LAND SUITABILITY EVALUATION FOR RAGI CROP IN THE HEMAVATHI WATERSHED: KARNATAKA STATE

Subash S.Sannashiddannanavar.,* Bindumathi S.**
*Associate Professor, Department of Studies in Geography, Manasagangotri, University of Mysore.
**Research scholar, Department of Studies in Geography, Manasagangotri, University of Mysore.

Abstract
This article analyzed the land suitability for ragi crop in the Hemavathi watershed. The land suitability model is applied for this study as per the guidelines prepared by National Bureau of Soil Survey and Land use planning (NBSS&LUP). Land suitability for ragi crop in Hemavathi watershed is based on the physical and chemical parameters of soil, climatic condition and topography of the land. Hemavathi River is one of the important tributary of river Cauvery, the total catchment area is 5697 sq km, for the analysis purpose this watershed is divided into three zones and these zones are divided on the bases of rainfall, temperature and elevation of the study area the results are discussed in this paper.

Key words: *Land suitability, ragi, Hemavathi watershed etc.,*

Introduction

Ragi is an important food crop next to rice, wheat and maize. Ragi is important small millet grown in India, it is predominately grown as a dry land crop in the peninsular states of Karnataka, Andhra Pradesh and Tamil Nadu. Ragi is a crop of tropical and subtropical climate and it can be grown successfully up to an altitude of 2100 m from msl. It can be grown under rainfed as well as irrigated conditions. It grows best in moist climate. It is grown in areas with rainfall up to 100 cm. In regions of higher rainfall and under irrigation, it can also be grown as a transplanted crop. This crop is also raised even in summer and as rabi crop in south India, but mainly as kharif crop in north India. It is an erect, tufted annual, root system consists of a large number of slender and fibrous roots, which are able to absorb moisture very efficiently, form the soil. Crop is generally self-fertilized, photoinsensitive and can be grown throughout the year. (NBSS 2006).

Objective

The main objectives of this paper are: To assess physical, chemical and climatic factors influencing on the ragi crop in the study area. To prepare soil suitability index for ragi crop in the study area.

