Mitigating the impact of climate uncertainties on rubber cultivation in traditional rubber growing regions of India

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The impact of climate change on agriculture varies with crop, region and cultivation techniques. Variabilities in local weather rather than global climate patterns are more relevant in determining the impact of weather events on crop production. One of the widely predicted and observed effects of climate change, which has direct impact on agricultural productivity, is the changes in precipitation regimes with more precipitation deficits during summer season. Rising temperature and uncertainties in weather events such as unexpected dry spell during rainy season with hot and bright sunshine hours are some of the other manifestations of climate change.

The impact of uncertain weather pattern will be more pronounced during the establishment and early growth of young rubber plants. Traditionally monsoon season is the ideal planting season of rubber in India. In recent years, uncertainty in rainfall and other weather factors is making the scheduling of various farm operations like planting difficult even in traditional rubber growing regions. In field surveys it was observed that casualty immediately after planting was higher in years which experienced unexpected dry spells and bright sunny days with warm temperature during the monsoon season, even though soil moisture was sufficient (Jessy *et al.*, 2010). These changes in weather pattern may or may not be related to global climate change. However, new management strategies to mitigate the resulting adverse effects should be developed. Soil moisture conservation alone is not sufficient and the possibility of enhancing the ability of plants to tide over transient drought need to be explored.

We attempted nutritional manipulation to enhance the ability of young plants to tide over transient drought in a glass house study. Silicon (Si), potassium (K). and a combination of both were tried with and without water stress. Chlorophyll content index (CCI) and leaf

water potential (LWP) were significantly higher in water stressed plants supplied with Si, K and Si + K compared to unirrigated control. After imposing water stress for 35 days, all the plants were irrigated uniformly and K supplemented plants recouped at a faster rate and showed a better survival percentage. Under short dry spell both Si and K were effective in reducing the adverse effects of drought stress, however, under prolonged water stress, K was more effective than Si (Prasannakumari *et al.*,) This will be an important management strategy to address transient drought of young plants immediately after planting.

Increasing temperature and deficient soil moisture are major concerns for survival of young rubber plants during summer. In a survey conducted in Kerala in South India, it was observed that in addition to the recommended management practices like mulching and shading, life saving irrigation is increasingly being practiced. During the summer of 2010, in almost 18 percent of the holdings where planting was taken up in 2009, rubber plants were irrigated (Jessy *et al.*, 2010). Life saving irrigation was hitherto an unusual practice in the traditional rubber growing regions to tide over drought and the increasing adoption of life saving irrigation indicates the changing behaviour of growers in response to climate change.

A field experiment was conducted in a comparatively drought prone area of Kerala. to find out whether additional moisture conservation measures such as blocking of capillary pores by tillage have beneficial effect on soil moisture conservation and growth of plans. Tillage at the end of rainy season enhanced soil moisture content significantly during summer compared to untilled control with mulching. The growth of plants was significantly superior to that of control and was on par with that of plants with life saving irrigation. The extent of casualty was 4 per cent in the control whereas there were no vacancies in the other two treatments after summer. The data indicated that additional measures to conserve soil moisture will help to enhance growth of young rubber plants and reduce casualty. Both tillage and life saving irrigation were found effective; however, tillage is a more economic and feasible management practice (Jessy *et al.*, 2010).

Rubber trees are either leafless or with emerging leaves during the beginning of the summer and sunlight falls directly on ground during this period reducing soil moisture content. In field studies it was observed that retaining undergrowth of weeds/ intercrops significantly enhanced soil moisture status during summer and reduced. Summer depression of yield. This

could be an important management strategy to reduce the impact of increasing drought on rubber cultivation.

The current agronomic practices followed in rubber cultivation may be inappropriate and inadequate to meet the challenges of future climate. Weather uncertainties may become more adverse in future and further scientific management techniques should be developed to address such eventualities.

Soil moisture status during summer (%)

Treatments	January			February		
	0-15 cm	15-30 cm	30-60 cm	0-15 cm	15-30 cm	30-60 cm
Control	10.74	14.65	15.65	10.44	13.68	16.05
Tillage	12.98*	16.47*	18.69*	13.67*	15.12*	17.04*

Diameter of plants (mm)

	April
Control	18.34
Tillage	19.81*
Life saving irrigation	19.72*

Influence of tillage and life saving irrigation on extent of casualty

Treatment	Casualty at the end of summer (%)
Control	4
Tillage during October	Nil
Life saving irrigation	Nil

Economics

Labour requirement for tilling the base of 100 plants- 4