability to land use for one range use with spotting to the sustainable use of this lands.

Numerous studies are conducting about identifying medical plant and their compounds. Some of them are the analyzing chemical compound of *Prangos*

ferulacea and *Prangos uloptera* species [4, 5]; the other one is *Thymus kotschyanus* [6]. Safaeian [7] studied the range suitability of rangeland for medical and industrial plants for determining the quality of the best growth site and noticed to some factors like relative frequency, phenology, distance of water sources, slop, soil etc. Gholeijnia [8] expressed that the most important affected characteristics on medical and industrial plants (as byproducts) are relief or topography, climate and soil.

This study aims to assess Taleghan rangelands potential in providing medical plants in the context of sustainable development.

MATERIALS AND METHODS

Case study

This research is done in Taleghan catchment that located in 110 Km far from Tehran province of Iran. It is located between 50°34´53" to 51°11´22" east longitude and 36°06´19" to 36°20´28" north latitude in Alborz Mountains. The area of this catchment is over 132500 ha. Average annual precipitation is 236.5 mm and average height is 2665m above sea level. 50 Percent of this catchment area has slop higher than 40 percent. Rangelands included 45 vegetation types with 175species belonging to 32 families.

Base studies

For preparing maps and primary data layers, topographic maps with scale 1:50000 of region were prepared. After that, gauging has done and boundary defined on the maps. We use the information of the previous researches to access some needed information like weather and climatology data, geology, pedology, and hydrologic units.

Vegetation

Firstly, with topographic1:50000 maps of Taleghan and field survey of catchment, the boundary of rangelands separated and then measurement and investigation of vegetation parameters was done in range of the vegetation units (the range of the vegetation units according to Florestic-Physionomic method [9] has checked).

Study Method

Sampling in study units was done by random-systematic method. In each vegetation type, four parallel slop wise transect and two parallel transect at peak were applied. Regard to mountainous region and short hillside length, transect length was selected at most 50 meter for sampling. The location of the first transect selected randomly, and then in each transect with 50 cm intervals, presence and absence of medical plants was determined and relative frequency of them detected with 1 m^2 plots, after that medical plants are collected and identified. In addition, in this study GIS software was used to obtain good information to illustrate medical plants model.

Medical Plants Model

The effective factors in medical plants model classify in two groups: physical factors and vegetation-related factors. Figure 2 shows the component of final suitability medical plants model. The suitability of medical plants is displaying in four levels as shown in table 1.

Vegetation Suitability Model

Vegetation suitability model is the most important part of the medical plants model. The most effective criteria in medical plants vegetation suitability model that assessing in this study are as follow:

Presence and Absence of Medical Plants

In this study percent of presence and absence of medical species within sampling quadrates estimated in the case study units (vegetation types) area.

Relative Frequency and Combination of Medical Plants

With determination of relative frequency for medical plants in transect, plant composition was determined for each type of plants.

Production of Medical Plants

For determining the production of medical species within sampling quadrates we used clipping and weighting method. Therefore, after identification and clipping plants separately, production of all the medical species determined in the sampling units. Finally, general production of each type clarifies with the sum of production of all species.

Suitability Model of Environmental and Physical Factors

According to multiplicity of environmental and physical factors on medical plants model, in the study we tried to find the most effective factors, and then enter the most important criteria in the model because of simplification of model. Therefore, the role of these factors (climate and soil) notice via the effect of them on the vegetation indirectly and prevent to entrance them as a dependent factors in the model. Among all the physical factors in the medical plants model, only the effects of two factors are evident: slope and access routes. Figure 1 display the suitability model of physical and environmental factors.

Table 1: Description of each suitability class

Suitability level	Description
N	Non Suitable
S_1	High suitability
S_2	moderate suitability
S_3	low suitability

