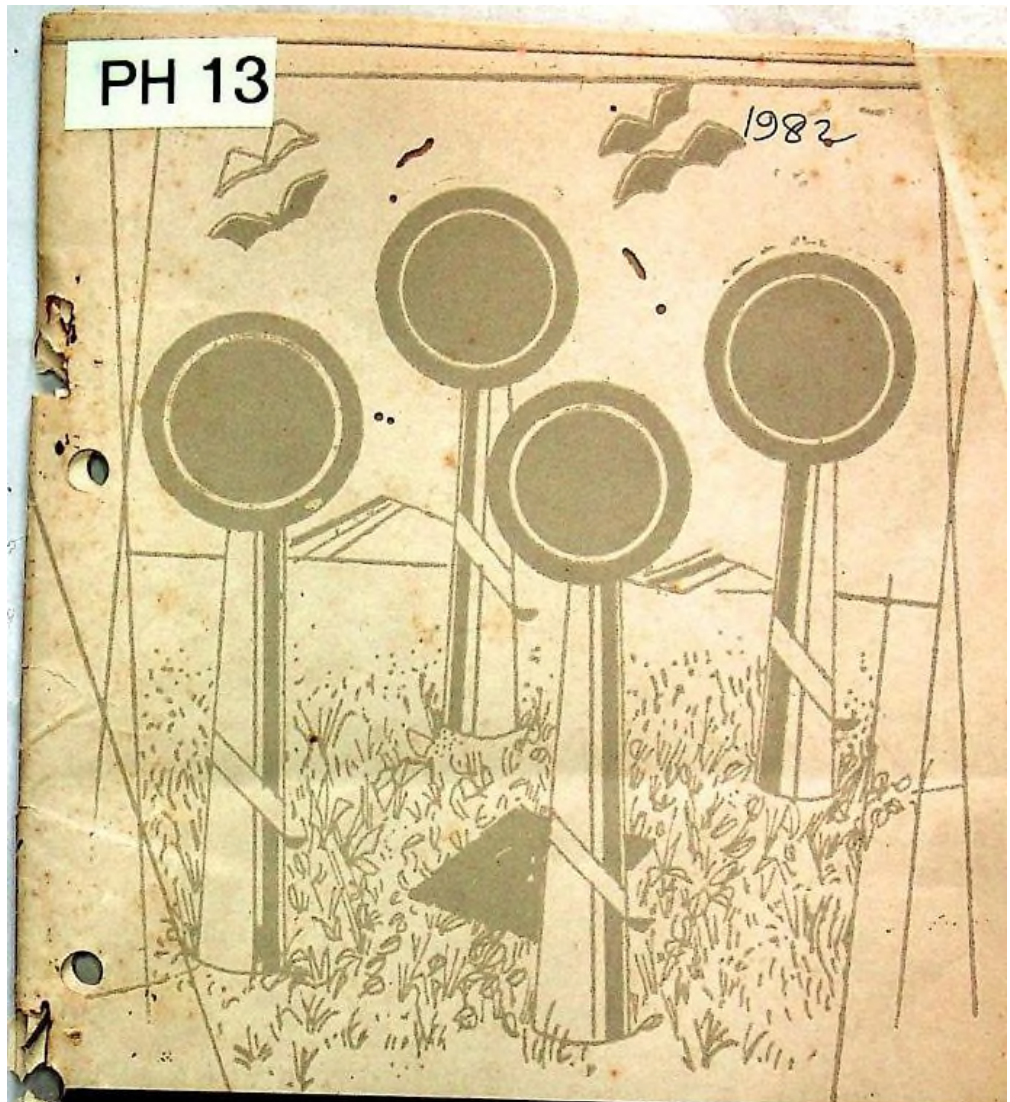


MANURING OF RUBBER

Manuring of Rubber

Rubber, like other plants, requires all the essential nutrient elements in adequate quantities for satisfactory growth and yield. An element qualifies for the status of an essential nutrient when (i) its deficiency makes it impossible for the plant to complete the vegetative or reproductive stage of its life, (ii) the deficiency symptom of the element in question can be corrected or cured by supplying that element only, and (iii) the element is directly involved in the nutrition of the plant, quite apart from its possible effect in correcting some microbiological or chemical conditions in soil or solution culture.

Essential nutrients are classified into two groups, viz macronutrients and micronutrients. Macronutrients are required by the plant in relatively larger quantities in contrast to micronutrients which are needed only in small quantities. Macronutrients are carbon, hydrogen, oxygen, nitrogen, phosphorous, potassium, calcium, magnesium and sulphur. Calcium, magnesium and sulphur are sometimes referred to as secondary nutrients. Micronutrients are iron, manganese, copper, zinc, molybdenum, boron and chlorine. Sodium, silicon, cobalt and vanadium have been found to be beneficial for some plants under certain conditions though these are not recognized as essential nutrients. These are called functional or metabolic elements.

Of the macronutrients, carbon, hydrogen and oxygen are supplied to the plant through air and water. Eventhough all the other macronutrients are also present in soil, the rate of supply of nutrients like nitrogen, phosphorus and potassium (NPK) from the soil is usually not adequate to meet the demand by the plants and therefore, these nutrients have to be supplemented. Some of the rubber growing soils in India are deficient in magnesium, and this nutrient is also supplied as fertilizer. In India, deficiency of micronutrients is not normally encountered. However, zinc

deficiency induced by excessive application of phosphatic fertilizers is at times noticed in nursery and young rubber in the field.