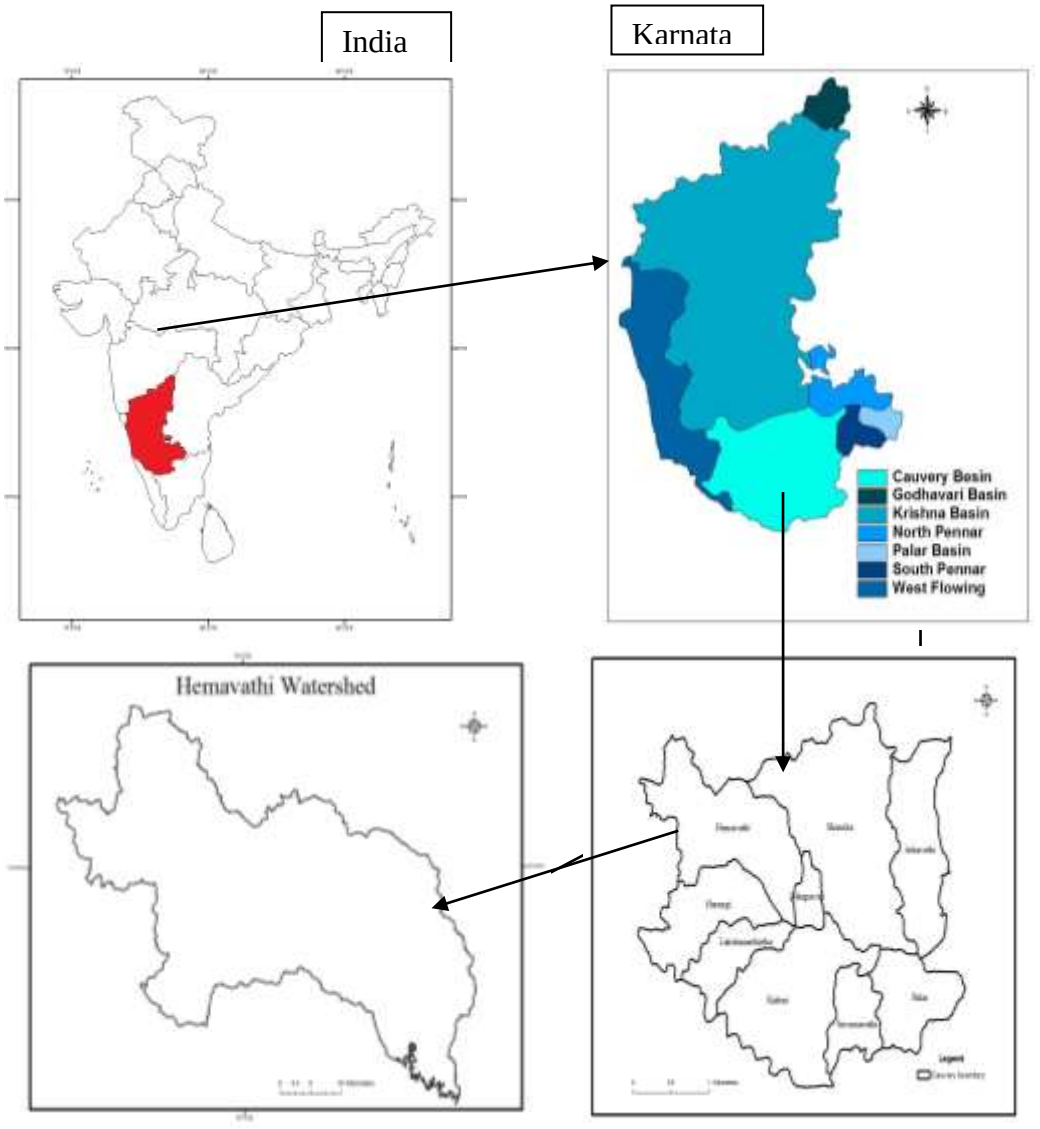
Methodology

The Food and Agriculture Organization (FAO) has done classification in land suitability order and NBSS & LUP (1990) guidelines have been prepared for the land suitability model. Both organisation guidelines are applied in this study. This land suitability model is concentrate on climatic factors, physical and chemical parameters of soil, soil drainage, depth of the soil, soil texture and slope. The Hemavathi watershed is divided into three zones on the basis of rainfall, temperature and elevation. S1, S2, S3 and N are assign by using the rating of each parameters.

Study area

The Hemavathi River is a very important tributary of the Cauvery river. It starts in the Western Ghats at an elevation of about 1,219 meters near Ballala Rayana Durga in the Chikamagalur district of the state of Karnataka and flows through Chikamagalur, Hassan, Mandya and Mysore districts, before joining the Cauvery river near Krishnarajasagara. It flows 245 km long and it has a drainage area of about 5,697.65 km^2. A larger reservoir has been built on the river at Gorur in the Hassan district. In the entire Cauvery basin the Hemavathi watershed is second largest in terms of area.

Figure 1. Location map of Hemavathi watershed



Suitability Analysis:

Table 1. Hemavathi Watershed. Land suitability parameters in different zones for Ragi crop-2013

Order	Zone one (area in ha)	Zone two (area in ha)	Zone three (area in ha)
S1	157229 (51.85%)	5942 (3.92%)	0
S2	110931 (36.58%)	44310 (29.25%)	0
S3	34896 (11.51%)	69477 (45.86%)	39258 (34.80%)
N	185 (0.06%)	31771 (20.97%)	73542 (65.19%)

