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PROPOSALS FOR THE DIVERSIFICATION OF AGRICULTURE ON TEA PLANTATIONS

1 - THE CONCEPT AND UNDERLYING PRINCIPLES

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Tea plantations in Sri Lanka occupy a large proportion of the land in the central highlands. The devotion of a large area of land to one crop seems undesirable and the question of introducing more crops on tea plantations has been often raised. It is explained that a programme of diversification should be part of an overall programme of development of tea plantations. This development would include the replanting of tea lands with vegetatively-propagated clones, infilling vacancies in good tea fields, the utilization of waste land and the introduction of additional species.

A classification of land within tea plantations is provided as a guideline so that crops suited to each land category can be tried out and the pitfalls of planting a crop unsuited to a particular land area can be avoided.

Suggestions for the choice of suitable species for pilot-scale or large-scale planting are provided for each elevation category. These suggestions are based on climate, land characteristics and water availability. Various types of diversification are described and the management and economic aspects of diversification are discussed in appropriate perspective.

1. INTRODUCTION

In achieving development on tea plantations five major courses of action are available. Firstly, vacancies in clonal tea fields and in good seedling tea fields not due for replanting in the near future can be infilled with tea plants of good genetic constitution. Secondly, poor tea on good land can be replaced with vegetatively-propagated clones. Thirdly, waste land could be utilized for agricultural purposes. Fourthly, agriculture can be diversified so that alternative crops can be accommodated and finally, land can be made available for urbanization, and the settlement of people.

In choosing which alternative is best for a particular field, a plantation, or a region, it would be desirable to categorize the tea fields into A, B and C (or more) categories on the basis of productivity (de Silva and Saravanapavan 1975). Land replanted with clonal tea and the best seedling tea would be included in A category. B category would consist of the average tea and C category would include the poorest tea. Some areas in C category would have to be replanted, and others may have to be diversified away from tea. In an earlier paper (de Silva 1977) suggestions were made on how to choose land for purposes of urbanization with due emphasis being paid to the domestic and agricultural needs of the settlers on such land.

In replanting old tea land with vegetatively-propagated clones much emphasis has been given in the past to selecting suitable land (Manipura 1972). Recommendations have been made for infilling vacancies in tea fields not due for immediate replanting (de Silva and Manipura 1975).

2. LAND CLASSIFICATION AND LAND USE

Classification of land can be done according to various criteria such as the intensity of rainfall, topography, soil characteristics *etc.* but it is necessary for us to evolve a system of classification which suits the specific needs of tea plantations and which, in practice, would serve the specific objectives we have in mind.

Table 1 provides such a classification of land within tea plantations according to topography, soil conditions, human needs and potential agricultural use. This classification is applicable to almost all the land within large tea plantations in all elevation categories in Sri Lanka. From Table 1 it will be noted that the land is basically classified into* 'well-drained, and 'ill-drained' lands. Under well-drained' lands are included lands, which are not subject to prolonged waterlogging or inundation, whereas *ill-drained lands include areas which are waterlogged

TABLE 1 — *A system of classification of land within tea plantations designed to suit development needs*

CLASSIFICATION	DESCRIPTION
1. **WELL-DRAINED LAND**	**Well drained, not water-logged**
1.1 **Steep**	Precipices, cliffs, steep hillsides
1.2 **Undulating**	
1.2.1 GOOD SOIL	Good topsoil
1.2.2 POOR SOIL	Rocky, shallow, eroded, excessively clayey
1.3 **Flat**	Firm ground suitable for buildings
2. **ILL-DRAINED LAND**	**Ill drained, water-logged, boggy, periodically inundated, ravines**
2.1 **Steep**	Gorges
2.2 **Undulating**	Ravines
2.3 **Flat**	Ravines, marshes
2.3.1 WATER AVAILABILITY PERENNIAL	Good perennial sources of water available
2.3.1.1 Near houses	
2.3.1.2 Far from houses	
2.3.2 WATER AVAILABILITY SEASONAL	Water availability seasonal
2.3.2.1 Near houses	
2.3.2.2 Far from houses	

and boggy for long periods or those which become inundated. It is possible that ill-drained lands could also be steep. Sloping or undulating well-drained lands and flat well-drained lands are suitable for tea and for many other crops if the soil is satisfactory but where the soil is poor, *ie* where it is rocky, shallow, roded or excessively clayey, the land will not be suitable for tea. Flat well-drained land at higher elevations can be earmarked for buildings rather than for agricultural purposes, because flat land in the higher elevation categories in Sri Lanka is hard to come by. Flat land classified as ill-drained could be subclassified into two groups based on whether water availability is perennial or seasonal, a significant factor in the type of agriculture that will be possible on such lands. Although ill-drained land was defined as waterlogged for prolonged periods it is nevertheless possible for such land to also dry out during long dry

* The terms 'well-drained land' and 'ill-drained land' are used in this sense throughout this article.

spells. Such land, where water availability is seasonal, would not be suitable for tea. However, this land may be used for agriculture in wetter seasons provided that suitable measures for draining the excess water are undertaken. Again, flat land where water availability may be either seasonal or perennial could be subdivided further on the basis of proximity to workers' houses. Whether such land is close to housing units or not would determine the type of agriculture that would be practicable. Suggestions for agriculture given in this article are based on this system of land classification.