Manuring of Cover Crops

Manuring of leguminous ground cover with rock phosphate alone or with a mixture of rock phosphate and muriate of potash, has been found to be very useful for the quick establishment, easy maintenance and efficient nitrogen fixation under the agroclimatic conditions prevailing in the rubber growing tract in South India. Application of 150 kg of powdered Mussoorie rock phosphate per hectare in 2 equal instalments, the first, one month after sowing and second two months after the first application during the year of establishment of the cover-crop is therefore recommended. In areas where the soils are known to be deficient in available potassium, application of a mixture of 150 kg of Mussoorie rock phosphate and 50 kg of muriate of potash is recommended in place of 150 kg Mussoorie rock phosphate alone. In either case, it is enough to broadcast the fertilizers on the strips where the cover crops are planted.

MANURING OF RUBBER

The rubber plants have been found to respond well to systematic manuring necessary to provide adequate nourishment to the plant. The extent of the response due to manuring, however, has been found to depend upon several factors, the most important of these being the nature and fertility of the soil. The fertilizer experiments conducted by the Rubber Research Institute of India, have clearly established that, while manuring brings about striking improvements in growth and productivity of rubber growing in soils which are grossly lacking in plant nutrients, it is unlikely to get economically beneficial effects from manuring of rubber growing on soils well-supplied with plant nutrients. Therefore, it is recommended that for newly established rubber plantings particularly on virgin soils, manuring should be undertaken after assessing the manurial requirements based on the plant nutrient supplying capacity of the soil, as determined by the

results of analysis of representative soil samples. However, in view of the fact that majority of our rubber growing soils belong to the laterite and lateritic types which exhibit only little variations in the inherent fertility status, the following generalised manurial recommendations are made based on the results on the fertilizer experiments conducted by the Rubber Research Institute of India on rubber of different age groups, growing in typical laterite and lateritic soils.

Recommendations for Manuring Rubber

It is well known that the object of manuring rubber differs according to the age of the plants. Also the results of the manurial experiments conducted by the Rubber Research Institute of India clearly showed that the manurial requirements of rubber plant vary considerably during the three important stages of growth, namely nursery, immature and mature stages. A distinction between these three stages is therefore made in offering recommendations for manuring rubber. The cultivation practices which influence the manurial requirements of rubber are also taken into consideration in offering the recommendations.

Seedling nursery

The object of manuring the seedling nurseries is to produce from unit area the maximum number of vigorous and healthy seedlings ready for transplanting or budding within the shortest period. The following manurial practices are recommended for achieving this objective.

1. Incorporation of two and a half tonnes of compost or wellrotted cattle manure and 350 kg of powdered (100 mesh) Mussoorie rock phosphate analysing 20-24% P_2O_5 for every effective hectare, i e., 25 kg of compost and 3.5 kg of Mussoorie rock phosphate per 100 sq. metre of the nursery bed, as a basal dressing. If the nursery is opened in a newly cleared forest area addition of compost or cattle manure may not be necessary during the year of opening, and application of Mussoorie rock

phosphate alone is sufficient. Also in cases where the same beds are used repeatedly, application of Mussoorie rock phosphate is necessary only once in 3 years.

2. Application of 2500 kg of 10: 10: 4: 1.5 NPKMg mixture per effective hectare, i e. 25 kg per 100sq metre of the nursery bed 6 to 8 weeks after planting. The composition of the mixture is given below.

Ingredients	Quantity	Analysis of the mixture			
		N%	P2 O5%	K2 O%	MgO%
Ammonium sulphate (20.6%N)	48.5 kg	10	..	..	..
Rock Phosphate (29.0% P2 O5)	34.5 kg	..	10	..	..
Muriate of potash (59.0%K20)	7.0 kg	..	..	4	..
Commercial Magnesium sulphate (16.0% MgO)	10.0 kg	..	..	..	1.5
Total	100 kg.	10	10	4	1.5

This mixture can also be prepared using Urea, Mussoorie rock phosphate, Muriate of Potash and Magnesite.

N P K Mg 10:10:4:1.5
(Urea, Mussoorie rock phosphate and Magnesite)

Ingredients	Quantity (Kgs)	Analysis of the mixture			
		N	PO	K2O	MgO
Urea (46%N)	21.75	10	..	..	..
Mussoorie rock phosphate (20% P2 O5)	50.0	..	10	..	..
Muriate of Potash (59%K2O)	7.0	..	..	4	..
Magnesite (40% MgO)	3.75	..	..	..	1.5
Filler	17.50	..	..	..	..
Total	100.0	10	10	4	1.5

3. Application of 550 kg of Urea per effective hectare 6 to 8 weeks after the first application but before undertaking.

Budwood multiplication nursery

The aim of manuring budwood nurseries is to obtain the maximum quantity of good quality budwood per plant during periods of 10-12 months with an initial period of 12 to 18 months for the first crop of budwood. To achieve this, the following manurial practices are recommended.

1. Incorporation of 150 kg of powdered (100 mesh) Mussoorie rock phosphate per hectare i.e. 1.5 kg per 100 sq. metre of the nursery bed as a basal dressing at the time of preparing the nursery bed.

2. Application of 250 gm of NPKMg. 10:10:4: 1.5 mixture the composition of which is given earlier, per plant in two equal split applications for the first crop of budwood. The first application should be made 2 to 3 months after planting the budded stumps or cutting back if budding is carried out in situ. The second application should be made 8-9 months after planting.

3. Application of 125 gm of 10: 10:4: 1.5 NPKmg mixture, per plant in one single application 2 to 3 months after cutting back for the second and subsequent crops of budwood from the nursery.

