EXTENT OF ADOPTION OF RECOMMENDED MANURING PRACTICES FOR RUBBER IN SOUTH INDIA

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A survey was undertaken during 2013 in the rubber growing tract of South India *viz*. Kerala, Tamil Nadu, Karnataka, Goa and Maharashtra to understand the extent of adoption of recommended manuring practices by rubber growers and to identify areas which need further intervention. Data obtained from the survey were digitized and information on manuring practices were retrieved. Majority of the rubber growers applied organic manures along with chemical fertilizers, which is a very desirable practice to improve soil fertility, and this practice is more prevalent in the northern regions of the traditional rubber growing tract. Though mixtures and complex fertilizers are costlier than straight fertilizers, irrespective of the region, farmers preferred fertilizer mixtures, may be due to the ease of handling. Though it is recommended that deep pocket placement of fertilizers should be avoided, many rubber farmers are still applying fertilizers by taking small pits which shows the need for renewed extension efforts generate awareness. Regarding frequency of fertilizer application for mature rubber, 68 to 91 per cent of the farmers followed the recommended practice of applying fertilizers twice in a year. The study identified that type of fertilizers and method of fertilizer application were the two major areas which needed extension focus to enhance fertilizer use efficiency in rubber plantations.

Key words: Extent of adoption, *Hevea brasiliensis,* Manuring practices, Natural rubber

Rubber *(Hevea brasiliensis*) was introduced in India in 1873, and since then, there has been rapid increase in the spread of this crop in Kerala, Tamil Nadu, Karnataka, Konkan region and also in the North-eastern region. Agro-management of rubber cultivation has experienced many changes and productivity of rubber has registered phenomenal increase from 300 to 1800 kg $ha^{-1}year^{-1}$ (Jacob and Siju, 2017). Besides genetic improvement of planting materials, proper soil and fertilizer management also have a significant effect in achieving these yield levels. Rubber Research Institute of India has been working closely with Rubber Production Department of Rubber Board and other stake holders to disseminate improved agro-technologies to rubber farmers and improve the adoption of these technologies.

The rubber plantation industry in India is dominated by small holdings, accounting for 90 per cent of the total area and 94 per

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cent of the total production (Annual Report 2013-14). Rubber Board has undertaken strong extension activities to train the farmers in scientific methods of rubber cultivation and utmost importance was given to nutrient management with an objective to ensure growth and yield and sustain soil fertility. RRII has provided general fertilizer recommendations for rubber of various age groups and offered discriminatory fertilizer recommendations based on soil and leaf testing, for more efficient nutrient management (Karthikakuttyamma *et al.*, 2000). Rubber farmers, in general, are educated and are aware of the scientific methods of farming. However, an understanding of the extent of adoption of the recommended practices by growers is important to identify areas which need further intervention. The present investigation was undertaken to understand how far the farmer's practices of manuring rubber conform to the recommended practices in the rubber growing areas of South India.

The data for the study was obtained by conducting a sample survey during 2013 in estates and small holdings in the rubber growing regions of Kerala, Tamil Nadu, Karnataka, Goa and Maharashtra along with soil sample collection for the major project on soil fertility mapping and soil health monitoring of rubber growing soils of South India. A total of 10,760 holdings were surveyed, out of which 80 per cent were mature plantations and 20 per cent were immature plantations. A detailed questionnaire was prepared including queries on all agro-management practices, and filled up by scientists or technical officers by interviewing the farmers. Data was collected based on stratified sampling with Neyman allocation method (Neyman, 1934). In this large sample survey, the number of samples taken for each aspect was different so as to eliminate the effect of missing data and to improve accuracy. The filled up questionnaires were digitized to create an electronic data base. Information on manuring practices in different regions was retrieved from this database, and the level of adoption of each manuring practice was expressed in per cent.

The total surveyed area in Kerala was divided into four agro-climatic zones, *viz*. South (Thiruvananthapuram, Kollam and Pathanamthitta districts), Central (Kottayam, Eranakulam, Idukki, and Alappuzha districts), North central (Trissur and Palakkad districts) and North (Malappuram, Kozhikode, Kannur, Kasaragod and Wayanad districts) as per Pushpadas and Karthikakuttyamma, (1980). Rubber growing districts of Karnataka (Dakshin Kannada, Uduppi, Shimoga and Coorg districts) were considered as one region and rubber growing areas of Goa and Maharashtra were combined together and Kanyakumari district of Tamil Nadu was considered separately.

Percentage of farmers applying only chemical fertilizers for immature rubber ranged from 25 in North zone of Kerala to 80 in Kanyakumari district of Tamil Nadu (Table 1). Percentage of farmers applying organic manures along with chemical fertilizers for immature rubber ranged from 18 in Kanyakumari to 61 in the North zone of Kerala. Percentage of farmers applying only organic manures for immature rubber ranged from five in South zone to 13 in North zone of Kerala. Percentage of farmers who did not apply either chemical fertilizer or organic manure even in the immature phase ranged from one in North zone to six in North central zone of Kerala.

