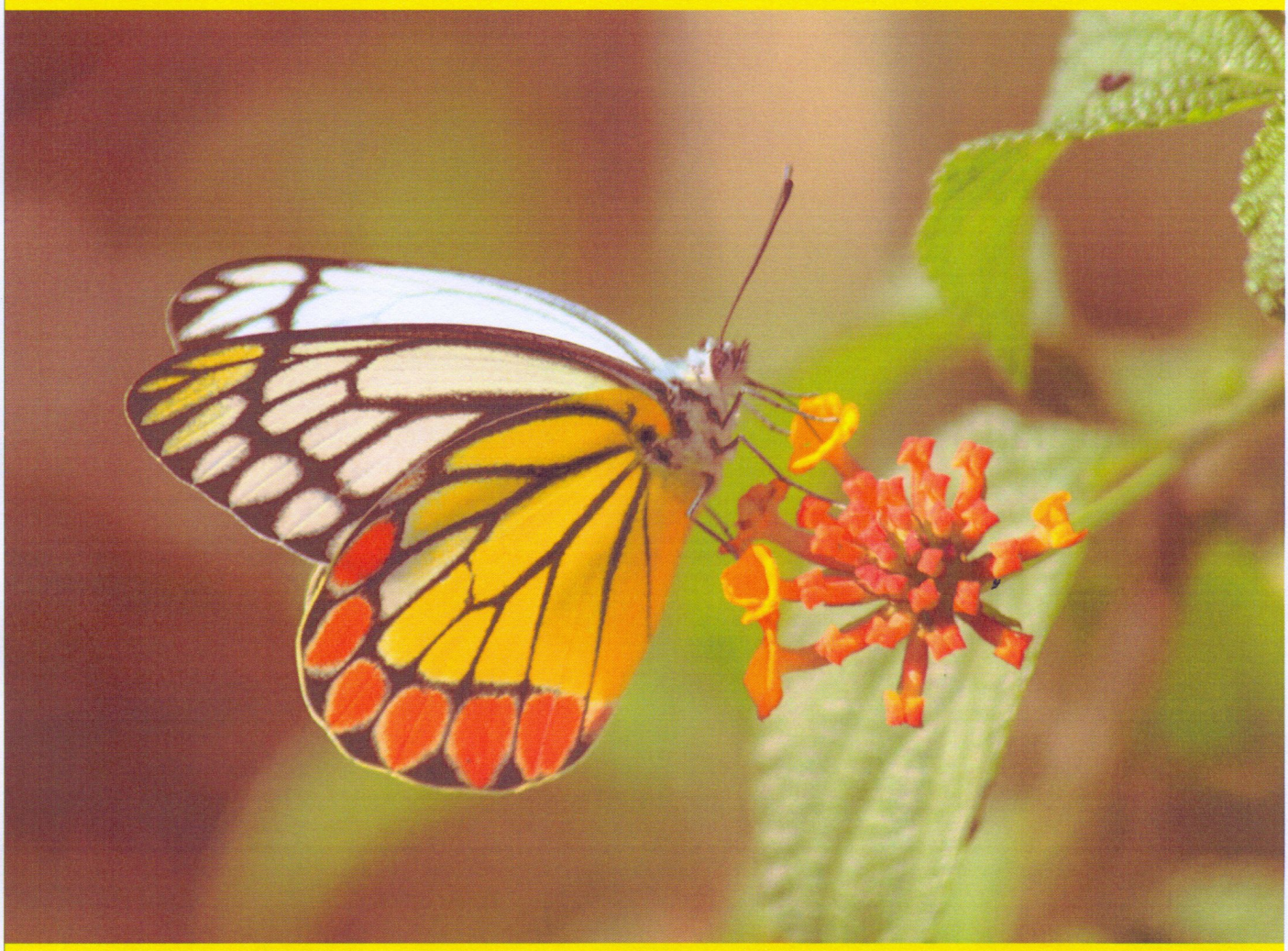
FIELD FORESTER

VOICES FROM THE FIELD



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FOREST PRODUCTIVITY

Rubber Growing Soils of Bishalgrah Block, Sepahijala District, Tripura: Their Characteristics, Suitability and Management

S.K. REZA[†,*], S. BANDYOPADHYAY[†], P. RAY[#], S. RAMACHANDRAN[#], S. MUKHOPADHYAY[†], K.D. SAH[†], D.C. NAYAK[†], S.K. SINGH[^] AND S.K. RAY[#]