Immature rubber

The object of manuring rubber plants during the immature (pretapping) stage is to accelerate the growth with a view to reducing the unproductive phase of the crop. Under the agro-climatic conditions prevailing in our rubber growing areas, rubber plants after planting used to take 7 to 9 years to attain the criteria of tappablility in most cases. But the result of the field experiments carried out by the Rubber Research Institute of India clearly showed the possibility of reducing the unproductive phase atleast by one year through systematic manuring in such cases. Manuring of immature rubber is therefore highly economical. Hence the following schedule of manuring is recommended for immature rubber grown in our country.

1. Incorporation of 12 kg of compost or well-rotted cattle manures and 175 gm of Mussoorie rock phosphate in every pit at the time of filling to provide good soil conditions required for the optimum development of the root system of the young rubber plant to be planted in it. In newly cleared forest areas it is enough to apply 175 gm. Mussoorie rock phosphate along well mixed with the top 20 cm soil in the pit as the surface soil with which the pits are generally filled may be fairly rich in organic matter.

2. Application of 10:10:4:1.5 NPKmg mixture as per schedule given below for the first 4 years.

Schedule for manuring rubber during its initial period of immaturity

Year of planting	Months after planting	Time of application	Doss of mixture per plant	Quantity of the mixture required per hectare with 440-450 planting points.
1st year	3 months	Sept.-Oct.	225 gm	100 kg
2nd year	9 ,,	April-May	450 gm	200 kg
do	15 ,,	Sept.-Oct.	450 gm	200 kg
3rd year	21 ,,	April-May	550 gm	250 kg
do	27 ,,	Sept.-Oct.	550 gm	250 kg
4th year	33 ,,	April-May	450 gm	200 kg
do	39 ,,	Sept.-Oct.	450 gm	200 kg

Eventhough, the above schedule envisages only one round of manuring in the first year and two rounds in the subesquent years, it is preferable to apply the same done in more split applications.

The fertilizers requirements of rubber during the remaining period of immaturity depend to a great extend on the cultivation practices, such as mulching the plant bases during the initial years

and the establishment and maintenance of leguminous ground covers in the area, as these cultivation practices if properly carried out, will result in the improvement of the soil conditions and availability of plant nutrients, particularly nitrogen. The results of the field manurial trials conducted by the Rubber Research Institute of India, have clearly shown that in the case of rubber grown along with Pueraria phaseoloides, when the plant bases were mulched during the initial years, there was no response in the rate of girthing of the rubber plants due to the continued application of fertilisers after 3 to 4 years. There is, therefore a clear case for making separate fertiliser recommendations for rubber areas with and without the above cultivation practices from the 5th year of planting.

The following recommendations are therefore made for manuring rubber plants from the 5th year of planting.

(a) For areas where the plant bases were mulched during the initial years and where Pueraria phaseoloides were established and maintained properly.

At there is only little chance of obtaining response to continued fertiliser applications in such areas, discriminatory fertiliser applications based on the results of the analysis of soil and leaf samples representing the area, should be adopted. But when it is not practicable to adopt discriminatory fertiliser usage, application of the following fertiliser mixture at the rate of 250 kg/ha in two split doses, one in April–May and the other in September-October, till the plants in the area become ready for tapping may be adopted.

Ingredients	Quantity	Analysis of the mixture		
		N%	P_2O_5%	K_2O%
Urea	26.0 kg	12	..	..
Mussoorie Rock phosphate	54.0 kg	..	12	..
Muriate of potash	20.0 kg	..	..	12
Total	100.0 kg	12	12	12

Any of the complex fertilizer of the grades 15: 15: 15 or 17: 17: 17 or 19: 19: 19 NPK may be used, quantities of these being 200 kg. 175 kg and 160 kg respectively 10:26:26 NPK complex (115kg) mixed with urea (40 kg) may also be used.

(b) **For plantations where no mulching was carried out during initial years and no legume ground covers were established and maintained.**

As already stated, good leguminous ground cover prevents soil erosion and fixes large quantities of nitrogen in the soil during its first 2 to 3 years growth, and this nitrogen will subsequently become available for utilisation by the rubber plants. Therefore, for rubber planted along with a leguminous ground cover, considerable quantities of nitrogen will be avaliable for its nutrition from the 4th and subsequent years of immaturity. In this connection, the finding of the Rubber Research Institute of Malaya, that in areas with no legume covers, the rapid growth of rubber associated with pure creeping legumes can be approached closely by the increased application of nitrogenous fertilizers, is worth mentioning. Therefore, in areas where no legume ground covers were established and no mulching practised during the initial years, application of the following NPK mixture which contains high nitrogen is recommended at the rate of 400 kg/ha in two split doses of 200 kg each during the 5th and succeeding years till the plants become ready for tapping.

