

A GUIDE TO THE MANURING OF CEYLON TEA (1955)

J. Lamb, G. B. Portsmouth and J. A. H. Tolhurst

Publication of this guide earlier in the year, in leaflet form as T.R.I. Pamphlet No. 1, met with such widespread approval that the desirability of reprinting it in somewhat more permanent form was clearly indicated. With the exception of the original preface, it is accordingly reprinted in full in this issue of the Tea Quarterly.

Opportunity is, however, again taken to emphasise that the information given is essentially dated 1955, and that it is based upon a combination of results obtained in the field and the laboratory during the past twenty five years. In the light of further experiments our recommendations may change and, as soon as there is substantial justification, new recommendations will be published.

1. TEA IN BEARING

Recommended Mixtures

T.R.I. 500 Mixture

Sulphate of ammonia	...	320	parts
Saphosphosphate	...	105	„
50% Muriate of potash	...	75	„
		<hr/>	
		500	„
		<hr/>	

Or

T.R.I. 488 Mixture

Sulphate of ammonia	...	320	parts
Saphosphosphate	...	105	„
60% Muriate of potash	...	63	„
		<hr/>	
		488	„
		<hr/>	

From the point of view of plant nutrients there is no essential difference between these two mixtures. The difference is entirely a matter of availability and cost of 50% and 60% muriate of potash. The difference is so small that application rates are not practically affected.

Rate of Application

Annual crop lbs.	Minimum pounds of mixture required annually	Minimum rate of application per annum		
		N	P ₂ O ₅	K ₂ O
400	275	36	17	21
450	300	40	19	23
500	325	43	20	24
550	350	46	22	26
600	400	53	25	30
650	425	56	26	32
700	450	59	28	34
750	475	63	29	36
800	500	66	31	38
850	525	69	33	39
900	550	73	34	41
950	575	76	36	43
1,000	600	79	37	45
1,050	650	86	40	49
1,100	675	89	42	51
1,150	700	92	43	53
1,200	725	96	45	54
1,250	750	99	46	56
1,300	775	102	48	58
1,350	800	105	50	60
1,400	825	109	51	62
1,450	875	115	54	66
1,500	900	118	56	68
1,550	925	122	57	69
1,600	950	125	59	71
1,650	975	129	60	73
1,700	1,000	132	62	75

Any estate obtaining crop levels above the maximum given in the table should communicate with the Institute for special advice.

Stress is laid upon the fact that the quantities given in the table are minimal and that where there is a demand for nutrients by heavy stands of shade trees, green manures, etc. some allowance must be made.

Many estates increase the basic figures given in the above table by 25%, and we are aware of instances where 50% increases have been made in very wet districts where the stand of shade trees and green manures is also very heavy. It is unfortunately impossible to give a rule of thumb recommendation for such allowances and this is a case where practical experience and judgment are indispensable. Every estate with proper records can judge the response to manures from the relation between the quantity of manure applied, the yield, and the consideration of the plant population. It is, however, pointed out that plants are not "penny in the slot machines" and that hasty judgment of response is to be deprecated. We also stress the fact that by "yield" we mean yield obtained by a high standard of plucking, reminding all growers that uptake of nutrients is dependent upon the bushes carrying adequate maintenance foliage. Manuring cannot compensate for over-plucking.

Some indication of the extent to which nutrients may be taken up by a newly planted stand of shade trees is given by the following specific instance in which 3 year old *Albizzia sumatrana* trees were found to have grown with such undue rapidity as to cause serious competition with the tea bushes. Analysis of the wood and roots of these trees made it possible to make the following estimate of the amounts of major nutrients taken up per acre by the shade trees in the three years since planting:—

Nutrient	(a) In timber lbs.	(b) In roots lbs.	(c) Total uptake lbs.
Nitrogen	30	53	83
Phosphoric acid	1	8	9
Potash	78	96	174

The figures in column (a) represent a permanent loss of nutrients, since these would be taken away in the timber. The figures in column (b) represent temporarily immobilised nutrients, since they will be slowly returned to the soil when the shade trees are felled and the roots decay. However, the total additional demand for available nutrients per acre in the first three years is the sum of both these amounts which is shown in column (c).

An arbitrary increase of 25% in the recommended application rates to allow for uptake of nutrients by shade trees is not, therefore, unreasonable. There can be clearly no substitute for skilled "on the spot" interpretation of the basic recommendations given in this publication.