[†]*ICAR-National Bureau of Soil Survey and Land Use Planning, Salt Lake, Kolkata, West Bengal;* [#]*ICAR-National Bureau of Soil Survey and Land Use Planning, Jamuguri Road, Jorhat, Assam;* [^]*ICAR-National Bureau of Soil Survey and Land Use Planning, Nagpur, Maharashtra.*

**E-mail: reza_ssac@yahoo.co.in*

Inappropriate agricultural practices, overgrazing and indiscriminate deforestation cause soil degradation which results decline in soil fertility, productivity and soil quality besides environmental hazards

INTRODUCTION

Planting rubber is one of the management practices in north-east India to replace shifting cultivation and control land degradation, produce natural rubber and generate income, and improve site quality. The state of Tripura has been under rubber plantation on denuded forest lands since 1975. Consequently, a large portion of the degraded tropical rain forests is under rubber plantations, even though the climate and other conditions are not always favorable.

Tripura Forest Development and Plantation Corporation Limited (TFDPCL) adopted rehabilitation of degraded forestland through commercial rubber plantations on 7087 ha area as its primary objective along with sustainable rehabilitation of tribal shifting cultivators in the state of Tripura. The Corporation is a pioneer in developing successful models for permanent settlement of tribal shifting cultivators through rubber cultivation by providing each family one ha of Rubber plantation for latex extraction. TFDPCL organized resettlement of more than 1133 scheduled tribe families and 70 scheduled caste families under different schemes and projects and creating employment for around 3585 people directly and to an almost equal number indirectly.

Soils are indispensable resources but their multipurpose use and continuous exploitation have serious impacts on the ecology of a particular region. Information of the soil with respect to its genesis, characteristics, classification, extent of distribution, potentials and problems is imperative for any developmental planning in a specific area. Hilly soils are very prone to

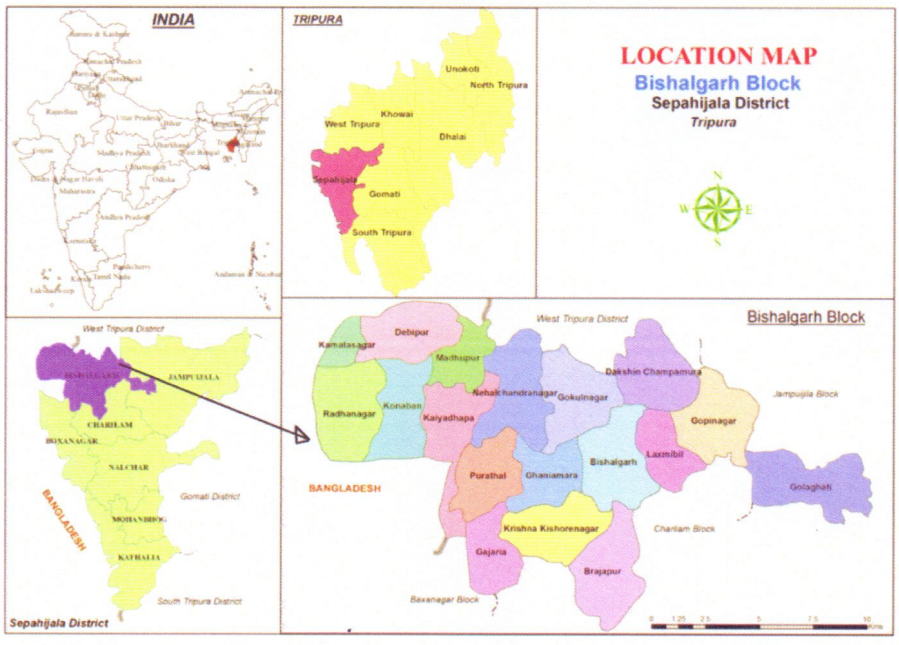
degradation and pose a serious threat to agricultural productivity. Inappropriate agricultural practices, overgrazing and indiscriminate deforestation cause soil degradation which results decline in soil fertility, productivity and soil quality besides environmental hazards (Blum 1997). Inaccessibility, fragility, marginality, heterogeneity, natural instability and human adoption mechanism are the key factors to be focused for sustainable agricultural development in such areas. The present study was undertaken to characterize the soils of rubber growing area and to evaluate the suitability of rubber and their management in Bishalgarh block, Sepahijala district, Tripura.