Ingredients	Quantity	Analysis of the mixture		
		N%	P_2O_5%	K_2O%
Urea	33.0 kg	15	..	..
Mussoorie Rock phosphate	46.0 kg	..	10	..
Muriate of potash	10.0 kg	..	..	6
Filler	11.0 kg	..	..	..
Total	100.0 kg	15	10	6

Mature rubber under tapping

The object of manuring rubber under tapping is to obtain an economic response in the yield of the trees. But it is now well recognised that the possibility of getting economic response to manuring of mature rubber depends on several factors such as the present yield and the genetic yielding capacity of the planting material, the age and condition of trees, the tapping history, the nutrient supplying capacity of the soil, the nutrient status of the trees and the manuring and soil management history. Therefore it is always advisable to assess the fertiliser requirements of individual mature rubber areas taking into consideration all the above factors and then to apply only the required fertilizers to the mature rubber trees for obtaining optimum results. As analysis of soil and leaf samples representing individual mature rubber areas and their case histories will indicate the fertiliser requirements of the mature rubber trees in the respective areas, it is possible to practice discriminatory fertiliser applications for mature rubber based on the results of soil and leaf analysis and case history data. Therefore it is recommended that discriminatory fertiliser applications based on the results of soil and leaf analysis should be practised for mature rubber, wherever it is possible. The Rubber Research Institute of India has now facilities for analysing soil and leaf samples for offering discriminatory fertiliser recommendations for mature rubber. Therefore planters and small holders desirous of availing this service can contact the Director, Rubber Research Institute of India, Kottayam-9 for obtaining the service.

The following general fertiliser recommendations are made for manuring mature rubber from the time of commencement of tapping to the age of economic production. But in this case, it is to be noted that no fertiliser applications are recommended for

mature trees which are expected to be replanted within a period of 5 years, because of economic considerations.

Application of an NPK 10: 10: 10 grade mixture at the rate of 900 gm per tree (approximately 300 kg per hectare) every year during March-April. The composition of the mixture is given below:

Ingredients	Quantity	Analysis of the mixture		
		N%	P_2O_5%	K_2O%
Ammonium Sulphate	48.5 kg	10	..	..
Rock Phosphate (29% P_2O_5)	34.5 kg	..	10	..
Muriate of Potash	17.0 kg	..	..	10
Total	100.0 kg	10	10	10

Instead of this mixture, the 12: 12: 12 NPK mixture recommended earlier, at the rate of 250 kg/ha may be used. Any of the complex fertilisers of the grades 15: 15: 15 or 17: 17: 17 or 19: 19: 19 NPK may also be used, the quantities of these being 200 kg, 175 kg and 160 kg respectively. 10: 26: 26 NPK complex (115kg) mixed with urea (40 kg.) may also be used.

Plantations where rubber trees exhibit Magnesium deficiency symptoms (interveinal yellowing of leaves during September December period), addition of 50 kg. of commercial Magnesium sulphate per hectare in addition to the above NPK mixture is recommended.

Time and method of application of fertilisers

The efficiency of fertiliser usage depends on the time and method of applications. Unless fertilisers are applied at the right

time and in the right way, the fertilisers will largely be wasted. The choice of the time of application depends mainly on the moisture conditions of the soil. The principle to be followed is that there should be sufficient moisture in the soil at the time or application of the fertilisers and at the same time the chances of loss by leaching should be minimum. Since the rubber growing regions in the country receive both the south-west and north-east monsoons, fertiliser applications should logically be made during March-May (Pre-monsoon) and or during September-October (Post-monsoon) periods. Applications during March-May should be made after the first few pre-monsoon showers and before the outbreak of the regular monsoon. The September-October application on the other hand should be undertaken after the south-west monsoon but before the onset of the north–east monsoon when a dry interval of 4 to 5 weeks will be usually available.

The method of application of fertiliser to rubber plants should depend on the stage of growth of the plants and the principle to be followed is that the fertilisers should be applied in zones where the roots of the plants are active.

Application in nurseries

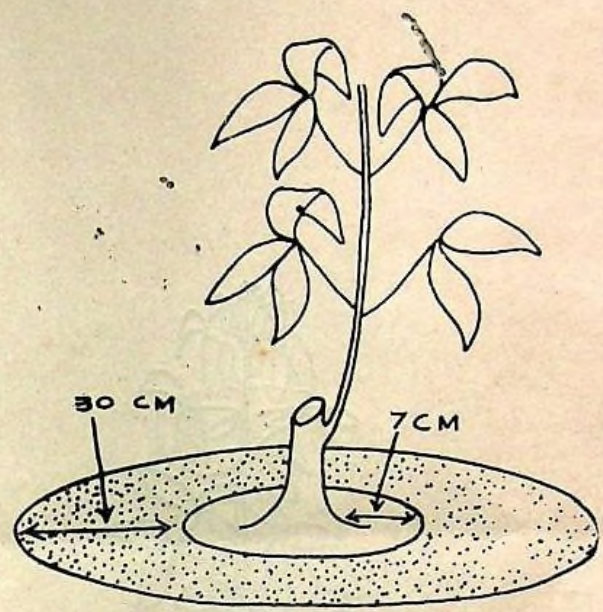
In the case of seedling nurseries, the first application of the recommended quantity of NPK Mg mixture should be made during September-October period, that is 6 to 8 weeks after planting the germinated seeds in the nursery beds. The fertilisers should be spread about 8 cm away from the base of the plants in a 14 cm. wide liner band in between two rows and gently forked in with a hand rake. The Second application of urea should be made 6 to 8 weeks after the first application, but before mulching,

adopting the same method of application. But in the case of both the application it is important to ensure that fertilisers do not come into contact with the stem of the seedlings to avoid injury to the plants and that there is sufficient moisture in the soil at the time of application.

In budwood nurseries, for the first crop of budwood the two recommended fertiliser applications should be made during September–October and March–April either in a band 8cm away from the base of the plant or in between two rows and lighty forked in with a hand rake. For the second and subsequent crops of budwood, the one round of fertiliser application recommended should be applied during September–October season adopting the same method.