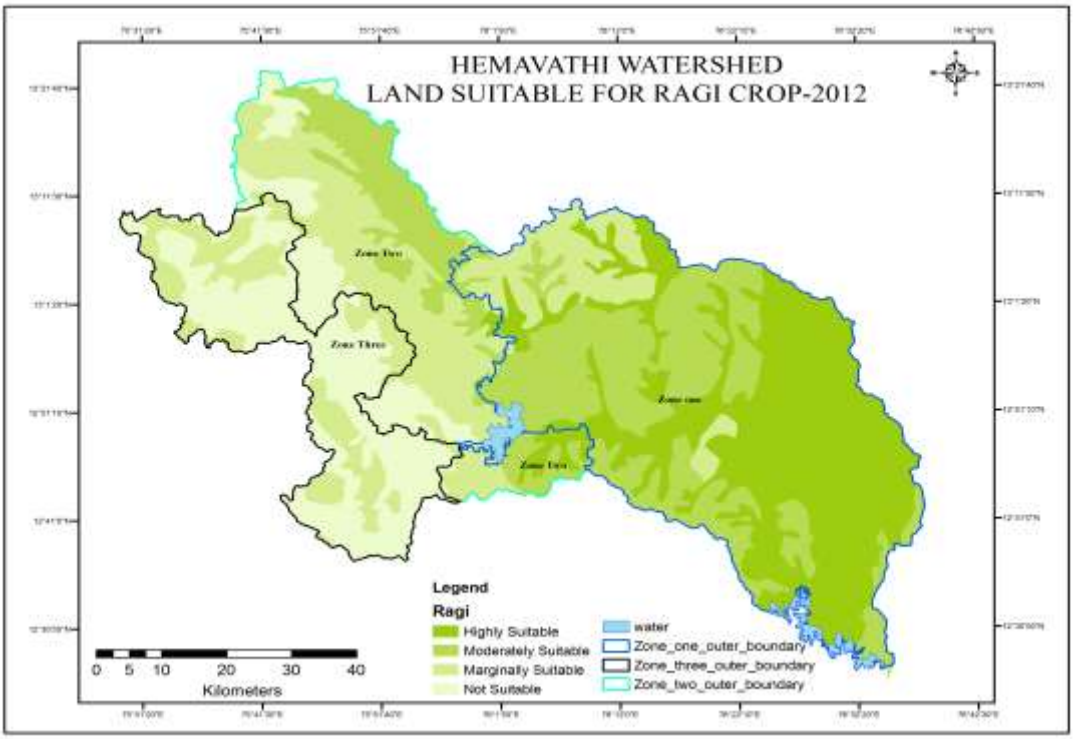
Source: Field survey, computed by researcher.

Table 2. Hemavathi Watershed. Taluk Wise Land Suitabile of Ragi Crop

Zone	Name of the Taluks	S1		S2		S3		N	
		ha	%	ha	%	ha	%	ha	%
1	Arsikere	1421	0.25	0	0.00	1379	0.24	0	0.00
	Chennarayapatana	40000	7.05	27700	4.88	100	0.02	0	0.00
	Hassan	16621	2.93	38994	6.87	29900	5.27	185	0.03
	Holenarasipura	15200	2.68	24500	4.32	2000	0.35	0	0.00
	K.R.Pete	66282	11.68	11801	2.08	1517	0.27	0	0.00
	Nagamangala	5495	0.97	105	0.02	0	0.00	0	0.00
	Pandavapura	11758	2.07	7042	1.24	0	0.00	0	0.00
	S.R.Patna	47	0.01	94	0.02	0	0.00	0	0.00
	K.R.Nagar	405	0.07	695	0.12	0	0.00	0	0.00
	Total	157229	27.71	110931	19.55	34896	6.15	185	0.03
2	Alur	1017	0.18	5537	0.98	25807	4.55	9439	1.66
	Arkalgud	4925	0.87	7350	1.30	6633	1.17	492	0.09
	Belur	0	0.00	19225	3.39	22565	3.98	12110	2.13
	Chikkamagalur	0	0.00	12198	2.15	14472	2.55	9730	1.71
	Total	5942	1.05	44310	7.82	69477	12.25	31771	5.59
3	Mudigere	0	0.00	0	0.00	18043	3.18	17757	3.13
	Sakleshpura	0	0.00	0	0.00	19200	3.38	37000	6.52
	Somvarpet	0	0.00	0	0.00	2015	0.36	18785	3.31
	Total	0	0.00	0	00	39258	6.92	73542	12.96
	Grand Total	163171	28.75	155241	27.35	143631	25.31	105498	18.59

Source: Field survey, computed by researcher.

