TRENDS IN AGRICULTURE SCIENCE

Popular Article

Vol.3 Issue 03 March 2024, Page: 1631-1634

Soil based Crop Suitability Evaluation for Sustainable Crop Production in arid region of Andhra Pradesh, India

R. Srinivasan[1], N. Maddileti[1], V. Ramamurthy[1] and V. Kasthuri Thilagam[2]

[1]ICAR-National Bureau of Soil Survey & Land Use Planning, Regional Centre, Bangalore-560024, Karnataka, India
[2]ICAR-Sugarcane Breeding Institute (SBI), Coimbatore- 641007, Tamil Nadu, India
https://doi.org/10.5281/zenodo.10947234

Introduction

India is blessed with diverse agro-climatic conditions and distinct seasons, enabling us to grow various crops. Food security is a major challenge due to unreliable rainfall and declining soil fertility. Most of the soil resources in the arid region, which constitutes a majority of smallholder farmers' fields, are in degraded condition. Hence, there is a need to identify suitable soils for crop selection and proper interventions. These soils functioned at a moderate and poor capacity in crop cultivation. Soil erosion, low AWC and poor soil fertility are the major limitations for crop production in these regions. In arid zones, soil management is the key to increasing crop yield. Agronomic erosion control measures such as cover crops, mulching, organic manure, and mineral fertilizer application are recommended to improve soil fertility in the arid region of India (Awoonor *et al.*, 2023).

Land and soil are heterogeneous, and any decision on crop cultivation is accounted for the prevailing local conditions. Therefore, assessing soil suitability assessment based on climatic parameters (rainfall and temperature), land characteristics (topography, drainage) and soil properties

Published: 28 March. 2024
ISSN: 2583-7850

(pH, EC, SOC, nutrients etc.) for sustainable crop production is emphasised (Mosleh *et al.*, 2017). More profound knowledge of land use systems should lead to better use of land resources and land use planning. Land evaluation is a part of the solution to land-use problems, as it supports rational land use planning and sustainable use of both natural and human resources. Land evaluation is the assessment process of land performance for the specific purposes of land use (Yeshaneh *et al.*, 2015).

Major cropping systems in arid regions of Andhra Pradesh

Crops like groundnut (*Arachis hypogaea*), pearl millet (*Pennisetum glaucum*), and pulses (*Cajanus cajan*) under rainfed conditions and rice (*Oryza sativa*), maize (*Zea mays*), and different vegetables (tomato, brinjal, and okra, etc) under irrigated condition are cultivated as mojor crops. Mango (*Mangifera indica*) is a major perennial horticultural crop extensively cultivated (Table 1).

Major soils

- Soils in the arid region are varied in nature.
- This diverse soil composition accommodates a wide range of crops, which significant contributors to agricultural output.
- Sustainable and efficient soil management strategies are critical for maintaining soil fertility and promoting healthy crop growth.

The major soil types are red sandy soils, colluvial soils, black soils, lateritic soils, *in situ* soils and alluvial soils. The shallow red sandy soils are found on the pediplains and dissected pediplains of the area. The black soils are in the lowland. The alluvial soils formed by the fluvial processes are found in the river valleys of the Pennar. Different soil types and their major land use system in arid region is given in the Figure 1.

Table. 1 Different soil types and suitable major crops in Andhra Pradesh

Soil Type	Major crops
Red Sandy Loams	Groundnut, Pulses, Millets, Cotton
Black Cotton Soils	Cotton, Sugarcane, Tobacco, Chillies
Coastal Alluvial Soils	Paddy, Coconut, Banana, Sugarcane
Laterite Soils	Cashew Nut, Millets, Pulses, Root crops

Land and crop suitability evaluation

According to (FAO, 1976) Land evaluation is concerned with the assessment of land performance when used for specified purposes. It can be defined as “all methods to explain or predict the potential use of land”. Land evaluation serves as an interface between land resources inventories and land use planning and management. In addition to information about climate, hydrology, vegetation, agricultural practices and their socio-economic aspects, land suitability evaluation, detailed

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ISSN: 2583-7850

field data, such as slope, soil depth, soil texture, and percentage surface stoniness are required for planning rainwater harvesting structures (Srinivasan *et al.*, 2021).