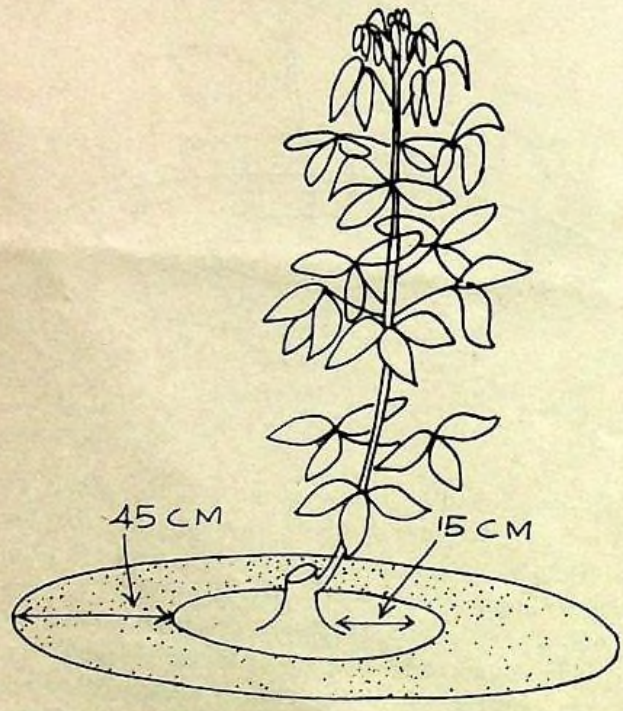
Application for rubber during its immature period

For rubber plants planted in the field, the method of application of fertilisers during the first few years after planting is very important as they will have only a very limited root system at that time. Therefore, for young rubber, fertilisers should be applied only after taking into consideration the possible root development of the plants at the time of application. Since the root development of the plants is only very limited at the time of the first application after planting it is recommended that the fertilisers should be evenly distributed over a circular band of about 30cm around the base of the young plant, leaving about 7 cm from the base all around and slightly forked into the top 5 to 8 cm of the soil. In areas where mulching is carried out, it is enough to put the mulch over the fertilisers instead of forking.

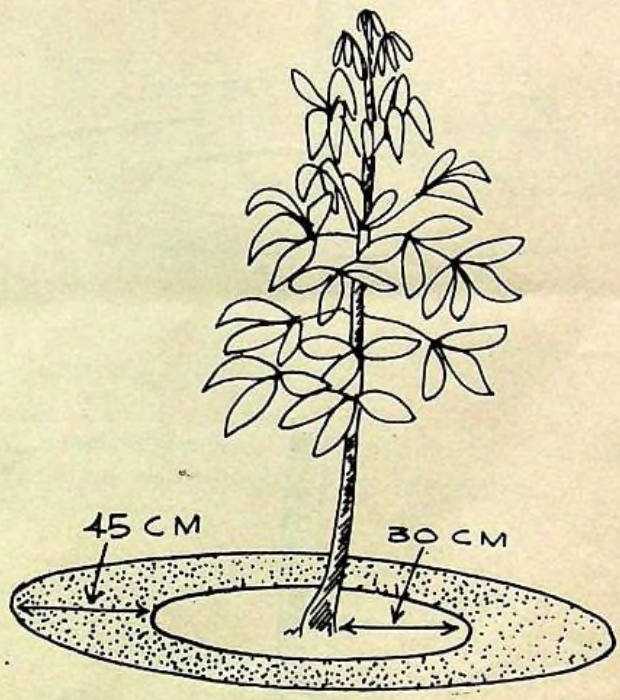


3 months

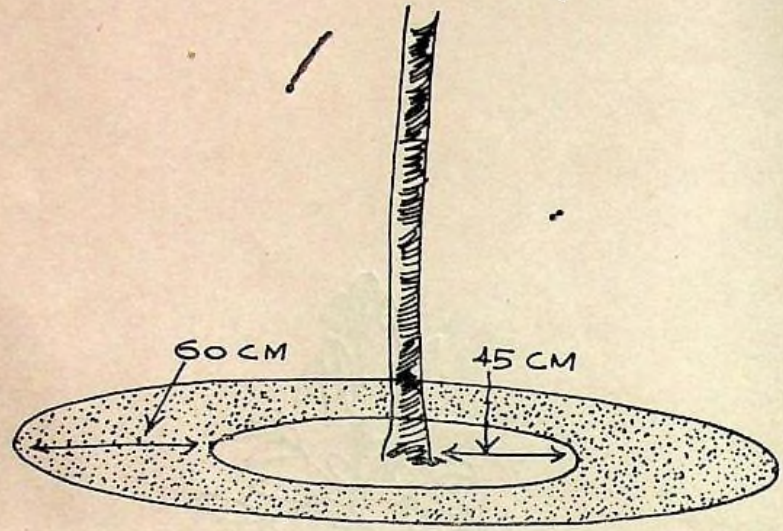
The second round of fertiliser application, that is when the plants are 9 months old, should be done in a circular band, the band width being 45 cm leaving 15 cm all around the plant base. The fertiliser applications in subsequent years till the canopy of the rubber plants closes, should be made in circular bands of steadily increasing width. Fertilisers should be applied in square or rectangular patches in between rows, each patch serving four trees, once the canopy of the plants closes, say, 5 to 6 years after planting. Light forking to incorporate the fertilisers into the top soil is necessary in areas where the ground is exposed without proper cover. In areas where there exists legume ground cover and where the legume cover has died out leaving a thick mulch it is enough to broadcast the fertilisers in between two rows of rubber trees. Deep pocket placement of fertilisers and application too close to the base of the trees should be avoided.