Similar trend was observed for fertilizer use in mature phase also (Table 2). Percentage of farmers applying only chemical fertilizers for mature rubber ranged from 22 in North

Table 1. **Source of nutrients applied during immature phase of rubber**

State	Zones/Districts	Source of nutrients			
		Chemical fertilizer alone	Chemical fertilizer + organic manure	Organic manure alone	No fertilizer / manure
		Per cent of farmers			
Kerala	South zone (518)	60	30	5	5
	Central zone (770)	33	54	8	5
	North-central zone (131)	30	52	12	6
	North zone (529)	25	61	13	1
Tamil Nadu	Kanyakumari (60)	80	18	-	2
Karnataka	Dakshin Kannada, Uduppi, Shimoga and Coorg (108)	62	28	7	3
Goa and Maharashtra	Sindhu durg, South Goa, North Goa (50)	36	52	10	2

Figures in parenthesis are the number of growers surveyed

Table 2. **Source of nutrients applied during mature phase of rubber**

State	Zones/Districts	Source of nutrients			
		Chemical fertilizer alone	Chemical fertilizer + organic manure	Organic manure alone	No fertilizer / manure
		Per cent of farmers			
Kerala	South zone (1776)	66	27	3	4
	Central zone (3140)	37	48	10	5
	North-central zone (605)	22	63	9	6
	North zone (2121)	28	61	9	2
Tamil Nadu	Kanyakumari dist. (233)	84	6	2	8
Karnataka	Dakshin Kannada, Uduppi, Shimoga and Coorg (306)	52	34	4	10
Goa and Maharashtra	Sindhu durg, South Goa and North Goa (23)	30	52	9	9

Figures in parenthesis are the number of growers surveyed

central zone of Kerala to 84 in Kanyakumari district of Tamil Nadu, and this practice is more prevalent in the South zone of Kerala and in rubber growing areas of Karnataka state. Percentage of farmers who applied organic manures along with chemical fertilizers for mature rubber ranged from six in Kanyakumari district of Tamil Nadu to 63 in North-central region of Kerala. Percentage of farmers who applied only organic manures for mature rubber ranged from two in Kanyakumari to 11 in Central zone of

Kerala. As in the case of immature rubber, only organic manuring and application of organic manures along with chemical fertilizers for mature rubber was more prevalent in the Central, North-central and North zones of Kerala and in Goa-Maharashtra region. Percentage of farmers who cultivated mature rubber without applying any fertilizer ranged from two in North zone of Kerala to 10 in Karnataka.

Though organic farming is a recommended practice in plantation crops such as tea, coffee, cocoa and cardamom, it is not given much importance in rubber which is an industrial raw material. Also, large quantity of biomass is annually recycled in rubber plantations through litter which maintains the organic carbon content of soil (Philip *et al*., 2003). Soil fertility evaluation and mapping of rubber growing regions in the traditional belt of rubber cultivation showed that organic carbon status of rubber growing soils, in general, is in the high or very high range. Farmers are advised to apply organic manure at the time of planting as basal dose and later only if the soil organic carbon status is low. But the data shows that many rubber growers practice combination of organic manure and chemical fertilizers which is reported to improve growth of rubber and soil fertility status (Philip *et al.*, 2012).

Data on form of chemical fertilizers used in rubber (immature and mature) plantations is shown in Table 3. Percentage of farmers applying straight fertilizers ranged from three in Kanyakumari district of Tamil Nadu to 31 in rubber growing regions of Karnataka. Percentage of farmers using fertilizer mixtures ranged from 41 in North-central zone of Kerala to 73 in South zone of Kerala. Percentage of farmers applying complex fertilizers ranged from eight in Karnataka to 40 in North-central zone of Kerala. Though fetilizer mixtures and complex fertilizers are costlier than straight fertilizers, irrespective of the region, farmers preferred these may be due to the ease of handling. Earlier, Rubber Board also promoted the use of fertilizer mixture, due to the ease of handling. But with an objective of reducing the cost of

Table 3. **Form of chemical fertilizers applied in rubber plantations**

State	Zones/Districts	Form of chemical fertilizer used		
		Straight fertilizer	Fertilizer mixture	Complex fertilizer
		Per cent of farmers		
Kerala	South zone (1182)	9	73	18
	Central zone (2003)	16	57	27
	North-central zone (542)	19	41	40
	North zone (1819)	13	66	21
Tamil Nadu	Kanyakumari (210)	3	72	25
Karnataka	Dakshin Kannada, Uduppi, Shimoga and Coorg (281)	31	61	8
Goa and Maharashtra	Sindhu durg, South Goa and North Goa (14)	29	71	-