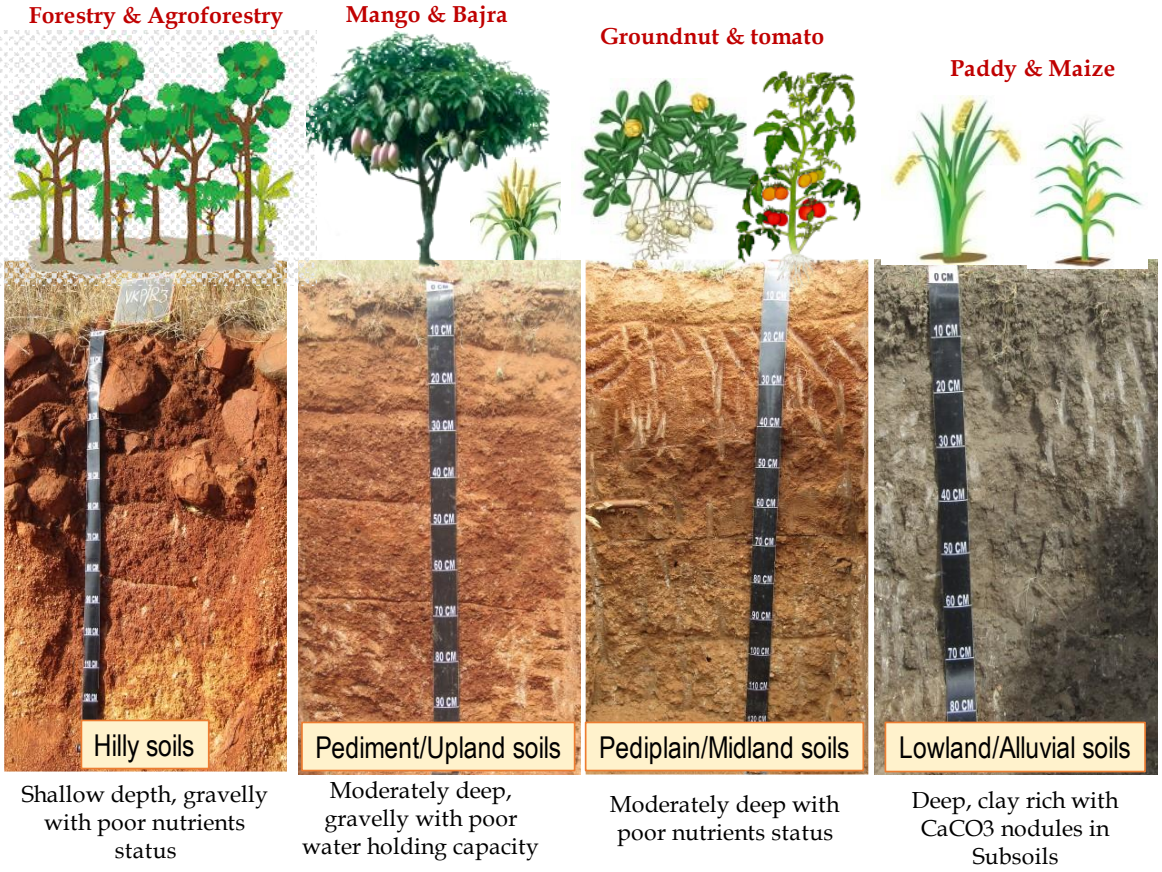

Fig. 1 Different soil types with suitable crops in arid part of Andhra Pradesh

Soil surveys are important sources of data that can be used to improve physical land suitability classifications, planning, and environmental protection-based soil quality and crop adoptability. Farm scale soil surveys highly helpful in providing the soil properties and their spatial distribution and potential. Soil maps that contain detailed information about soil properties and their spatial distribution are necessary for modern land evaluation, land suitability analysis, land resources management, land use planning, and other environmental modelling. Based on that, soil crop suitability model is developed and suitable area identified in the arid region (Fig. 2).

Conclusions

A good relationship was found between landforms and soil attributes in arid region of Andhra Pradesh. Using the soil-landscape prediction model and a sufficient number of field observations within each class, an acceptable accuracy and good spatial distribution of the suitability classification was achieved.