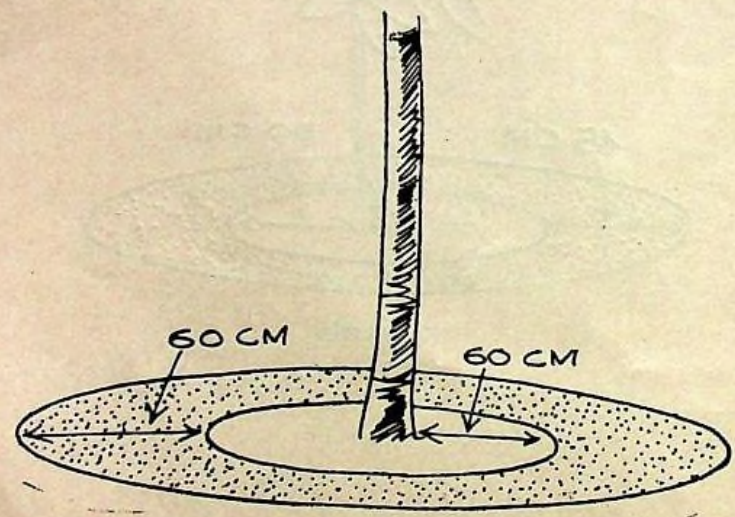
9 months



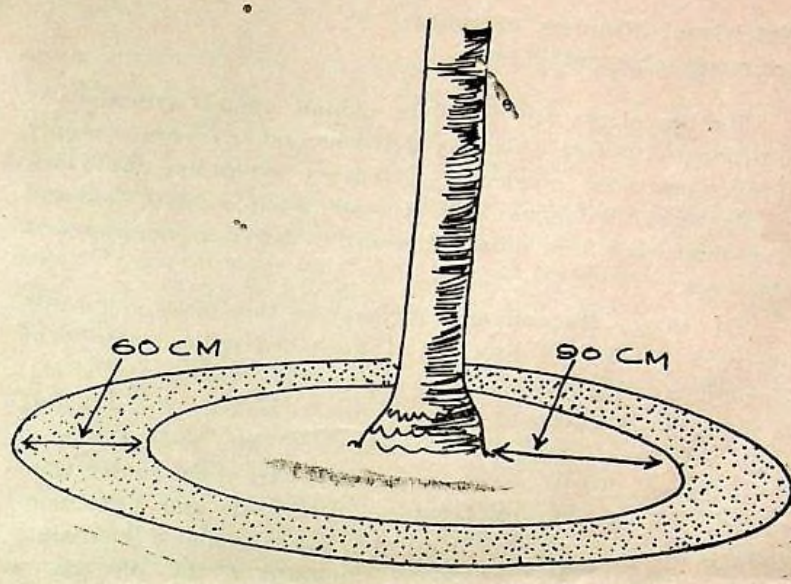
15 months



21 months



27-33 months



39-45 months

The straight fertilisers commonly used for manuring rubber and their plant nutrient contents are listed below:

Fertilisers	Percentage plant nutrient contents			
	N	P_2O_5	K_2O	MgO
1. Ammonium sulphate	20.6	..	..	..
2. Ammonium sulphate/nitrate	26.0	..	..	..
3. Urea	46.0	..	..	..
4. Mussoorie Rock phosphate	..	20.0-24.0	..	..
5. Rock phosphate (imported)	..	29.0-34.0	..	..
6. Muriate of potash	..	..	..	..
7. Commerical magnesium sulphate (Epsom salt)	..	..	..	16.0
8. Magnesite	..	..	..	40.0

Nutritional disorders of rubber commonly observed in India

Rubber plants are found to exhibit typical symptoms of nutritional disorders caused by deficient and or excessive supply of individual plant nutrients. Deficiency symptoms due to lack of Magnesium Potassium and in some isolated cases Zinc and Manganese have been observed in our rubber nurseries and field plantings.

Of these, Magnesium deficiency is the most commonly observed nutritional disorder. The characteristic symptom of Magnesium deficiency is the development of chlorosis (yellowing) in the interveinal areas on exposed mature leaves giving a herring bone pattern. This deficiency incidences are seldom seen in Kanyakumari district and in the northern part of the rubber tract consisting of Palghat, Malapuram, Kozhikode and Cannanore districts where the soils are found to be fair in available Magnesium status. Usually the deficiency is noticed in the plantations located in central areas of Kerala and or in cases where the rubber has been manured with excessive quantities of Muriate of potash and/or rock phosphate.

Potassium deficiency is commonly found on rubber grown in highly impoverished soils.

The characteristic symptom of Potassium deficiency is the development of marginal and tip chlorosis which is followed by marginal necrosis. Only older leaves exhibit the deficiency symptoms. Size reduction of the leaves and the absence of herring bone pattern of yellowing, allow Potassium deficiency symptoms to be distinguished from those of Magnesium deficiency.

Zinc deficiency causes interveinal chlorosis of leaves. The outstanding features of this deficiency are that the laminae become much reduced in breadth in proportion to their length and the young leaflets becomes incurved towards one another and present a hooked or claw appearance. Zinc deficiency incidences have been noted so far only in the case of young rubber plants

either in the nursery or in the field. In most cases these deficiencies were noticed to be only transient. The case of the deficiency appears to be heavy applications of Rock phosphate in most cases resulting in poor availability of Zinc.