Frequency of Application

For low yielding areas, that is to say yields below 700 lbs. per acre, the quantity to be applied limits the frequency of application, because of the difficulty of spreading small quantities of manure uniformly. This difficulty may, to some extent, be overcome by incorporation of 10% by weight of coir dust in the manure which doubles the bulk of the mixture.

Also in low yielding areas the cost of application becomes a considerable factor in the cost of production and it is doubtful whether applications at intervals more frequent than nine months are in the long run economic. The interval between application at the end of one pruning cycle and the beginning of the following cycle should not exceed nine months.

For yields above 700 lbs. per acre the frequency of application should be increased and intervals between applications reduced to six months. The first application in pruning cycles should normally be given as soon as the fields are ready for tipping and, where fields are vigorous and showing rapid recovery, should not exceed three months. There is no particular objection, especially during weather conditions favourable to manuring, to an application of manure as late as three months before the end of the cycle. In any case the interval between last and first application should not exceed nine months. The frequency of application must be planned according to the normal pattern of weather conditions, and designed to avoid application in very dry or very wet weather.

In cases where yields are very high and well distributed the frequency of application may, with advantage, be increased to four month intervals.

Some elasticity in the frequency of manuring, again so far as is permitted by estate routine, is to be recommended. A period of exceptionally favourable growth, in which exceptional yields have been obtained, should be taken advantage of whenever possible and an extra application of manure given.

The recommendations made in this section should be considered in conjunction with those explained in the sections on method of application and weather conditions.

Method of Application

It must be understood that it is weather conditions, that is to say, warmth, light and moisture, which control the rate of growth of the tea bush. Manure does not stimulate growth, but the lack of available nutrients may limit growth when other conditions are favourable.

The art of manuring is, therefore, to ensure a sufficiency of nutrients whenever the bushes are able to make use of them and must be based on rates of application according to yield and distribution according to root growth.

The ideal is to supply manure as quickly as it is used, so that sufficient nutrients are always available to meet the maximum demands created by the maximum stimulation of weather conditions. In practice the application can only be made at intervals set by cost of production, availability of labour and weather conditions.

Once the intervals of application have been decided upon, and related to monsoon and dry weather periods, the amount put out at each application should be based on the yield actually obtained since the previous application. Some compromise is inevitable since application cannot be varied without consideration of the "kanak" or distribution rate. There are many possible solutions to the problem and the choice must be left to the practical planter.

Since it is desired that the manure should be available to the whole of the feeding root system of the bush it should, when quantities permit, be spread in both rows. Under no circumstances, however, should both rows be deep forked at the same time, as the root breakage may cause a severe check to growth. From the evidence at present available we feel that one deep forking per cycle is sufficient in normal cases and suggest that one row be deep forked at the first application after pruning and the alternate rows deep forked at the following application.

Recent soil studies have indicated that it is undesirable to fork manure in deeply. It should, as far as possible, be scuffed into the top few inches of soil.

Weather conditions during application

The only real objection to manuring in wet weather is the practical difficulty of carrying out the operation. The manure is firmly held by the soil and the danger of leaching or washing out is negligible before nitrification. If the manure is scuffed into the soil it cannot be washed off unless there is serious erosion.

In effect, therefore, the main condition to be avoided is drought, especially alternate wetting and drying of the soil containing the freshly applied manure. Alternate wetting and drying of soil is undesirable in any case and should be, as far as possible, countered by soil cover (including the tea bush) and mulching.

Acknowledging the fact that agricultural operations are mostly a gamble on weather conditions, manuring should be timed, as far as possible, to anticipate sufficient rain to wash the manure down to the permanently moist zone in the soil layer.

General Considerations

First and foremost it must be appreciated that the recommended T.R.I. manure mixtures are not wholly concerned with the replacement of nitrogen, phosphate and potash. For further details the following *Tea Quarterly* articles should be read:--

1. The Mixture as Prescribed. J. Lamb and J. A. H. Tolhurst. *Tea Quarterly*, Vol. XXV, Part III, p. 51.

2. Magnesium and Manganese Deficiencies in Tea. J. A. H. Tolhurst. *Tea Quarterly*, Vol. XXV, Part IV, p. 84

For further details of the relationship between potash, calcium and magnesium:—

3. Potash Deficiency in Tea. G. B. Portsmouth. *Tea Quarterly*, Vol. XXIV, Part IV, p. 79.

Elements such as calcium and magnesium are so far as is known at present just as essential to the well being of the tea bush as nitrogen, phosphate and potash. In fact the amount of calcium and magnesium present in the tea bush is comparable to the amount of the other three.