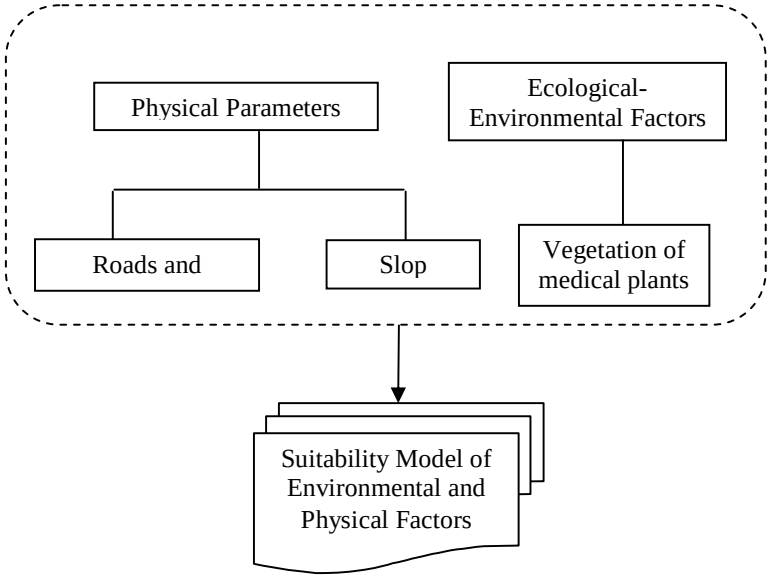

Figure 1: Suitability Model of Environmental and Physical Factors

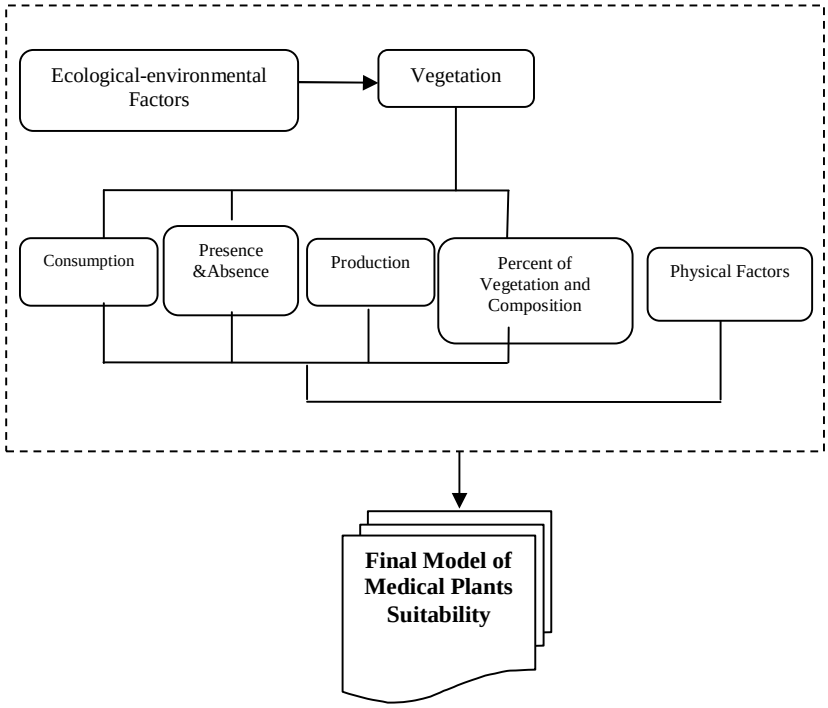

Figure 2: Final Model of Medical Plants Suitability

Table 2: List of medical plants in Taleghan catchment and their characteristics

Code	Family	Species	Consumption amount		
			low	medium	high
1	Compositae	*Achillea talagonicum*			*
2	Compositae	*Taraxacum syriacum*	*		
3	Labiatae	*Ajuga chamasistus*	*		
4	Cruciferae	*Alyssum bracteatum*			*
5	Cruciferae	*Alyssum dasycarpum*			*
6	Cruciferae	*Alyssum inflatum*			*
7	Compositae	*Centaurea solstitalis*	*		
8	Compositae	*lactuca sp*		*	
9	Labiatae	*Mentha longifolia*			*
10	Labiatae	*Nepeta bracteata*			*
11	Labiatae	*Nepeta racemosa*			*
12	Leguminosae	*Onobrychys sativa*			*
13	Zygophyllaceae	*Peganum harmala*			*
14	labiatae	*Phlomis olivieri*	*		
15	Plantaginaceae	*Plantago lanceolata*		*	
16	Umbelliferae	*Prangos uloptera*			*
17	Ranunculaceae	*Ranunculus arvensis*		*	
18	Polygonaceae	*Rheum ribes*	*		
19	Labiatae	*Salvia verticillata*			*
20	Rosaceae	*Sanguisorba minor*	*		
21	Labiatae	*Stachys inflata*	*		
