

Soil-based Crop suitability evaluation is a nexus to the sustainable farming

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[DOI:10.5281/TrendinAgri.14991862](https://doi.org/10.5281/TrendinAgri.14991862)

Introduction

Agriculture is backbone of national economy, which is major contribution to the development and advancement of society. Country pays great attention to achieve self-sufficiency in food and horticultural crop production. Agricultural sector obtains the jobs of many of the total workers in the country. Soil provides ecosystem services critical for life. Soil acts as a water filter and a growing medium and habitat for billions of organisms.

Land suitability assessment, frequently carried out to ascertain whether kind of land use is suited for a specific region, is the first phase in agricultural land use planning (Abdel Rahman *et al.* 2022). A technique for evaluating a piece of land called land suitability assessment identifies the main barriers to growing a particular crop. Both qualitative and quantitative evaluations are included in the assessment of land suitability. Climate, hydrology, terrain, vegetation, and soil qualities are taken into account in the qualitative land suitability assessments, whereas the results of the quantitative assessment are more precise and the yield is estimated (Srinivasan *et al.* 2023). For determining the suitability of a piece of land, employed the FAO land evaluation framework and physical land evaluation (Sys *et al.* 1991).





Soil-based crop suitability evaluation is a process that determines how well a particular type of land is suited for growing a specific crop. It involves assessing the soil's quality and fertility, as well as other factors that affect the growing conditions of a crops.

Soil Map

Soil mapping is very important for the correct implementation of sustainable land use management. The idea is that in order to make a map describing the distribution of a soil attribute across a given spatial domain, soil observation points are intersected with layers of different landforms. Farm scale or survey number wise soil information using 1:10,000 scale is a high-intensity survey that maps level of soil series, types, and phases. It deals with systematic detailed study of soils comprising morphological examination of soils in the field, analysis of soil samples in the soil laboratory and preparation of maps in GIS environment (Srinivasan *et al.* 2021). Detailed Soil Survey is high priority area for generate detailed data base on soils which are pre-requisites for formulation of village level plan. Detailed soil map prepared using different soil profiles observation in Mittahalli village (Fig.1).

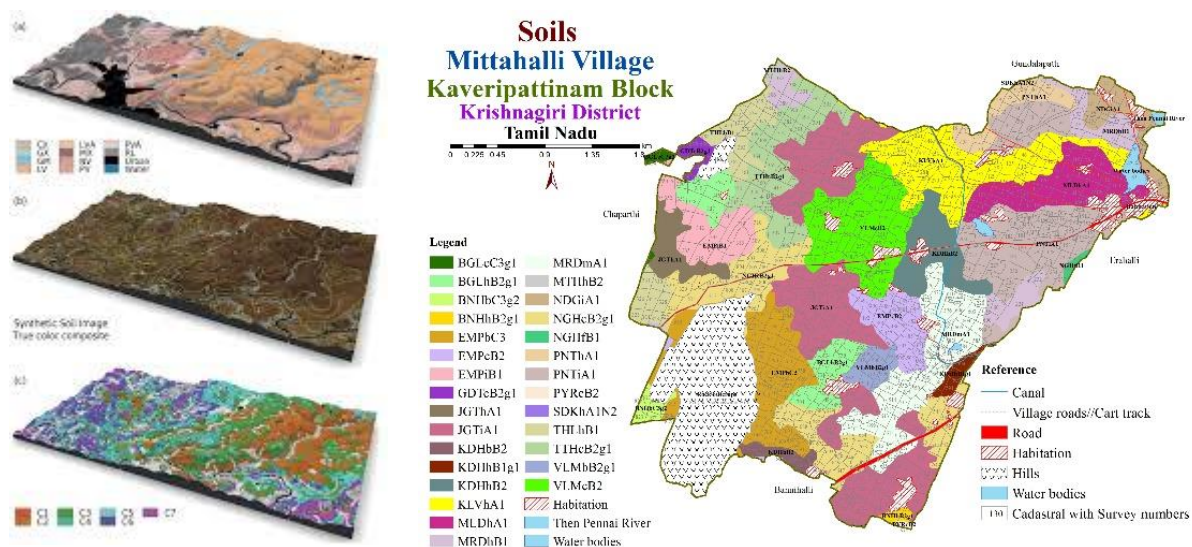


Fig. 1. Soil map of Mittahalli village of Tamil Nadu

Crop Suitability Evaluation

Crop suitability evaluation, also known as land suitability analysis (LSA), is a process that determines how well a particular piece of land is suited for growing a specific crop. The cropland suitability analysis is the process of assessing the appropriateness of a given type of land for growing a particular crop based on its optimum growth requirements (FAO, 1976). It is a function of different parameters such as climate, soil, topography, land use, infrastructure, water availability, socio-economic and environmental factors etc. It also involves major decisions at various levels starting from choosing significant land-use types, selecting criteria, deciding suitability limits for each class

of the criteria and deciding the preferences, both qualitative and quantitative. Identification of suitable crop/crops will further facilitate environmentally friendly sustainable agriculture by developing optimum crop plans. Soil properties-based paddy (Fig. 2) and coconut (Fig. 3) crop suitability evaluated in Mittahalli village.