To some extent potash, calcium and magnesium are inter-changeable in their nutrient capacity. Tea demands an acid soil and an acid soil is one most probably low in calcium and magnesium. Tea soils are in fact alarmingly low in their calcium and magnesium reserves. It is most probable that potash is at present being supplied in quantities in excess of basic requirements and is usurping some of the functions of calcium and magnesium. Beyond certain limits this substitution of potash for calcium and magnesium may lead to grave difficulties and the ultimate position, especially in high yielding areas where the demand for available nutrients is highest, requires the most careful investigation and co-ordination of chemical and physiological studies.

It must be clearly understood that there is an alarming gap in our knowledge of the requirements for potash, calcium and magnesium and their inter-relationships. It can only be filled by vigorous research.

From the advisory point of view there is no reason, however, why some purely common sense action should not be taken to ensure against calcium and magnesium deficiencies arising in the future, and it is suggested that single applications of ground dolomite limestone at the rate of 5 cwt. per acre should be given, at least to all high yielding tea areas, as a contribution to calcium and magnesium reserves. (*N. B. Soil pH must be checked first. Ed.*)

It is emphasised that this recommendation is not based on any definite scientific evidence and is entirely of the nature of a temporary precaution. No more than one application of limestone should be given to any field until more information becomes available. The ground limestone should have a guaranteed magnesium content expressed as "MgO". It is difficult to make any specific recommendation, but an "MgO" content of the order of 20% should be satisfactory. Ground limestone must not under any circumstances be mixed with other manures but spread separately. There is no reason why ground limestone should not be broadcast at the same time as other manures, but it would be preferable to make the application after the normal mixture has been scuffed in.

There is no particular point in using very finely ground limestone on tea areas and material passing a No. 10 mesh sieve will be suitable.

Trace Elements

One of the reasons for our use of saphosphosphate as the source of phosphoric acid is that it also contains appreciable quantities of some of the trace elements which are just as essential for plant growth as the more familiar major nutrients. A word of warning must be given in regard to these trace elements. They are required by plants in very small amount, hence their name, and if this amount is exceeded harmful effects may follow. It is definitely recommended that commercial trace element supplements should NOT be used, as evidence so far obtained suggests that some tea soils are already supplying an excess of one of the trace elements.

2. YOUNG TEA

Our recommended mixture for young tea is:

T.R.I. 180	
Sulphate of ammonia	... 100 parts
Saphosphosphate	... 50 "
Muriate of potash (50%)	... 30 "
	<hr/>
	180 "
	<hr/>

If 60% muriate is to be used, then the 30 parts quoted above are reduced to 25, the mixture then becoming T.R.I. 175.

In the first year in the field, and with an average rate of growth, the plants should receive two equal doses of $\frac{1}{2}$ ounce each of the mixture, applied at an interval of 6 months. Subsequent doses should be increased in accordance with the age of the plants as below:—

	<i>Size of each dose.</i>
First year	... $\frac{1}{2}$ ounce per plant
Second year	... $\frac{3}{4}$ " " "
Third year	... 1 " " "

Where, however, there is very rapid growth, such as may be expected from high yielding clones, then it will probably be advisable to increase the application frequency to once every 4 months, whilst maintaining the size of the doses recommended in the table. This will have the effect of increasing the annual application rate by 50%.

On no account should the mixture touch the stems, and a space of several inches is desirable. A very light scuffling is required.

3. SEED BEARERS

A suitable mixture is:

T.R.I. 530	
Sulphate of ammonia	... 300 parts
Saphosphosphate	... 110 "
Muriate of potash (50%)	... 120 "
	<hr/>
	530 "
	<hr/>

This would become T.R.I. 510 if 100 parts of 60% muriate is used instead of the 50% muriate.

Our suggestion is to apply the manure at 6 monthly intervals, with whatever cultivation is normally adopted, at a rate of not less than 265 lbs. per acre at each application. Higher application rates may well be desirable where large crops of seed are obtained.