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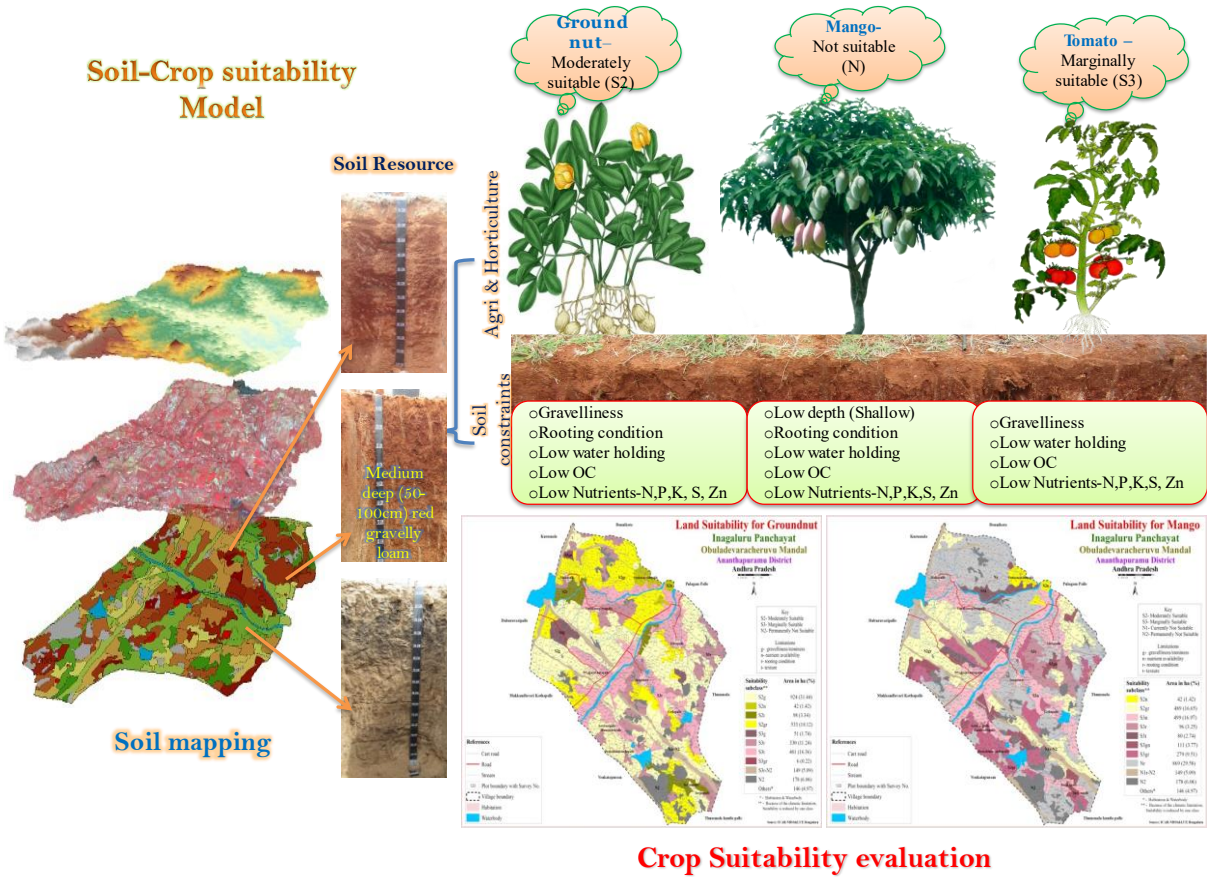

Fig. 2 Soil-crop suitable models in arid part of Andhra Pradesh

Soil-landscape relationship provided better detection of soil attributes, such as rocky areas and deep soils. This is crucial because proper soil characterization and topography analysis play an important role in identifying suitable areas for various crops. Developing soil-based crop suitability maps with good spatial distribution and adopting site specific land use system.

Reference

Awoonor, J.K., Dogbey, B.F., & Quansah, G.W. (2023). Soil suitability assessment for sustainable intensification of maize production in the humid Savannah of Ghana. *Frontiers in Sustainable Food Systems*. 7:1094290. doi: 10.3389/fsufs.2023.1094290.

Food and Agriculture Organization of the United Nations (FAO). (1976). A Framework for Land Evaluation. Soils Bulletin, No. 32. FAO, Rome.

Mosleh, Z. et al. (2017). Sustainable allocation of agricultural lands and water resources using suitability analysis and mathematical multiobjective programming. *Geoderma* 303, 52–59.

Srinivasan, R., Rajendra Hegde, Kasthuri Thilagam, V. and Naveen Kumar, S. (2021). Soil-site characterization on crop productivity in Alfisols of Eastern Ghats of Tamil Nadu, India. *Journal of Soil and Water Conservation* 20(4): 355-364, DOI: 10.5958/2455-7145.2021.00045.X.

Yeshaneh, E., Salinas, J.L., & Blöschl, G. (2015). Decadal trends of soil loss and runoff in the Koga catchment, north western Ethiopia. *Land Degradation and Development*. http://dx.doi.org/10.1002/ldr.2375.

Published: 28 March. 2024
ISSN: 2583-7850