Figures in parenthesis are the number of growers surveyed

Table 4. **Method and frequency of fertilizer application in mature phase**

State	Zones/Districts	Method		Frequency	
		Application in pits	Broadcasting	Once in a year	Twice in a year
		Per cent of farmers			
Kerala	South zone (1641)	58	42	13	87
	Central (2640)	39	61	32	68
	North-central zone (513)	25	75	22	78
	North zone (1883)	64	36	31	69
Tamil Nadu	Kanyakumari (210)	67	33	10	90
Karnataka	Dakshin Kannada, Uduppi, Shimoga and Coorg (262)	27	73	22	78
Goa and Maharashtra	Sindhu durg, South Goa and North Goa (21)	63	37	9	91

Figures in parenthesis are the number of growers surveyed

cultivation, use of straight fertilizers is being recommended now. It was observed that a higher percentage of farmers in Karnataka, Goa and Maharashtra preferred to use straight fertilizers (31 and 29%, respectively).

Method and frequency of fertilizer application for mature rubber, followed by farmers over different zones / regions is shown in Table 4. Percentage of farmers applying fertilizers by taking small pits in mature rubber ranged from 25 in North-central zone of Kerala to 67 in Kanyakumari district of Tamil Nadu. Percentage of farmers who applied fertilizers by broadcasting in the inter-row area ranged from 33 in Kanyakumari district of Tamil Nadu to 75 in North-central zone of Kerala. Recommended method of fertilizer application in mature rubber plantations is broadcasting in square or rectangular patches in between four trees followed by gentle forking / broadcasting in the inter-row areas (Karthikakuttyamma *et al*., 2000). It is also recommended that deep pocket placement of fertilizers should be avoided. Feeder roots of rubber are concentrated in the surface soil layer and 55 per cent of roots are concentrated in the top 10 cm soil layer (George *et al*., 2009; Jessy *et al*., 2007). Data showed that many rubber farmers are still applying fertilizers in pits which is not advisable. Regarding frequency of fertilizer application, majority of the farmers (68 to 91%) followed the recommended practice of applying fertilizers twice in a year and nine to 32 per cent farmers applied only once in a year.

Data obtained from the survey conducted in the rubber growing regions of Kerala, Tamil Nadu, Karnataka, Goa and Maharashtra showed that majority of the rubber growers applied organic manures along with chemical fertilizers, which is a very desirable practice to improve soil fertility, and this practice is more prevalent in the northern regions of the traditional rubber growing tract. A small percentage of farmers cultivated rubber without applying any fertilizer/manure during immature and mature phases. Majority of the farmers preferred mixtures or complex fertilizers compared to straight fertilizers. It is evident that many rubber farmers are still

applying fertilizers in pits which is not a recommended practice and shows the need for renewed extension activities to generate awareness. The study identified type of fertilizers and method of fertilizer application as the major areas which need strong extension efforts to enhance the fertilizer use efficiency.

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REFERENCES

Philip, A., Philip, V., Geoge, E.S., Punnoose, K.I. and Mathew, M. (2003). Leaf litter decomposition and nutrient release in a fifteen year old rubber plantation. *Indian Journal of Natural Rubber Research*, **16**(1&2): 81-84.

Philip, A., Varghese, M., Syamala, V.K., Joseph, K., Jessy, M.D. and Nair, N.U. (2012). Integrating organic manure to reduce chemical fertilizer input and enhance growth in young rubber plantations. *Journal of Plantation Crops*, **40**(3): 158-162.

Price stabilization fund trust, Annual Report (2013-14). Department of Commerce, Ministry of Commerce & Industry, Government of India.

George, S., Suresh, P.R, Wahid, P.A., Nair, R.B. and Punnoose, K.I. (2009). Active root distribution pattern of *Hevea brasiliensis* determined by radioassay of latex serum. *Agroforestry Systems*, **76**: 275-281.

Jacob, J. and Siju, T. (2017). Increment economic worth of the first high yielding Indian hybrid clone, RRII 105 over RRIM, 600. *Rubber Science*, **30**(3): 193-200.

Jessy, M.D., Meerabai, M., Nair, A.N.S. and Meti, S. (2007). Adaptability of low soil phosphorus in rubber trees *(Hevea brasiliensis)*. Role of roots and arbuscular micorrhizal fungi. *Journal of Plantation Crops*, **35**(3): 133-138.

Karthikakuttyamma, M., Joseph, M. and Nair, A.N.S. (2000). Soils and nutrition. In: *Natural Rubber: Agromanagement and Crop Processing*, (Eds: P.J. George and C. Kuruvilla Jacob), Rubber Research Institute of India, Kottayam, pp. 170-198.

Neyman, J. (1934). On the two different aspects of the representative method: The method of stratified sampling and the method of purposive selection. *Journal of the Royal Statistical Society*, **9**(4): 558-625.

Pushpadas, M.V. and Karthikakuttyamma, M. (1980). Agro-ecological requirements. In: *Handbook of Natural Rubber Production in India* (Ed. P.N.R. Pillay), Rubber Research Institute of India, Kottayam, pp. 87-109.