The typical Manganese deficiency symptom is an overall paling and yellowing of the leaf with bands of green tissue outlining the midrib and main veins. Though this deficiency is widespread in India, it has been found to be only very mild in intensity.

Apart from these deficiency diseases, problems connected with nutrition, such as precoagulation of latex on the tapping panel and excessive drainage of latex causing dryness of trees have also been reported from rubber plantations. Of these, the pre-coagulation of the latex on the tapping panel, has been found to be due to excessive supply of Magnesium to rubber. Also, there are indications to believe that unbalanced nutrition can cause excessive drainage of latex resulting in the dryness of trees.

The incidences of nutritional disorders mentioned above, are known to affect the growth and productivity of rubber to a great extent. Therefore, the planters are advised to consult the Rubber Research Institute of India if any of these disorders is noticed in their plantations and to take necessary preventive measures without delay.

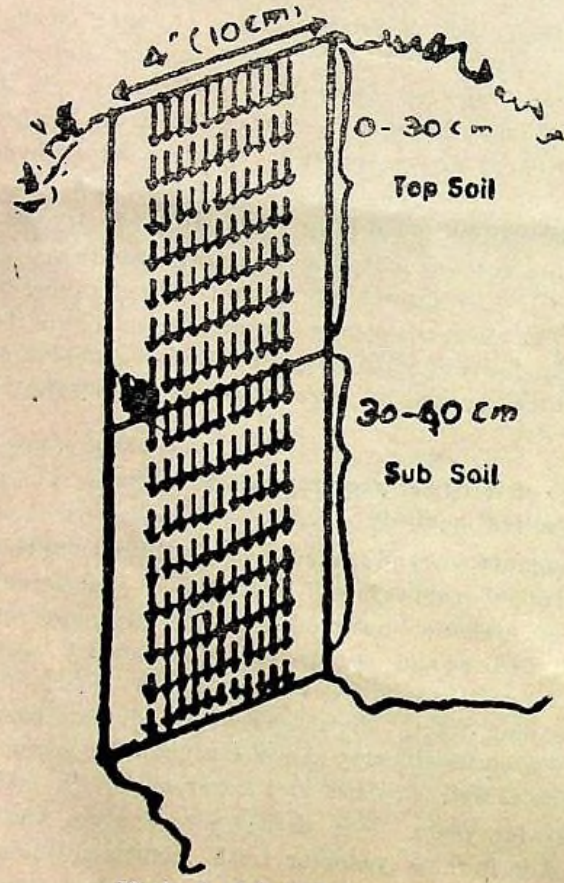
Diagnosis of fertilizer requirements of rubber by soil and leaf analysis

The value of soil and leaf analysis for diagnoising the fertilizer requirements of rubber is well recognised. Before undertaking planting of rubber in nurseries or main field, representative soil from the area should be analysed for fertility status. This practice is particularly important, if the area is outside the rubber growing tract. Fertilizer recommendations based on this initial soil analysis will serve as a useful guide for manuring rubber in nurseries as well as rubber and cover crop in the main field for the initial few years. It is desirable to analyse the soil in the nursery once in three years for fresh recommendations. In the case of rubber in the main field, the recommendations based on

initial analysis may be followed during the first four years, if the growth of the plants is satisfactory. During the fifth and subsequent years of immaturity, and after commencement of tapping, discriminatory fertilizer application based on the results of analysis of soil and leaf samples representing the area should be followed.

Method of Collecting Soil and Leaf Samples

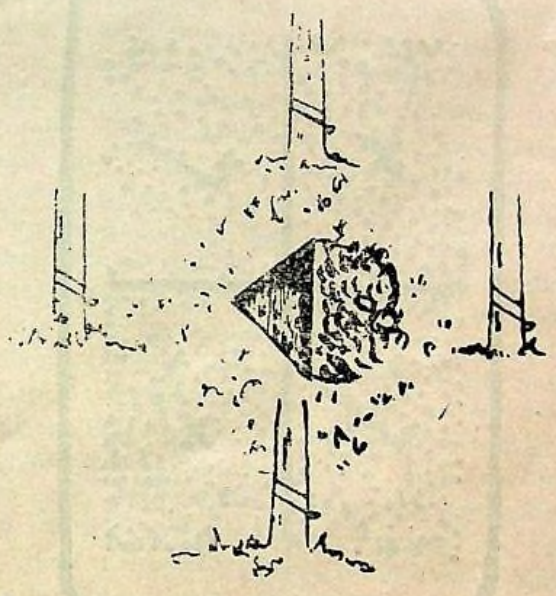
While collecting soil and leaf samples from rubber plantations for the purpose of analysis, it is necessary to take



Method of Soil Collection

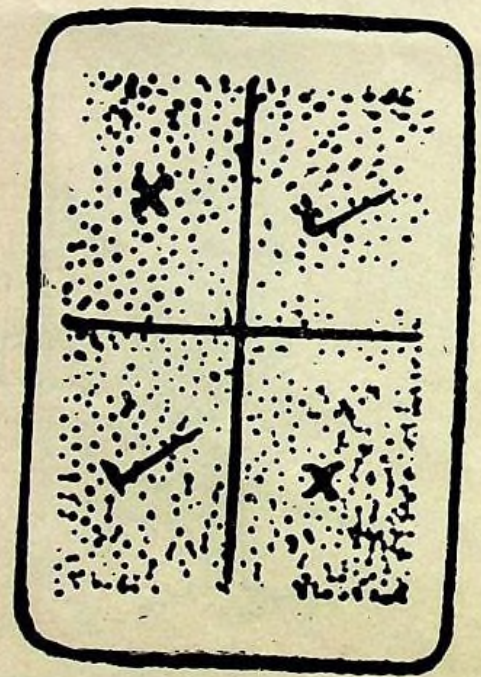
some precautions. The most important point to be kept in mind is that the samples collected should be truly representative of the area sampled. Moreover, after manuring, two to three months should elapse before samples are collected. If their is uniformity in the nature of soil, lie of the land, manurial history, age of the rubber tree and growth of rubber and cover crop, one composite sample of soil and leaf would suffice for an area upto 20 hectares. But if there are marked differences in the above factors, take separate samples for the different areas. It is also desirable to have separate leaf samples for each clone.