Study Area

The study was carried out in Bishalgarh block of Sepahijala district, Tripura, India (23°36'51-23°45'02 N, 91°08'58-91°23'00 E) covering an area of 170.51 km^2. The area is characterized by humid subtropical climate with annual mean maximum temperature is 36ºC and annual mean minimum temperature is 7ºC. Mean annual rainfall is 2340 mm and about 85% of rainfall is from south-west monsoon. Geomorphologically, the study area represents undulating topography (325% slope). The rocks are sandstone, siltstone and shale grading into clay. These rock types are repeated as layers one above the other. Depending on their characters and the presence of fossils, these sedimentary rock sequences are divided into Surma group (the oldest), Tipam group and the Dupitila group (the youngest).

Methodology

The IRS-R2 LISS-IV satellite data of 06 January 2015 was interpreted to delineate the landform units and land use/land cover. Soils of different landforms and land use/land cover were studied in the field in respect of their morphological properties by digging profiles. Soil samples of each horizon of representative pedons were



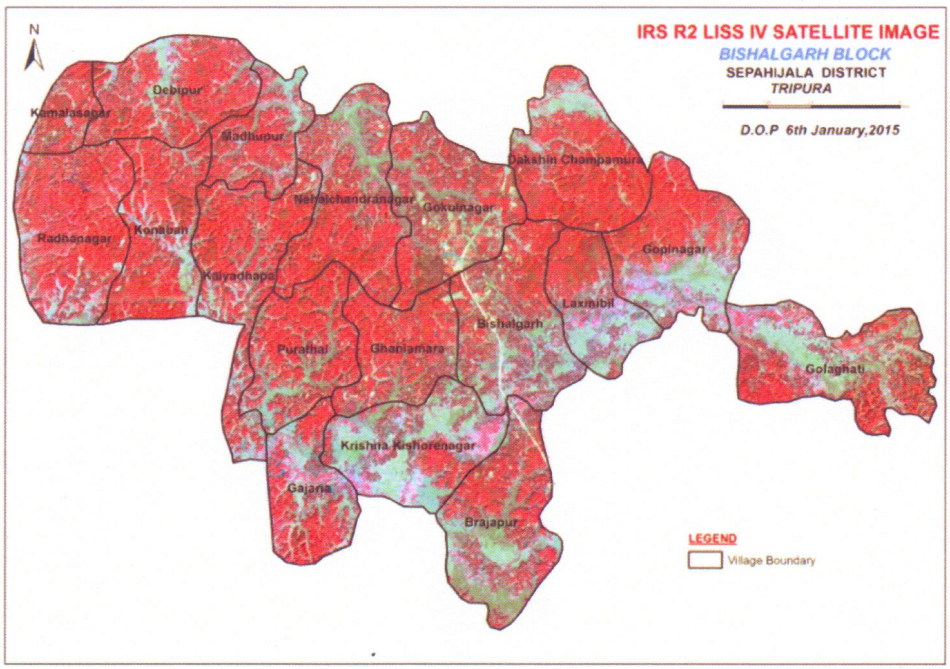
collected, processed (<2 mm) and analysed for important physicochemical properties using standard procedures.

Characteristics of soils

Soils at the study sites are Ultisols which developed on tertiary hill sediments of unconsolidated beds of sedimentary rocks. They are sandy clay loam/clay loam in texture. Accelerated erosion accounted for a substantial loss of silt, clay and organic matter from upland areas, which, in turn, were deposited in the valleys. Induced leaching and surface runoff of basic cation have caused the soils to become strongly acidic over time. Some basic properties of surface soils were Bulk Density (BD) 1.551.67 Mg m^3, pH 4.0-4.6, sand 29.060.3%, silt 14.930.6%, clay 24.940.4%, OC 0.630.92%, exchangeable Al^{3+} 1.53.1 cmol (p^+) kg^1, CEC 5.0-9.0 cmol (p^+) kg^1 and base saturation 37-45%. The characteristics of the sub surface soils were BD 1.401.67 Mg m^3, pH 4.4-5.3, sand 20.146.6%, silt 14.233.3%, clay 17.049.3%, OC 0.240.81%, exchangeable Al^{3+} 3.64.0 cmol (p^+) kg^1, CEC 4.2-8.9 cmol (p^+) kg^1 and base saturation 19-46.8%.

