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AGRO-ECOLOGICAL ZONING FOR YIELD PREDICTION FROM RUBBER PLANTATIONS IN INDIA

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Explanatory crop growth simulation models, constructed on the underlying physiological processes such as CO_2 assimilation and respiration as influenced by environmental factors, can be used to predict different levels of production classified on the basis of various stresses. Agro-ecological zoning of different parts of India for yield of rubber was carried out under rainfed conditions through simulation in different environments, without accounting for stresses due to nutrients, pests and diseases but taking into consideration standard loss of trees in the life cycle of the crop due to natural damage. Mean yield during the first 20 years of tapping has been simulated under specific assumptions for 27 locations, spread all over the traditional/non-traditional rubber cultivating regions of India. The commercial yield data of the clone RRIM 600 was used for the validation of the simulated yield. The yield per hectare ranged from 500 kg at Nellore in Andhra Pradesh to 1427 kg at Trivandrum in Kerala. Wide variations have been observed in the simulated yield among locations in non-traditional areas. On the basis of the predicted yield, the non-traditional areas were classified into high, medium and low productivity zones. The Andaman-Minicoy islands and locations in North East India are under the high productivity zone. The medium zone consists of locations in Karnataka, Goa, Maharashtra, Orissa and West Bengal. Nellore, Kakinada and Visakhapatnam are grouped under the low productivity zone. The rainfed rubber yield decreased with increase in latitude in the West Coast and its reverse is observed in the East Coast and North East India.

Key words: Agro-ecological zoning, Crop simulation model, *Hevea*, Yield prediction.

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INTRODUCTION

Plant growth and productivity are determined by a complex interaction of different genetic and environmental factors. The interrelationships among the biological and non-biological variables can be analysed through descriptive and explanatory crop models. Descriptive models are simple representations of the crop system in the form of mathematical regression equations based on empirical data. However, explanatory models, also known as mechanistic models, analyse crop growth on the basis of the underlying processes such as CO_2 assimilation and respiration as influenced by environmental factors. Growth and yield can be predicted for different production levels classified on a physiological basis as limited by weather, water, nutrients and pests and diseases (de Wit and Penning de Vries, 1982; Penning de Vries and van Laar, 1982). Along with the limiting factors, crop models include variables related to dry matter production, leaf area growth and phenological development. Crop growth simulation models are increasingly being used to support research and extension in agriculture (Penning de Vries *et al.*, 1989). The dynamism of crop simulation models in terms of predicting responses to different environments, situations and limiting factors led to their wider application in agroclimatic zonation and in studies related to the impact of infestation of pests and diseases, water