22	Compositae	*Tragopagon caricifolius*	*		
23	Labiatae	*Thymus kotschyanus*			*
24	Leguminosae	*Trifolium repens L.*		*	
25	Apiaceae	*Eryngium bungei*		*	
26	Apiaceae	*Falcaria vulgaris*	*		
27	Apiaceae	*Heracleum persicum*		*	
28	Asteraceae	*Artemisia fragrans*	*		
29	Asteraceae	*Cichorium intybus*			*
30	Berberidaceae	*Berberis vulgaris*			*
31	Boraginaceae	*Anchusa italica*	*		
32	Caryophyllaceae	*Dianthus orientalis*			*
33	Cruciferae	*Capsella bursa-pastoris*			*
34	Cruciferae	*Descurainia sophia*			*
35	Fabaceae	*Alhagi camelorum*		*	
36	Fabaceae	*Melilotus officinalis*			*
37	Fabaceae	*Coronilla varia*			*
38	Fumariaceae	*Fumaria asepala*		*	
39	Hypericaceae	*Hypericum scabrum*			*
40	Labiatae	*Teucrium orientale*			*
41	Labiatae	*Ziziphora clinopoides*			*
42	Labiatae	*Ziziphora tenuir*	*		
43	Malvaceae	*Malva sylvestris*			*
44	Poaceae	*Agropyron repens*	*		

Table 3: The result of the slop and access routes suitability

Suitability Class	N		S_1		S_2		S_3	
	Hectare	%	Hectare	%	Hectare	%	Hectare	%
Slop Suitability	3155.5	4.3	25830.9	35.2	38159.3	52	6237.6	8.5
Access routes suitability	37912.7	30.5	57179.7	46	16781	13.5	12430.4	10