3. DIVERSIFICATION OF AGRICULTURE

If we consider that we have to diversify our agriculture away from tea, it must mean that the tea is not growing well, because it is not suited to that particular land area, and that its profitability is reckoned to be rather low. Poor performance could, of course, be the result of poor management, insufficient finance, inadequate labour, unenlightened agricultural policy or because the land itself is unsuitable. In the last-named case it means that tea is the wrong choice of species for that land.

If tea is the right choice of species for a particular area then it follows that the tea must grow well and if it grows well it will cover the soil and prevent its erosion. It can be assumed that if tea grows well it would have good economic potential. Tea, however, requires the management and financial inputs referred to above and the question of profitability may be dependent on the availability of these inputs. If these inputs were not available, even if the choice of land was correct tea may become unprofitable for its owners. Given the necessary inputs, if tea has failed to grow well then it means that tea is the wrong choice of crop for that area. In that event and only in that event, should we consider diversification.

Diversification away from tea could be total or partial. In the case of partial diversification it would mean that other crops can be interplanted with tea, whereas in the case of total diversification tea would be completely eliminated and other crops would be grown. In the case of total diversification we have to consider the magnitude of the project; it could be large scale (macro) or it could be small scale (micro). The concept of microdiversification (sometimes called minidiversification) was introduced in an earlier article (de Silva 1977). *Macrodiversification cannot be encouraged at this juncture, as tea is more profitable than most other crops in the central highlands and the wetter low lands of Sri Lanka.* It is therefore argued that the question of macrodiversification has to be postponed for some time.

Microdiversification can be achieved in monoculture as well as polyculture. We can diversify away from tea into one or more crops. We can also have temporary polyculture where, on land earmarked for microdiversification, we retain the tea temporarily, interplanting another species, usually a tree crop, with the intention of abandoning the tea later. There are many instances where microdiversification is desirable on tea plantations. The necessity for microdiversification arises because large contiguous areas of land were originally planted in tea in monoculture without due regard to localized unsatisfactory soil or land characteristics. Subsequently it became evident that in small areas tea did not grow well, but the emphasis on maximization of tea production on each plantation was so great that attempts were made by land owners to grow tea on every available area ignoring the question of whether some areas were suited to tea or not. These areas now stand out in sharp contrast to the surrounding tea areas as soils are

eroded and the land is denuded. Microdiversification of such areas is strongly recommended. This subject was discussed at length in a previous article (de Silva 1977), which pinpointed the need for identifying areas to be earmarked for microdiversification.

4. SELECTION OF SUITABLE CROPS

Tables 2, 3 and 4 provide preliminary suggestions for possible land use for the different types of land on tea plantations in the high country, mid country and low country respectively. The objective of achieving optimal land use based on land characteristics is tied up not only with good agriculture but also with sound economics. If we were to attempt to grow a particular crop on the wrong type of land not only would the crop be unsuccessful because it would not grow well, but it would also cause the soil to become eroded by exposure due to lack of an adequate plant cover and this crop may not always be profitable. It is therefore most important that the selection of species be done extremely carefully according to climatic and land characteristics suitable for each species. Trials on a pilot scale with new crops will always help in deciding which crops are likely to be most successful.

Macrodiversification as explained above is strongly discouraged as we do not want Sri Lanka's tea production to diminish. Microdiversification on areas where tea is not growing well is encouraged. It must be realized that microdiversification is to be undertaken only in areas where tea is a most unsuitable species. It follows that there would be no point in planting a species similar to tea on such land because it is likely to be unsuitable for such crops. A new species which is more vigorous than tea will therefore have to be selected for planting on land where tea fails to thrive. This means that its root system will have to be larger and more efficient than that of tea. It follows therefore that tree species would have to be considered.

TABLE 2 — *Provisional suggestions for planting additional crops on tea plantations situated above* 1200 *m amsl*

CLASSIFICATION	USE
1. WELL-DRAINED LAND	
1.1 Steep	*Acacia decurrens* (second canopy), *Eucalyptus grandis* (first canopy) *Eucalyptus robusta* (first canopy), *Pinus patula* (only canopy)
1.2 Undulating	
1.2.1 GOOD SOIL	*Camellia sinensis, Coffea arabica*
1.2.2 POOR SOIL	*Cinchona* spp., *Cymbopogon citratus, Eucalyptus grandis, Eucalyptus robusta, Pinus patula*
1.3 Flat	Buildings
2. ILL-DRAINED LAND	
2.1 Steep	*Eucalyptus grandis, Eucalyptus robusta*
2.2 Undulating	*Eucalyptus grandis, Eucalyptus robusta,* Fodder grasses
2.3 Flat	
2.3.1 WATER AVAILABILITY PERENNIAL	
2.3.1.1 Near houses	Fodder grasses, intensively-cultivated vegetables, Horticulture
2.3.1.2 Far from houses	*Eucalyptus robusta*
2.3.2 WATER AVAILABILITY SEASONAL	
2.3.2.1 Near houses	Fodder grasses
2.3.2.2 Far from houses	*Eucalyptus robusta*