Sedimentary rocks (siltstone and shale) which range in age from Miocene to loosely consolidated sediments of recent age in Bishalgarh block

Rubber is grown in both the traditional and non-traditional areas experiencing high rainfall. It thrives well under acid environment in the soil. The optimum pH for rubber is reported



Landscape and soil pedons of Rubber growing soils

to be in the range of 4 to 6.5 and it can tolerate up to the pH of 3.8 at the low and 7.0 at the higher side. Rubber is grown in soils with a wide range of CEC. While CEC of 2-16 cmol (p^+) kg^{-1} is reported in Malaysia. It ranges from 3.5-18 cmol (p^+) kg^{-1} in soils under rubber in India. On an average organic matter contents of 0.7 to 1.0% and more than 1.0% have been found to be slight to no limitation for rubber plantation. The slow rate of oxidation inside the closed canopy of rubber plantation helps to maintain high organic matter status in the later stage.

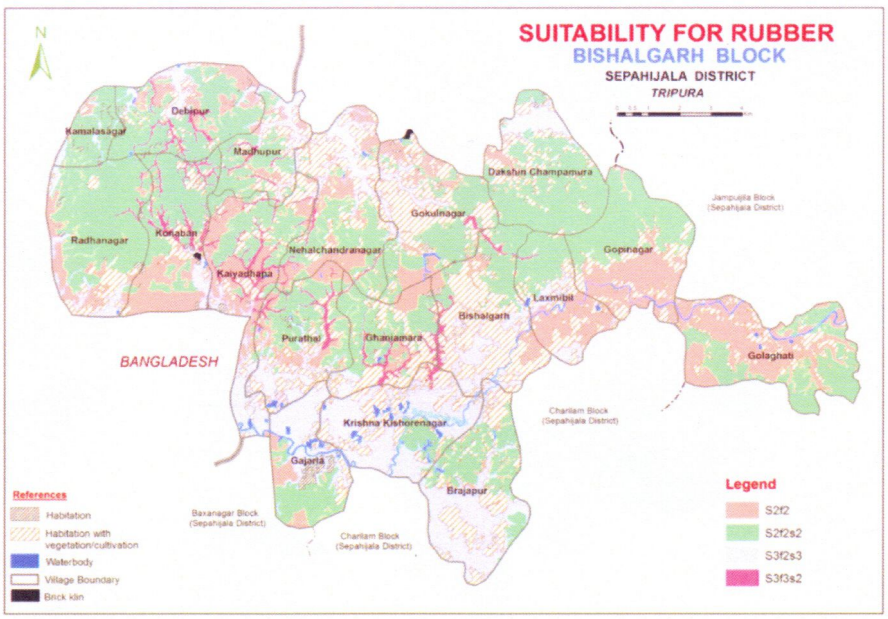
Suitability of Rubber

Soil suitability for rubber in Bishalgarh block, Sepahijala district, Tripura was worked out in two steps. In the first step suitability criteria for rubber crop was evolved with the help of existing literature with special reference to north-eastern region of India. Emphasis was placed on land characteristics or land qualities, *e.g.* climate, soil, *etc.* which determine the limitations. In the second step, the defined suitabilities were superimposed on soil maps according to the map legend (soil composition) to prepare a relative suitability map for rubber in Bishalgarh block, Sepahijala district, Tripura.

The evaluated suitability of rubber showed that 56.50% TGA of the block is moderately suitable in moderately sloping (510% slope) to steeply sloping (1525% slope) with high KCl-Al. whereas, 16.71% TGA is marginally suitable due to water stagnation in valley lands.

Management

The yield of rubber and the income of rubber growers in the block may be increased by adaptation of following management strategies:



- Rubber plantation with application of recommended dose of NPK fertilizer in two equal splits.
- Amelioration of soil acidity with application of 200250 kg lime ha^{1} in furrows.
- Use of biofertilizers particularly phosphate solubilizing micro-organisms.
- Use of manures to reduce the adverse effect of soil acidity (particularly high Al) which would also improve the soil health.
- Use of specific management practices like mulching, ridge and furrow system, *etc.* which can help in conserving soil moisture for *rabi* crop.

CONCLUSIONS

From this study it is concluded that Bishalgarh block showed that rubber was moderately suitable in the undulating plains and uplands without forests. It is therefore, recommended that the marginal lands may be useful for growing rubber subject to their availability.

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