Figure 2. Land suitability for ragi crop in Hemavathi watershed



Highly Suitable (S1)

Ragi crop can be grown throughout the year. It is a heat loving plant. The temperature required for its growth is 20^0 C to 40^0 C. And the temperature between 28^0C to 34^0C is highly suitable for ragi crop cultivation. The distribution of rainfall throughout the growing season is more important than the total precipitation during the period. 750 mm to 900 mm annual rainfall is highly suitable for its growth. Well drained and moderately well drained soil is most suitable because ragi cannot be stable in the water logging area. Loamy, sil, sl, cl, sicl and scl soil texture are highly suitable, where as the pH is 5.5 to 7.5, EC is less than 1.0ds/m is most suitable. More than 75cm of soil depth and less than 3 percent of slope are highly suitable for ragi crop cultivation (refer appendix no 1)

Table no 1 indicates the total area of highly suitable for ragi crop cultivation in the study region. Accordingly 1,57,229 ha (51.84%) of land is highly suitable for ragi crop cultivation in zone one. Out of this, K.R.Pet taluk is having largest area of high suitability area i.e., 66,282 ha (11.68%), second largest area was record in Chennarayapatna taluk i.e., 40,000 ha (7.95%). Remaining taluks are having less than 3 % of highly suitable area for ragi crop cultivation. In the zone two 5,942 ha (3.92%) of land is having highly suitable characteristics. In this zone only two taluks are recorded in highly suitable class i.e., Alur (0.18%) and Arkalgud (0.87%) in all these taluks the above soil suitable characteristics are observed.

Moderately suitable (S2)

Site characteristics of moderately suitable land for ragi cultivation is mean temperature is between 25^0C to 27^0C and 35^0C to 38^0C, rainfall between 600-700 mm, where as soil

drainage is imperfectly well drained or somewhat excessively drained, is moderately suitable. Whereas pH value of soil is 7.6 to 8.5 and 4.5 to 5.4 and EC of soil is 1.0 to 2.0 is moderately suitable. 50 cm to 75cm of soil depth and 3 to 5 percent of slope is moderately suitable for ragi crop cultivation, these observation are noticed in following areas.

In the zone one, 1, 10,931 ha (36.58%) of land is moderately suitable for ragi crop cultivation, in the taluk of Hassan 38,994 ha of land falls under S2 class. The Chennarayapatna taluk recorded 4.88 %, Holenarasipura 4.32 % and remaining taluk have less than 3 percent of moderately suitable criteria in the study region. In the zone two, 44310 ha of land is fall under S2 class, out of this Belur taluk was record largest area i.e., 3.39 % .Remaining taluks are Chikkamagalur 2.15 percent, Arkalgud 1.30 percent and Alur 0.98 percent of land is having moderately suitable criteria for ragi crop cultivation (refer map 1).

Marginally Suitable (S3)

In the study region zone two is having largest marginal suitable land for ragi crop cultivation i.e., 69,447 ha (45.85%). Out of this Alur taluk was recorded largest area i.e., 4.55 percent. The Belur taluk was recorded 3.98 percent, Chikkamagalur taluk 2.55 percent and Arkalgud taluk was recorded 1.17 percent of marginal suitable land for ragi crop cultivation. In the zone three 39,258 ha of land is comes under this class. In this zone Sakleshpura taluk is recorded largest area i.e., 19,200 ha (3.38%) and Somvarpet taluk is record less area i.e., 0.36 percent. In the zone one, only 5 taluks is having marginal suitable characteristics. Among them, Hassan taluk is recorded largest area i.e.,5.27 percent. Remaining taluks like Holenarasipura, K.R.Pet, Arasikere and Chennarayapatna are having less than 1 percent of marginal suitable characteristic for ragi crop cultivation.