If soil and leaf samples are simultaneously collected, the suitable period would be between August and October. But if soil sample alone is collected, the period between December and March would also be suitable. Take composite soil samples at two depths 0-30 cm and 30-60 cm.



Method of Pitting for Collection of Sample

For this purpose select at random 5 to 15 spots (depending on the total area to be sampled) and dig 60 cm. deep pits at these spots. As it is necessary to ascertain the effect of past manuring on the fertility of the soil, locate pits at the site of past manuring application. (For mature rubber, fertilizers are applied either broadcast or in rectangular patches in the middle of every four trees). Do not sample road margins, labour line sites, cattle shed or compost pile neighbour-hoods, are recently fertilized, old bunds, marshy spots, very near trees or stumps or other non-representative locations. After removing the surface litter and mulch, cut a thin vertical section of soil from the top to a depth of 30 cm using a sharp-edged tool such as chisel. Pool all the samples of 0-30 cm depth from the different pits and mix well. If the size of the composite sample is large, reduce by quartering. For this purpose spread the well-mixed soil into a thin-layered



square on polythene sheet or brown paper. Divide the square into four equal squares and discard the soil in the diagonally opposite squares. Repeat this process until about 500 gm sample of soil is obtined. Prepare composite sample from 30-60 cm depth also in similar manner. Dry the samples under shade and pack them in clean cloth bags and never in manure contaminated gunny or alkathene bages. Label each sample giving details of block sampled, depth of sampling and date of collection, and put the label in the bag. (Write the label with pencil and never in ink).

Leaf samples are collected during August to Oetober period. During this period leaves would be 6-8 months old. Depending on the area to be sampled select 10 to 30 trees at random, (Upto 5 hectares select 10 trees, for 20 hectares select 30 trees, and for area between 5 and 20 hectares select proportionate number of treos). In the case of branched immature trees and trees under tapping, collect four basal leaves from the terminal whorl of low branches in shade from each of the selected trees. Four basal leaves from "spur leaves' (small off-shoots with only one whorl from trunk or main branches) are also suitable for sampling mature rubber. Branches with new flushes and leaves infected by Oidium and other leaf diseases are unsuitable for sampling. Leaves formed during the onset of south-west monsoon are also not mature enough for sampling. Do not select Brown bast or Root disease affected trees for sampling purpose. In the case of unbranched young plants with storeys, select plant without new flushes, and collect four basal leaves from the top-most whorl. If 30 trees are selected, collect only the middle leaf-let from each leaf, if 15 trees are selected, collect the two leaf-lets on either side and if 10 trees, collect all the three leaf-lets, so that about 120 leaf-lets would be available in one composite sample. Place the leaves between sheets of newspaper and label each composite sample. Send the samples of soil and leaf to the Director, Rubber Research Institute of India, Kottayam-9, Kerala, as quickly as possible, if it is not possible to deliver the samples within 24 hours after collection the samples may be dried by pressing with and elective iron heated to the temperature

used for pressing the cotton clothes. Along with the sample, send the case history of the area represented by each sample in the proforma given below:

Case History Sheet of the Sampled Area/Estate

1. Name of the estate with postal address.
2. Name of the block sampled along with area in hectares.
3. Sample No.
4. Depth of sampling: 0-30 cm 30-60 cm.
5. Date of sampling.
6. Planting material used with spacing.
7. Age of the tree in the sampled area.
8. Average girth of the trees in the sampled area. (In the case of seedling, the girth at the height of 50 cm from base, and for buddings the girth at 125 cm from the bud union, may be given).
9. Elevation above mean sea level.
10. Rainfall average for last five years.
11. Slope-level-gentle/medium/steep.
12. Cover crops.
    (1) (Pueraria, Calopogonium' Centrosema or Desmodium.)
    (2) Mixture of legumes.
    (3) Others.
13. Previous history of the sampled area. (Here state whether the area is a replanting or new planting, previously cultivated or Virgin area).
14. Manuring history. (Here state the rubber mixures used specifiying the various ingredients, composition and quantity applied per tree or per hectare for the past three years).
15. Time and method of application.

16. Tapping system (S/2 d/2, S/2d/3 etc.) adopted with average yield for the past three years with initial tapping height.
17. Please state whether the sampled field is with rubber mixed with coconut, arecanut or intercultivated with tapioca, banana etc.
18. Stand per hectare.
19. Protective measures adopted against diseases.
20. Please state whether stimulants are used if so, give details.
21. Any other relevant information.

Place.....

Date..... Signature.....

Mobile soil and tissue testing Laboratory

The Institute has put into service a mobile soil and plant tissue testing Laboratory for giving on-the spot fertilizer recommendations to small growers based on soil and plant tissue analysis. Ten leaves and twenty soil samples collected from ten small holdings can be analysed in a day in this laboratory. This service is free for the small holdings.

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