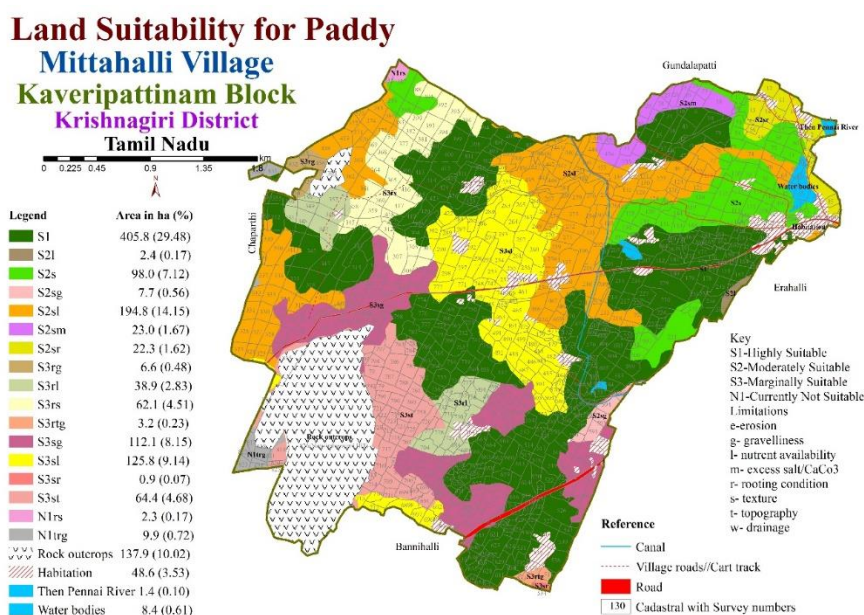


Fig. 2. Soil based paddy crop suitability evaluation in Mittahalli village of Tamil Nadu

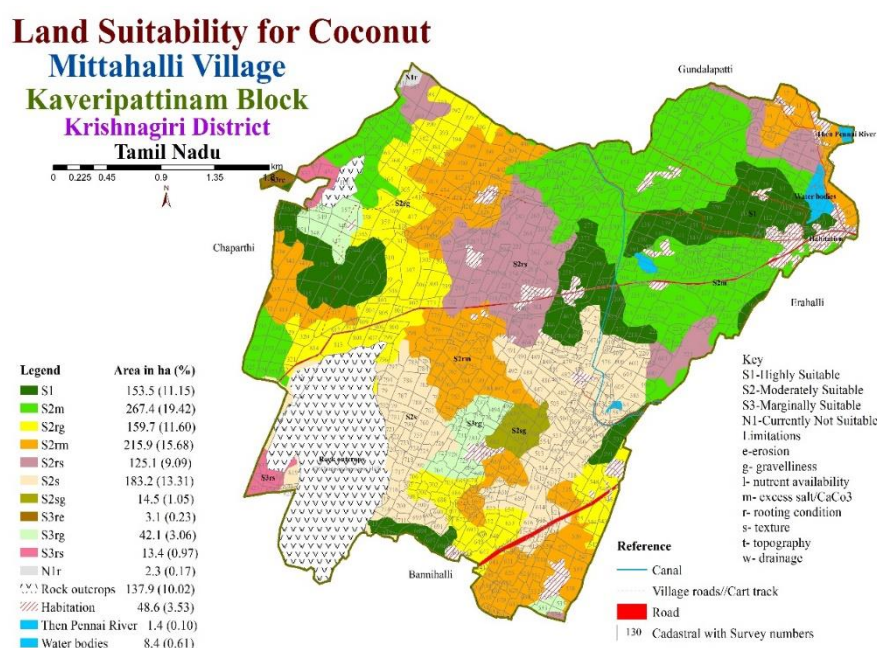


Fig. 3. Soil based coconut crop suitability evaluation in Mittahalli village of Tamil Nadu

Sustainable Farm Management

Soil is the essential environment for plants. Sufficient agricultural production not possible in poor or unsuitable for farming, while sustainable agriculture can reduce soil erosion and restore soil fertility. A sustainable farm ensures soil fertility with multiple crops, crop rotation, green and animal manures, etc. Soil fertility management for sustainable agriculture is fundamental because fertile soils supply enough nutrients for crop development, making plants more vigorous



growth. Crop suitability assessment is a crucial technique for agricultural planning and development. It helps determine if a specific region is suitable for growing a particular crop by evaluating multiple parameters. Understanding of land resources and suitable soils for major crops will enhance the extending the area and productivity.

Conclusions

Scientific soil-based crop suitability evaluation has an important role in agriculture. Developing countries such as India face many challenges as far as food security is concerned due to the increasing rates of population growth and the limited agriculture resources. Assessing detailed soil resources at farm scale is very crucial for crop management and environmental sustainability. Crop suitability evaluation is consideration of climate, water availability and different soil parameters. A precise land suitability assessment provides, better land and soil management and adopting suitable crop production.

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