Not Suitable (N)

In Zone three, 73,542 ha of land is not suitable for ragi crop cultivation. Out of this Saklesphura taluk has largest area i.e., 6.52 percent. Remaining taluks like Mudigere and Somvarpet taluks noticed 3.13 percent and 3.31 percent respectively. In zone two, 31,771 ha of land is not suitable for ragi cultivation. Out of this Belur taluk has recorded 2.13 percent of land is not suitable and remaining taluks of this zone have less than 2 percent. In zone one only 185 ha of land is not suitable for ragi crop cultivation and this area is concentrated in the taluk of Hassan. In the above mentioned areas are not having favourable criteria's as mentioned in the earlier pages.

Conclusion

Regarding the land suitability for ragi cultivation, the zone one comprises taluks like Arsikere, Chennarayapatna, Hassan, Holenarasipura, K.R.Pet, Nagamangala, Pandavapura, S.R.Patna, K.R.Nagar, these taluks have fovorable conditions for the ragi crop. In zone two 51.76 % of the area is marginal suitable for ragi crop cultivation. In zone three 12.96% of land is not suitable for ragi cultivation, because of predominate area is under forest cover and high rainfall.

References

Abdollah Ghasemi Pribalouti., 2009., "GIS based land suitability evaluation for rapeseed oil crop", Journal of Food Agriculture & Environment Vol 7 (3&4).

Alejandro Ceballos Siva and Jorge Lopez Blanco., 2003., "Evaluating biophysical variables to identify suitable areas for oat in central mexico: a multi-criteria and GIS approach:, Agriculture Ecosystems & Environment 95.

Ali Asghar Jafarzadeh & Goldast Abbasi., 2006., "Qualitative land suitability evaluation for the growth of onion, potato, maize and alfalfa on soils of the Khalat pushan research station", Biologia, Bratislava, 61/ Suppl.19: S349-S352.

Bhagat.R.M, Sharda Singh, Sood.C, Rana.R.S, Kalia.V, Pradhan.S, Immerzeel.W., 2009., "Land suitability analysis for cereal production in Himachal Pradesh (India) using Geographical Information System", Journal of Indian, Soc. Remote Sensing 37.

Mishra Antaryami., 2007., Land Suitability Classification for Different Crops Orissa review.

FAO., 1976., A framework for Land Evaluation. Soils Bull 32, FAO, Rome.

NBSS & LUP., 1990., Soil resources of Tamil Nadu for land use planning- detailed report, Bangalore Centre.

Prakash.T.N., 2003., "Land suitability analysis for agricultural crops: A fuzzy multicriteria decision making approach", MSc thesis. ITC, Netherlands.

Sailesh Samanta, Babita Pal and Dilip Kumar Pal., 2011., "Land suitability analysis for rice cultivation based on multi-criteria decision through GIS", International Journal Science & Emerging Technologies E-ISSN:2048-8688. Vol 2 No 1.

Appendix No 1: Soil – Site suitability criteria (crop requirements) for Ragi

Soil – Site Characteristics	Unit	Highly Suitable S1	Moderately Suitable S2	Marginally Suitable S3	Not Suitable N
Mean temperature in growing season	^{0}C	28-34	25-27 35-38	39-40 20-24	>40 <20
Total rainfall	mm	750-900	600-750	450-600	<450
Soil drainage	Class	Well drained: moderately well drained	Imperfectly drained: somewhat excessively drained	Poorly drained: excessively drained	
Texture	Class	l,sil, sl, cl, sicl, scl	sic, c, sc	Ls, s, c >60%	
pH	1:2.5	5.5-7.5	7.6-8.5; 4.5-5.4	8.6-9.5; 4.0-4.4	<4.0
Effective soil depth	cm	>75	51 to 75	25 to 50	<25
Salinity (EC saturation extract)	ds/m	<1.0	1.0-2.0	2.0-4.0	
Slope	%	<3	3-5	5-10	>10

Source: NBSS & LUP, Shivaprasad, et al., (1998), altered by research scholar