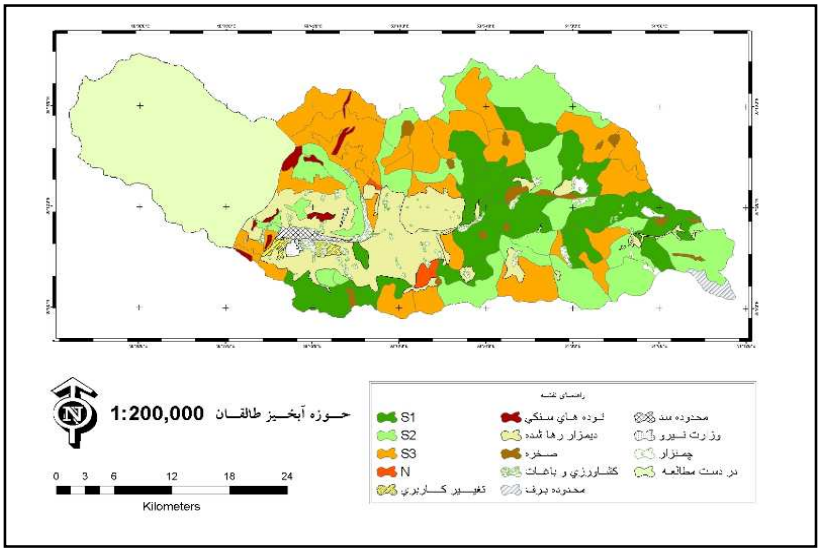

Figure 3: Map of Final Model of Medical Plants Suitability

Table 4: Suitability levels of medical plants in the vegetation types

Type Code	Type Name	Area (Hectare)	Suitability Class
1	Ag.in-As.sp-Br.to	450.5	N
2	Go.al-Ag.tr	80.2	N
3	Ag.in-Th.ko	2147.9	S1
4	As.go-Ag.in	5000.7	S1
5	As.sp-Ag.in	9846.6	S1
6	As.sp-Ag.tr	2640.0	S1
7	Di.ca-Rh.Ri	1570.1	S1
8	Ag.in-As.sp	4361.6	S2
9	As.go-Br.to	789.0	S2
10	As.sp.-Lotus-ge	296.5	S2
11	As.sp.-Lotus-goeb	291.5	S2
12	As.sp-Br.to	161.1	S2
13	As.sp-Ci.ar	5807.5	S2
14	As.sp-On.co	2589.9	S2
15	As.sp-On.co-Ci.ar	2026.0	S2
16	As.sp-St.ba	329.2	S2
17	As.sp-Th.ko	400.3	S2
18	Ce.vi-As.go	762.3	S2
19	Di.ca-Ag.in	762.4	S2
20	Di.ca-As.sp	4521.9	S2
21	Fe.ov-Pr.ul	684.2	S2
22	Pr.ul-Th.ko	780.5	S2
23	Ag.in-Fe.sp	370.0	S3
24	Ag.in-Fe.sp-Di.s	731.7	S3
25	Ag.in-Pr.ul	1271.3	S3
26	Ag.ta-As.sp.-Pr.ul	2996.3	S3
27	Ag.ta-Er.bu	159.7	S3
28	Ar.au-As.go	411.8	S3
29	As.go-Fe.ov	1133.1	S3
30	As.go-On.co-Ag.in	1387.3	S3
31	As.go-Th.ko-Ec.po	176.9	S3
32	As.sp.-Ac.as-On.co	2500.9	S3
33	As.sp-Ag.tr-Di.ca	256.6	S3
34	As.sp-Di.ca	2491.8	S3
35	As.sp-Ec.ro	569.7	S3
36	As.sp-Ech-ke	378.9	S3
37	As.sp-On.co-Ac.sp	2095.4	S3
38	As.spp.-Eu.ae	153.1	S3
39	Ce.vi-Ag.tr	287.2	S3
40	Di.ca-On.co	4080.2	S3
41	Gu.to-Ag.ta	1068.5	S3
42	On.co-Ag.in	735.2	S3
43	On.co-As.sp	1008.3	S3
44	On.co-Di.ca	2392.0	S3
45	Pr.ul-Ag.in	427.8	S3
Sum		**73383.2**	**-**

RESULTS

In vegetation suitability sub model, at the first step the floristic list of the region and its medical plants was prepared. Table 2 shows the list of the medical plants in case study and their characteristics. The result of checking frequency, composition, presence and absence of medical plants shows that many of medical plants in the region are belong to Leguminosae (12 species), Labiatae (12 species) and Compositae (9 species) families. Consequently, vegetation suitability sub model indicate that 530.8 ha of rangelands (0.7%) locate in N suitability level, 21205.2 ha in S_1 class (28.9%), 24563.8 ha in S_2 class (33.5%) and 27083.5 ha equal to 36.9% of rangeland area locate in S_3 class.

The result of the slop and access routes shows in the Table 3. In the final model of medical plants with conflation of given sub models, table 4 illustrate the suitability class of medical plants in the case study vegetation types. In addition, figure 2 shows the final suitability of rangelands according to medical plants feature and figure 3 illustrates Map of Final Model of Medical Plants Suitability.

CONCLUSION

Researchers mention various factors for determining the rangelands suitability for medical plants. For example, Safaeian [7] expressed vegetation percent, relative frequency, and medical plants diversity, application type, phenology, distance of water sources, soil and slope. In the other study, Ghorbani [10] noticed elevation, slop, aspect, climate, and rainfall as the most effective factors on the distribution of medical plants. Gholeij Nia [8] said that the most effective factors on the medical plants are topography, climate and soil. In addition, in this study according to FAO [1] method we used percent and composition of vegetation, presence and absence, production and consumption of medical plants and physical criteria (like slop and access routes factors), for determining the suitable medical plants growth site.

Limiting factors in vegetation suitability model are low vegetation percentage and medical plants production and low portion of them in the vegetation composition. Other researchers like Shams [11], Safaeian [7], Mohtasham Nia [12] confirm that factors as limiting factors.

Results show that in impassable and high gradient slops more medical plants exist than plains. Thus, high slop percent can conserve medical plants against over utilization and destruction. So, in medical plants model, increasing slope causes improvement in land suitability.

A GIS can provide better information and easier integration of various information layers to support model of range suitability assessment. It found that GIS is a useful technique to provide greater flexibility and accuracy for range suitability assessment.

Finally, with identifying the region medical plants, we can have better range management and improve sustainable development; in addition, it creates jobs and improves local people income and well-being.

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