

TEA RESEARCH INSTITUTE OF SRI LANKA

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GUIDELINES ON THE USE OF "SOIL QUALITY INDEX" (SQI) FOR DECISION MAKING IN SOIL REHABILITATION PRIOR TO REPLANTING

Introduction

Soil rehabilitation by planting recommended grasses; Guatemala (*Tripsacum laxum*) or Mana (*Cymbopogon confertiflorus*) and maintaining for a minimum of 18 months, prior to replanting is a recommended practice in tea cultivation. Long term experimental evidence reveals replanting, with soil rehabilitation is economically viable and replanting without rehabilitation would lead to productivity decline in most tea lands including the smallholdings. However, there has been a concern in the smallholdings sector as to the long gestation of 18–24 months for soil rehabilitation. It has also been evident that some arable lands are sufficiently fertile so that they could be replanted without soil rehabilitation. The above circumstances together with unavailability of adequate extent of lands amongst small holders for replanting, has prompted the Tea Research Institute to carry out investigations to introduce alternative approaches for decision making in soil rehabilitation prior to replanting.

Soil Quality Index

Development, validation and use of Soil Quality Indices (SQIs) in the promotion of sustainable agriculture has been considered as a novel strategy. The soil quality is defined as the soil's capacity to perform within managed ecosystem boundaries to sustain plant productivity while reducing soil degradation. A range of soil parameters or indicators has been identified to estimate soil quality, depending on crop, adoption of agricultural practices and crop interactions with environments. As to local tea cultivation, soil bulk density (BD; gram per cm³), available water content (AWC; mm per 30 cm), organic carbon (C; %) and microbial biomass content (MBC µg per gram of soil) from a depth of 0-30 cm, have been used to compute the soil quality indices for different tea growing regions. The scores given to averages of each of the above parameters and their variations in the Index are given in Table 1. Each parameter was provisionally assigned with weighted average and they were later validated from the actual data and their relationships.

Table 1: Soil parameter values and the scores given for each parameter

BD (g/cm ³)		AWC (mm/30cm)		C (%)		MBC (μg/g)	
Value	Score	Value	Score	Value	Score	Value	Score
1.0-0.7	10	60-70	9-10	> 5	10	300-400	10
1.2-1.0	9-10	50-60	8-9	4-5	8-10	250-300	8-10
1.3-1.2	7-9	40-50	7-8	3-4	6-8	200-250	7-8
1.4-1.3	5-7	30-40	6-7	2-3	4-6	150-200	5-7
1.5-1.4	3-5	20-30	3-6	1-2	2-4	100-150	3-5
1.6-1.5	1-3	10-20	1-3	0.6-1	0-2	50-100	1-3
> 1.6	0	< 10	0	< 0.6	0	< 50	0

The formulae used for the computation of SQI for different tea growing regions is as follows:

$$\text{SQI} = 0.36 \text{ BD} + 0.14 \text{ AWC} + 0.34 \text{ C} + 0.16 \text{ MBC}$$

SQIs for different tea growing regions

Accordingly, recommended SQIs for tea lands in different tea growing regions have been established, considering the aforesaid parameters of the rehabilitated fields and neighboring fields earmarked for up-rooting, as given in Table 2.

Table 2: Recommended SQI value for different regions

Tea growing region	Recommended SQI value
Low country	5
Mid country	6
Up country	7
Uva	7

Methodology for the determination of SQI of lands earmarked for tea replanting

Submission of expression of interest

Requests for the determination of SQI should be sent to the Director of Tea Research Institute of Sri Lanka, Talawakelle, by the Regional Manager, Tea Small Holdings Development Authority.

Compliance to land suitability criterion

It is essential that the lands earmarked for replanting should qualify for tea cultivation as per the TRI Guidelines on Land Suitability Classification for Tea (Refer TRI Advisory Circular LU 1; Serial No. 03/02, Issued in October 2002), or TSHDA Guidelines.

Compliance for absence of nematodes, root diseases and up country live wood termite

The land selected for replanting based on land suitability criteria, referred to above is then checked for the occurrence of parasitic nematodes, root diseases viz. Poria and white root disease and up country live wood termite, based on historical information in the relevant region/location and/or analytical results. Also, earmarked field needs to be checked for presence of nematode species as per the TRI Advisory Circular PM 5; Serial No. 03/10, Issued in December 2010. Once the land is cleared as free from the incidences of the above pests and diseases and any other irreversible factors hindering the healthier tea cultivation, Soil Quality Index (SQI) for the land will be then computed.

Sampling procedure

In order to determine the SQI of the earmarked field, it is necessary to collect soil samples at least from six points (core samples) per one acre plot (15 samples per ha), identified randomly representing the land. For this purpose, the field may be separated into few blocks depending on the topography and drainage *etc.* and sampled them separately if required. The number of samples may vary proportionately depending on the actual extent earmarked for replanting and/or blocks, with a minimum of two samples. Also, it is necessary to take soil samples avoiding drains, field paths, ravines and unusual patches. Undisturbed core samples for BD and AWC are taken from 0-10, 10-20 and 20-30 cm depths whereas for C and MBC, samples are taken at 0-15 and 15-30 cm depths separately, from each sampling point.

Once soil samples are collected, they should be individually labelled, packed and handed over to the Tea Research Institute immediately for soil analyses and computation of the SQI.

Recommendation

Once the SQI value is computed as per the above formulae, and if the value is equal or more than the recommended value for the region (Table 2), it is in order to plant tea directly following other recommended agricultural practices. However, if the computed SQI value is less than the recommended, it is absolutely necessary to undertake soil rehabilitation by planting recommended grass species for a minimum period of 18 months, prior to replanting of tea.

**Tea Research Institute of Sri Lanka
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