TABLE 3 — *Provisional suggestions for planting additional crops on tea plantations situated from* 600 *to* 1200 *m amsl*

CLASSIFICATION	USE
1. WELL-DRAINED LAND	
1.1 Steep	*Albizzia moluccana, Albizzia sumatrana, Eucalyptus grandis, Eucalyptus robusta, Pinus carribaea*
1.2 Undulating	
1.2.1 GOOD SOIL	*Camellia sinensis, Coffea robusta, Theobroma cacao*
1.2.2 POOR SOIL	*Albizzia moluccana, Albizzia sumatrana, *Elletaria cardamomum, Eucalyptus grandis, *Piper nigrum, Persea* spp. *Myristica fragrans, Syzygium aromaticum*
1.3 Flat	Buildings
2. ILL-DRAINED LAND	
2.1 Steep	*Albizzia moluccana, Albizzia sumatrana, Eucalyptus grandis, Eucalyptus robusta*
2.2 Undulating	*Musa* spp., *Oryza sativa, Saccharum officinarum*
2.3 Flat	*Musa* spp., *Oryza sativa, Saccharum officinarum*

*In association with a tree species

TABLE 4 — *Provisional suggestions for planting additional crops on tea plantations from sea level to* 600 *metres amsl*

CLASSIFICATION	USE
1. WELL-DRAINED LAND	
1.1 Steep	*Albizzia moluccana, Albizzia sumatrana, Eucalyptus grandis, Hevea brasiliensis, Pinus carribaea, Swietenia macrophylla*
1.2 Undulating	
1.2.1 GOOD SOIL	*Camellia sinensis, Coffea robusta, Theobroma cacao*
1.2.2 POOR SOIL	*Albizzia moluccana, Albizzia sumatrana, Eucalyptus grandis, Elaeis guinensis, Hevea brasiliensis, Swietenia macrophylla*
1.3 Flat	Buildings
2. ILL-DRAINED LAND	
2.1 Steep	*Albizzia moluccana, Albizzia sumatrana, Hevea brasiliensis*
2.2 Undulating	*Saccharum officinarum*
2.3 Flat	*Oryza sativa*

A new outlook may be required on the part of the estate management if diversification is to be meaningful. The number of species that can be grown in any elevation category is extremely large. In order to select the best species suitable for any particular area it is necessary that we keep an open mind and observe very carefully the success or failure of new species planted on small pilot areas as well as on neighbouring estates. The planting of new species on small areas on a pilot scale is encouraged but the planting of new species extensively, in the first instance, is discouraged. Experience with new species has to be gained before planting is extrapolated over very large areas. However, a keen eye is required to identify the better varieties of new species so that when planting is undertaken we would endeavour to plant the best available varieties. For this reason as well, pilot-scale planting is to be encouraged in the first instance.

In undertaking development programmes substantial interest is required for success. It would be necessary for management to seek new information from the institutions most experienced in handling particular species. New contracts would have to be established with organizations which will be prepared to assist growers with their development programmes. Discussions with neighbours and individuals experienced in handling different species of plants will always be beneficial.

Initially it must be remembered that tea is more profitable than many other species of plants and the extent to which even microdiversification is undertaken on tea land would be governed by this fact. Priority should therefore be given to the planting of waste land, ravine land, patna land *etc*, before the tea is interfered with.

In the late 1960's when the concept of diversification was strongly mooted, emphasis was on diversifying away from tea if the tea was considered as 'uneconomic'. Tea considered to be uneconomic at that time has, in the late 1970's, become highly profitable. This apparent contradiction would appear to need some scrutiny. If, at any time, tea happens to be unprofitable on a particular field or plantation, it is suggested that the reasons for this be carefully investigated. It may be due to management or financial reasons of a temporary nature, in which case the unprofitable state of the tea could well be reversed, and diversification need not necessarily be undertaken. If however unprofitability is due to agricultural factors such as a wrong choice of land, because of soil, pest or disease factors or because of climatic factors, then diversification can be contemplated after thorough investigation. Areas to be microdiversified would come into this category.

The apparent attraction of alternative crops in terms of monetary return must also be examined with some degree of caution, if not suspicion. A crop may be financially attractive today but may not be that attractive later on, particularly if the degree of success achieved in growing that crop from the agricultural point of view is less than optimal. If it is optimal the economic reward would be much more promising. It is therefore stressed that prime consideration must be given to agroclimatic factors in selecting new crops. If the agroclimatic requirements of a crop are statisfied then there is the question of looking into the economic rewards that may accrue, but if the agroclimatic prerequisites are lacking, that crop has little hope for sustained economic success. This principle must be borne in mind in all diversification endeavours.

Future articles in this series will provide guidelines to tea plantations on schemes for diversification of agriculture within tea plantations based on the principles given in the present article.

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