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## PLANT ECOLOGY IN INDIA\*

ECOLOGY is everywhere a relatively new science. In view of the complexity of our vegetation and the transformations it has undergone through human occupation for some 5,000 years, our progress in ecological studies is perhaps not as great as in some of the Western countries. Complex and varied as our forest types are, they nevertheless present over the greater part of the country a remarkable integrity and similarity. The bulk of the vegetation of India is of a tropical character, conditioned by a monsoon climate in which the severity of high summer temperatures is mitigated by the onset of the rainy season. While the similarity of the tropical vegetational types in the north and the south in structure and composition is striking—certain species of *Anogeissus*, *Acacia* and *Terminalia* exhibiting a

wide range in both regions—there are, as may be expected, considerable differences in detail. The chief characteristic of tropical vegetation is the multiplicity of the constituent species, composed of grasses, herbs, shrubs, climbers and trees. The tropical evergreen forest presents a picture of a three-dimensional almost solid block of vegetation packed with herbs, shrubs, leaves and trees arranged in several storeys.

Tropical forests are essentially mixed forests. The variations in detailed composition are therefore far greater than is the case in temperate forests, where the number of species is smaller and the vegetation quite frequently assumes a more or less pure character. Add to this the fact, that except in the Eastern Himalayas, biotic influences have been at work for centuries and there is hardly any sizable block of vegetation now left in an undisturbed condition.

\* Summary of Presidential Address by Sri. C. R. Ranganathan to the Indian Botanical Society Session held at Paroda.

The pursuit of ecological studies is therefore one of peculiar difficulty. Since the eco-system includes plants, higher animals including man, insects, micro-organisms in the soil, the soil itself, and the climatological factors, a proper appreciation of the causal factors at play depends on a working knowledge of many different aspects of the physical and biological sciences.

Some part of the difficulty in the study of plant ecology derives from the obvious but not always remembered fact that plants function in two media, the air and the soil. Being literally rooted in the soil and incapable of locomotion, they are fully subject to the annual cycle of climatic and atmospheric influences. These influences are modified by their community life and by the formation of a canopy, leading to the creation of a micro-climate. Climatic and atmospheric influences, such as rainfall, temperature, humidity, wind pressure, intensity of solar radiation, etc., are relatively easy to measure. This fact taken with the fact that light, heat and water are the chief determinants of plant growth has weighted the scales in favour of systems of classification based on sub-aerial factors. Since the nature of the soil itself is largely conditioned by the climate, these systems based on climate have worked very well. There are gaps in our knowledge of the climatic data relating to many parts of India. Meteorological coverage of the country is still very far from being full. Micro-climatic data under various types of forest cover are practically non-existent. These matters require to be attended to before any great advances can be made in the detailed classification of forest types.

In this connection, it must be stressed that a considerable part of the plant is underground. Any study of the factors influencing vegetation cannot be complete without a study of the soil supporting the vegetation. This is especially so because the reactions of vegetation on the soil factors are in general more profound than those on the atmospheric factors. Vegetation affects considerably the physics, chemistry and biology of the soil. These reactions are of particular importance in relation to the suitability or otherwise of the conditions for natural reproduction.

The difficulties involved in soil studies are obvious. Firstly the ramifications of the plants underground are hidden from view and the behaviour of the plants in response to changes in soil conditions cannot be directly observed. Secondly, experience has shown that while

chemical analyses of soil may throw light on the chemical nature of the soil and its special features or pronounced deficiencies in plant nutrients, they are rarely specific enough to account for local variations in the vegetation or to throw light on problems of natural reproduction. Chemical analyses are, moreover, expensive and time-consuming. pH determinations, foliar analyses and the like are frequently of limited interpretative value when viewed in isolation without reference to successional changes and do not furnish a reliable diagnostic of vegetational variations.

If the view is accepted that, so far as natural vegetation is concerned, it is the climate which paints the broad lines of the picture, while the soil fills in the details, we are still a long way from understanding exactly how the soil fulfils its role. In agriculture we can to a considerable extent influence the physical nature and chemical composition of the soil by tillage and fertilization techniques. But these measures are not available in forestry practice, except to a limited extent in nurseries and plantations. The fact that a particular soil can be artificially conditioned to grow a particular crop, whether agricultural or silvicultural, does not, however, provide an explanation for the absence over a given site of a particular constituent of the vegetational type which may be common or abundant in the same type elsewhere. It appears that our knowledge of our soils, especially of the factors which correlate them to the vegetation on them, is very imperfect. The soil is not a mere physico-chemical medium; it is also a biological medium. It may be that when we have a better understanding of the microbiology of our soils, we shall be in a better position to appreciate its role as a determinant of the flora.

The setting up of a composite organization for the promotion of ecological studies is therefore worth our serious consideration. If it is agreed that such an organisation should be created, it may have to include specialists in forestry, botany, zoology, meteorology, soil science including soil microbiology, soil conservation, agronomy and agrostology. Representation should be given to institutions dealing with applied research in these sciences, as well as to associations of scientists and the universities. Working out the details of the composition and functions of the proposed organization may well be the first step for setting ecological studies in our country on a sure foundation.